MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

Higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

**WORK PROGRAMS**

**disciplines of the main professional educational program of higher education**

**(Bachelor's program)**

|  |  |
| --- | --- |
| Direction of training | Biology |
| Provisioning direction code | 06.03.01 |
| Orientation (profile) | Microbiology |
| Graduate qualifications | bachelor |
| Form of study | Full-time/part-time |

Grozny, 2022

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

Higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

"Foreign language"

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Biology |
|  |  |

**1. The list** of **competencies formed by the discipline in the process of mastering** the **educational program**

|  |  |  |
| --- | --- | --- |
| **Competency group** | **Category of competencies** | **Code** |
| Universal | Communication | UC-4  Able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language(s) |

|  |  |  |
| --- | --- | --- |
| **Competency Code** | **Code and name of the competency indicator** | **Learning Outcomes**  **By discipline** |
| UC-4.1;  UC-4.2;  UC-4.3. | ID-1UC-4 Knows: computer technology and  Information infrastructure in the organization;  communication in professional ethics; factors for improving communication in the organization,  Communication technologies in professional  Interaction; Characteristics of communication  Threads; the importance of communication in professional interaction; methods of research of the communicative potential of the individual; modern means of information and communication technologies.  ID-2UC-4 Able to: create in Russian and foreign languages  written texts of scientific and official-business  styles of speech on professional issues;  investigate the passage of information on  management communications; Define internal communications in the organization.  ID-3UC-4 Owns: the principles of system formation  Communication; analyze the system  communication links in the organization by the implementation of oral and written  communications, including in a foreign language; presentation of plans and results of their own and  team activities using  communication technologies; technology12  building effective communication in  Organization; transfer of professional  information in information and telecommunication networks; Using  modern means of information and communication technologies. | **To know:** the basic rules of grammar (at the level of morphology and syntax); the basic norms of the use of vocabulary and phonetics; requirements for the speech and language design of oral and written statements, taking into account the specifics of a foreign culture; the main ways of working on language and speech material; lexical minimum of a general nature.  **Be able to:** perceive by ear and understand the main content of simple texts of a regional nature; to carry out monological and dialogical statements on professional topics; to use the basic techniques of translating texts.  **Own:** a foreign language as a means of communication; skills of colloquial and business speech (to possess normative pronunciation and rhythm of speech, apply them for everyday communication); oral (monologue and dialogical) speech on general topics; the most common (basic) grammar and basic grammatical phenomena characteristic of oral speech; professional vocabulary of a common language in a foreign language; basic skills in translating texts. |

**2. Competencies, indicators of their achievement and learning outcomes in the discipline**

**3. Scope of discipline**

|  |  |
| --- | --- |
| ***Types of educational work*** | ***Forms of study*** |
| ***Face-to-face*** |
| **Total Labor Intensity**: Credits/Hours | 288/8 |
| **Contact work**: | 134 |
| Lecture-type classes  Seminar-type classes  Intermediate Certification: Pass/***Pass***with Grade/***Exam\**** |  |
| 134 |
| 27 |
| **Independent work** (SRS) | 127 |
| Of these, for the implementation of course work (course project) |  |

\* - highlight the necessary in bold italics

Notes:

1. Credit and credit with assessment in full-time education shall be carried out within the framework of seminar-type classes. There are no hours allocated in the curriculum.

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
| 1. | Introductory phonetic course | English alphabet.  Transcription.  Rules  Read.  Vowels and consonants.  Reading rules  vowels in 4 types of syllables.  Reading consonants. Reading  vowels and consonants digraphs.  Dumb  (unpronounceable) consonants.  Stress.  Intonation.  Eurhythmics. |
| 2. | Morphology | 1. Article. Definite, indefinite. 2. Name  noun. Mn. number. Noun case.  3. The name is an adjective.  Degrees of comparison of adjectives.  4. The name is numeral. Sequence. Quantitative.  Fractions. Date. Clock.  5. Pronouns. Personal. Possessive case.  Object case. Indefinite pronouns.  Demonstrative pronouns. 6. Verb.  7. Tense forms of the verb. Group of Indefinite Tense.  The Continuous group. Perfect Group. Active voice.  Passive voice. Coordination of times.  8. Non-personal forms of the verb. 9. Modal verbs and their substitutes.  10. Prepositions. |
| 3. | Syntax | 1. Offer. Narrative.  Negative. Question. General question.  Alternative question. A dividing issue.  Special question.  2. Word order.  3. Compound sentences.  4. Difficult subordinates. sentences.  5. Interrogative sentences.  6. Turnover there is/there are.  7. Impersonal sentences.  8. Subordinate clauses.  9. Direct and indirect speech. |
| 4. | Lexical, conversational and professional topics | About Myself and My Family.  The Chechen State University  My Future Profession  The English language  Great Britain/London  The Chechen Republic  Specialization in Agriculture  Improvements of Plants  Biotechnology for Plants, Animals, and the Environment  Gardening  Forests, Trees and Wood  Agricultural Machinery  Agricultural Economics  Agriculture and Environment  Agriculture in Great Britain  Gardening in Great Britain  The Importance of Agriculture to the UC  Farming Types in Britain  Agriculture in the USA  Farming Regions of the United States  Agriculture in Canada  Mastering the vocabulary of the topic. Basic grammar  Design. Questions to the topic. Development  monologue and dialogical speech on the topic. |

**4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allotted for them and the types of training sessions**

4.1. Distribution of hours by sections/topics and types of work

4.1.1. Full-time education

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No p/n** | | **Section/Topic** | | **Types of educational work (in hours)** | | | | | | |
|  |  | | **Contact work** | | | | | | | Inde-  Pendent  work |
| **Lecture-type classes** | | | **Seminar-type classes** | | | |
| *Lecture* | | *Other training sessions* | *Hands-on training* | *Seven bunks* | *Laboratory slaves.* | *Other activities* |
| 1. | | Introductory course | |  |  | 32 |  |  |  | 30 |
| 2. | | Morphology | |  |  | 34 |  |  |  | 32 |
| 3. | | Syntax | |  |  | 34 |  |  |  | 32 |
| 4. | | Lexical, colloquial and professional topics. | |  |  | 34 |  |  |  | 33 |
| 5. | | Total | |  |  | 134 |  |  |  | 127 |

4.1.2. Full-time and part-time education

4.2. The program of the discipline, structured by topics / sections

4.2.2. Content of practical classes

**5. Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control of the development of a particular discipline are provided:

- current monitoring of progress

- intermediate certification of students in the discipline

The fund of evaluation tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation tools for the current certification of the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Controlled sections (topics)** | **Name of the appraisal tool** |
| 1. | Introductory course | Oral questioning |
| 2. | Morphology | Oral questioning |
| 3. | Syntax | Mini-test |
| 4. | Lexical, colloquial and professional topics. | Oral questioning |

5.2 Typical control tasks or other materials necessary to assess knowledge, skills, abilities and (or) experience in the process **of** current research

Discipline section: **Introductory phonetic course.**

Questions:

1. English alphabet.

2. Transcription.

3. Reading rules.

4. Vowels and consonants.

5. Rules for reading vowels in 4 types of syllables.

6. Reading consonants.

7. Reading vowels and consonants, digraphs.

8. Dumb (unpronounceable) consonants.

9. Stress.

10. Intonation.

11. Rhythmics.

Discipline section: **Morphology.**

Questions:

1. Article. Definite, indefinite.

2. Noun.

3. Mn. number. Noun case. Possessive case. Object case.

4. The name is an adjective.

5. Degrees of comparison of adjectives.

6. The name is numeral. Sequence. Quantitative.

7. Fractions. Date. Clock.

8. Pronouns. Personal.

9. Indefinite pronouns Demonstrative pronouns.

10. Prepositions.

11. Verb.

12. Tense forms of the verb.

13. Indefinite.

14. Continuous Group.

15. Perfect Group.

16. Active Voice.

17. Passive voice.

18. Coordination of times.

19. Non-personal forms of the verb.

20. Modal verbs and their substitutes.

Discipline section: **Syntax.**

Questions:

1. Offer. Narrative. Negative.

2. Interrogative. General question. Alternative question. A dividing issue.

Special question.

3. Word order.

4. Complex sentences.

5. Complex sentences.

6. Turnover There is/there are.

7. Impersonal sentences.

8. Subordinate clauses.

9. Direct and indirect speech.

**Test task:**

1. Test task:

1. Every day

a) I go every day there.

b) I go there every day

c) Either could be used here.

2. Fluently

a) I want to speak English fluently.

b) I want to speak fluently English

3. Since

a) He’s been since three clock here.

b) He’s been here since three clock.

4. Probably

a) I probably won’t have time to do it.

b) I won’t probably have time to do it.

5. Never

a) I’ve never met her.

b) I’ve met her never.

6. There

a) I went last week there.

b) I went there last week.

7. Own

a) I did it on my own.

b) I did on my own it.

8. Often

a) Do you come here often?

b) Do often you come here?

9. Hard

a) He worked hard all week.

b) He worked all week hard.

10. Well

a) The computer system worked well.

b) The computer system well worked.

Keys: 1b, 2a, 3b, 4a, 5a, 6b, 7a, 8a, 9a, 10a.

**2. Test task:**

1.It is getting late. Are... in the park?

a) the children playing still

b) still the children playing

c) the children still playing

2. Denny was very hungry, so....

a) he quickly ate his dinner

b) quickly he ate his dinner

c) he ate quickly his dinner

3. Aslan plays football well..., but not as well as Aslan.

a) also his brother plays football

b) his brother also plays football

c) his brother plays football also

4. There are ... on the ground this autumn as last year.

a) not such many leaves

b) not so many leaves

c) so not many leaves

5. There was a ... forest near the village.

a) beautiful large old pine

b) pine old beautiful large

c) large beautiful pine old

6....at work after office hours?

a) Do you have often to stay

b) Have you often to stay

c) Do you often have to stay

7. .... on the shelf over there?

a) Shall I put your books

b) I shall put your books

c) Shall I your books put

8. Did you learn...?

a) at school today a lot of things

b) a lot of things at school today

c) today a lot of things at school

9. Does Amina ...?

a) every week write a letter to her parents

b) write a letter to her parents every week

c) a letter to her parents write every week

10. Often

a) Do you come here often?

b) Do often you come here?

c)Do you come often here?

Keys: 1c, 2a, 3b, 4b, 5a, 6c, 7a, 8b, 9b, 10c.

**3. Test task:**

1. ... about his new book?

a) How do you think

b) How you think

c) What you think

d) What do you think

2. ... far is it from the town where you live?

a) What

b) How

c) Where

d) When

3. ... to buy a new car?

a) Where you are going

b) What are you going

c) When are you going

d) What you are going

4. ... colour pencils would you like to use?

a) Which

b) What

c) Where

d) How

5. ... in Moscow or in Saint Petersburg ?

a) Where do you live

b) You live where

c) Do you live

d) Are you live

6. Magomed knows a lot of interesting things, ... ?

a) Isn’t he

b) Does he

c) Hasn’t he

d) Doesn’t he

7. They are learning French, ... ?

a) Are they

b) Do they

c) Aren’t they

d) Don’t they

8. Malika isn’t very clever, ...?

a) isn’t she

b) is she

c) doesn’t she

d) does she

9. ... arrive at the hotel?

a) When will they

b) When they will

c) Where will they

d) Where they will

10. ... one of Makka’s friends, are you?

a) Aren’t you

b) You don’t

c) You aren’t

d) Don’t you

Keys: 1d, 2b, 3c, 4b, 5c, 6d, 7c, 8b, 9a, 10c.

5.3 Methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) experience

**Verbal response**

Assessment of knowledge involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, mastery of oratory skills are evaluated.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of the material without factual errors.

The assessment of "*excellent"* is put in the case when the material is presented exhaustively, consistently, competently and logically coherently, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not find it difficult to answer, observes the culture of speech.

A *"good"* grade is given if the student firmly knows the material, competently and essentially presents it, knows the practical base, but when answering the question, he makes insignificant errors.

A *"satisfactory"* grade is given if the student has mastered only the basic material, but does not know certain details, makes inaccuracies, insufficiently correct formulations, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of a proper connection between analysis, argumentation and conclusions.

An *"unsatisfactory"* grade is given if the student does not answer the questions posed.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*the correct answer to the question

An *"excellent*" grade is given if 90-100% of the tasks are completed correctly

A *"good"* grade is given if 70-89% of the tasks are completed correctly

*A "satisfactory"* grade is given if 50-69% of the tasks are completed correctly

An *"unsatisfactory"* grade is given if less than 50% of the tasks are completed correctly

**6. The list of educational literature necessary for the development of the discipline (module)**

1. Aghabekyan I. P. "English for bachelors". Rostov-on-Don "Phoenix" 2016 -383 p.

2. Koroleva N. E. English language. Service and tourism. English For Tourism: A Study Guide. — Ed. 2nd. — Rostov-on-Don: Phoenix, 2017. — 407 p. Access mode: <https://studfile.net/preview/5642359/>

**7. Modern professional databases and information reference systems**

[http://www.wikipedia.org/](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.wikipedia.org%2F)

[http://agendaweb.org/listening/easy\_reading\_listening.html](http://infourok.ru/go.html?href=http%3A%2F%2Fagendaweb.org%2Flistening%2Feasy_reading_listening.html)

[http://www.merriam-webster.com/dictionary.htm](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.merriam-webster.com%2Fdictionary.htm)   
[http://www.thefreedictionary.com/](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.thefreedictionary.com%2F)  
[http://www.1911encyclopedia.org/Main\_Page](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.1911encyclopedia.org%2FMain_Page)  
[http://www.lingvo.ru/lingvo/](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.lingvo.ru%2Flingvo%2F)

[http://www.westegg.com/cliche/](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.westegg.com%2Fcliche%2F)   
[http://www.owlnet.rice.edu/~ling215/NewWords/index.html](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.owlnet.rice.edu%2F%257Eling215%2FNewWords%2Findex.html)   
[http://www.yourdictionary.com/languages/ge...ic.html#english](http://infourok.ru/go.html?href=%23english)  
[http://www.onelook.com/](http://infourok.ru/go.html?href=http%3A%2F%2Fwww.onelook.com%2F)

[http://standart.edu.ru/](http://infourok.ru/go.html?href=http%3A%2F%2Fstandart.edu.ru%2F)

[www.lingvo.ru](http://www.lingvo.ru/) Abby Lingvo Electronic Dictionary

[www.multitran.ru](http://www.multitran.ru/) Multitran Electronic Dictionary

**8. Composition of the software:**

List of information technologies used in the implementation of

the educational process in the discipline, including a list of software and

Information reference systems:

Electronic educational environment of the university ([http://www.chgu.org](http://www.chgu.org/) )

Electronic library system IPRBooks([http://www.iprbookshop.ru](http://www.iprbookshop.ru/) )

Multidisciplinary educational resource "Consultant

student" ([http://www.studentlibrary.ru](http://www.studentlibrary.ru/) )

Electronic library system "IVIS" ([http://ivis.ru](http://ivis.ru/) )

Desktop Education ALNG LicSAPk OLVS E 1Y Academic Edition Enterprise;

Kaspersky Endpoint Security for Business – Standard Russian Edition. 100-149 Nose

1 year Education License, contract No. 15573 / RND 2933 dated 12/27/2017.;

OS Windows No. 15576 / RND 2933 dated 12/27/2017.;

MS Office No. 15576 / RND 2933 dated 12/27/2016. OVS Agreement (Open value)

subscription) Agreement codeV8985616;

Kaspersky Endpoint Security for Business 700 (License document number :

658/2018 dated 24.04.2018);

WINHOME 10 RUS OLP NL Acdmc legalization Get Genuine (contract dated 10.08.2017);

WINEDU RUS UpgrdSapk OLP NL Acdmc (contract dated 10.08.2017);

CoreCAL SNGL LicSAPk OLP NL Acdmc UsrCAL (contract dated 10.08.2017);

WinSvrStd RUS LicSAPk OLP NL Acdmc 2 Proc (contract dated 10.08.2017)

**9. Equipment and technical means of training**

            Interactive whiteboard, computer, projector for practical classes, electronic library of the course, links to Internet resources, etc. Kadyrov Chechen State University has a material and technical base that provides all types of disciplinary and interdisciplinary training, and has access to global electronic communication networks. The educational process takes place in classrooms for lecture and practical classes. Premises for lectures, practical classes are equipped with specialized educational furniture, technical means that serve to present educational information to students.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational

institution of higher education

"Chechen State University»

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Department of Philosophy

**WORK PROGRAM**

**ACADEMIC DISCIPLINE**

**«Philosophy»**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Biology |
|  |  |

The RPD is adapted for persons

with disabilities

health and disability

                                                       Grozny, 2022

Denilkhanova R.Kh. Work program of the discipline "Philosophy" / Comp. R.Kh. Denilkhanova Head of the Department, Associate Professor, Candidate of Philosophical Sciences – Grozny: Chechen State University, 2021.

The work program was reviewed and approved at a meeting of the Department of Philosophy, recommended for use in the educational process (protocol No. 10 dated June 03, 2021), drawn up in accordance with the requirements of the Federal State Educational Standard of Higher Education in the direction of training 06.03.01 Biology, (bachelor's level), approved by order of the Ministry of Education and Science of the Russian Federation dated August 07, 2020 No. 920.

 R.Kh.Denilkhanova, 2021

 Chechen State University, 2021

**Content**

**1. Explanatory note**

1.1 The purpose and objectives of the discipline *(module)*

1.2. The list of planned learning outcomes in the discipline (*module*), correlated with indicators of achievement of competencies

1.3. The place of discipline in the structure of the educational program

**2.** **Structure of the discipline *(module)***

**3. The content of the discipline *(module)***

**4. Educational Technology**

**5. Evaluation of planned learning outcomes**

5.1. Grading system

5.2. Grading criteria

5.3. Evaluation tools (materials) for current monitoring of progress, intermediate certification of students in the discipline *(module)*

**6. Educational, methodological and information support of the discipline**

6.1. List of sources and references

6.2. List of resources of the information and telecommunication network "Internet"

**7. Material and technical support of the discipline *(module)***

**8. Ensuring the educational process for persons with disabilities and disabled people**

**Application**

Appendix 1. Changesheet

**1.1 Goals and objectives of mastering the discipline**: is the formation of students:

- ideas about philosophy as a way of cognition and spiritual development of the world;

- concepts of the foundations of philosophical knowledge;

- humanistic worldview and positive system of value orientation;

- general culture of thinking and the ability to critically analyze scientific and philosophical theories;

**Tasks of mastering the discipline:**

1. To acquaint with the main sections of the program, revealing: the specifics of the subject of philosophy and the formation of a philosophical worldview;

2. Show the features of the development of philosophical ideas from Antiquity to the present;

3. To acquaint with the basic teachings and stages of the formation and development of philosophical knowledge, to help the student comprehend and choose worldview, epistemological, methodological and axiological guidelines for determining their place and role in society;

4. To form a holistic view of the processes and phenomena occurring in inanimate and animate nature and social life;

**1.2. The list of planned learning outcomes in the discipline, correlated with the planned results of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competency Code** | **Code and name of the competency indicator** | **Learning Outcomes**  **By discipline** |
| **UC-5**  Able to perceive the intercultural diversity of society in socio-historical, ethical and philosophical contexts | **K-5.4** Uses philosophical knowledge to form a worldview position that involves the adoption of moral obligations in relation to nature, society, other people and to oneself | **To know:**  - basic philosophical concepts and categories, patterns of development of nature, society and thinking;  **can**:  - analyze and systematically present worldview, socially and personally significant philosophical problems;  - argue and formulate a worldview and civic position;  **possess:**  – the initial experience of scientific reflection (analysis, comparison, systematization).  - skills of reasoned speech, correct discussion, controversy and dialogue. |

1.3**The place of discipline in the structure of the BRI.**

The discipline "Philosophy" is in a logical and content-methodical relationship with other parts of the EP. Mastering the discipline "Philosophy" is a necessary basis for the study of subsequent disciplines:

1. History

2. History of the Czech Republic

3. Chechen traditional culture and ethics

**2. Structure of the discipline**

The total labor intensity of the discipline in full-time education is 3 credits (108 academic hours)

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No p/n | Discipline/Topics Section | Semester | Types of educational work  (in hours) | | | | | | Forms of current monitoring of progress,  Form of intermediate certification *(by semesters)* |
| Contact | | | | Intermediate certification | Independent work |
| Lecture | Seminar | Hands-on training | Labs |
| **1** | Philosophy, its subject and place in culture | **7** | 4 |  | 4 |  |  | 8 |  |
| **2** | Philosophy of the Ancient World | **7** | 4 |  | 4 |  |  | 4 |  |
| **3** | Philosophical thought of the European Middle Ages | **7** | 4 |  | 4 |  |  | 4 |  |
| **4** | Renaissance philosophy | **7** | 4 |  | 4 |  |  | 4 |  |
| **5** | Philosophy of the New Age | **7** | 4 |  | 4 |  |  | 4 |  |
| **6** | German classical philosophy (late XVIII-mid XIX centuries). | **7** | 4 |  | 4 |  |  | 4 |  |
| **7** | Russian philosophy | **7** | 2 |  | 2 |  |  | 4 |  |
| **8** | The main directions of foreign philosophy of the XIX-XX- centuries. | **7** | 2 |  | 2 |  |  | 4 |  |
| **9** | The main problems of philosophy.  Philosophy of being. | **7** | 2 |  | 2 |  |  | 7 |  |
|  | **exam** |  | **30** |  | **30** |  |  | **48** |  |

**3.The content of the discipline *(module)* The content of the discipline *(module) should consist of sections corresponding to the structure of the discipline, subsections and individual topics with the degree of detail that, in the author's opinion, optimally contribute to the achievement of the goal and the implementation of the tasks***

|  |  |  |
| --- | --- | --- |
| **№** | **The name of the section of the discipline** | **Content** |
| **1** | Philosophy, its subject and place in culture | 1. The place and role of philosophy in the system of spiritual culture.  2. Philosophy and worldview.  The subject and the main question of philosophy. |
| **2** | Philosophy of the Ancient World | Ancient Eastern religious and philosophical thought.  2. Ancient philosophy. |
| **3** | Philosophical thought of the European Middle Ages | 1. Medieval philosophy of the West.  Classical Arab-Muslim philosophy |
| **4** | Renaissance philosophy | 1. Humanistic stage;  2. Neoplatonic stage;  3. Natural philosophical stage;  Skeptical stage; |
| **5** | Philosophy of the New Age | 1. Francis Bacon's empiricism.  2. The rationalism of René Descartes. |
| **6** | German classical philosophy (late XVIII-mid XIX centuries). | 1. The philosophy of Immanuel Kant.  2. Objective idealism and Hegel's dialectics.  Ludwig Feuerbach's Anthropological Materialism |
| **7** | Russian philosophy | The Formation of Russian Religious Philosophy: The Slavophile Doctrine of the Messianic Role of the Russian People and Conciliarity. |
| **8** | The main directions of foreign philosophy of the XIX-XX- centuries. | 1. Irrational philosophy.  2. Materialist dialectics.  3. Philosophy of positivism.  4. Phenomenology.  5. Hermeneutics. |
| **9** | The main problems of philosophy.  Philosophy of being. | 1. Philosophical understanding of being.  2. Problems of matter and forms of its existence. |

**4. Educational Technology**

**Educational Technology**

|  |  |  |  |
| --- | --- | --- | --- |
| **No p/n** | **Section name** | **Types of training sessions** | **Educational Technology** |
| **1** | **2** | **3** | **4** |
| *1.* | Philosophy, its subject and place in culture | Lecture 1. | Introductory lecture using video materials |
| *2* | Philosophy of the Ancient World | Workshop 1. | A detailed conversation with a discussion of the report |
| *3* | Philosophical thought of the European Middle Ages | Independent work | Counseling and checking homework by e-mail |
| *4* | Renaissance philosophy | Lecture 1. | Introductory lecture using video materials |
| *5* | Philosophy of the New Age | Workshop 1. | A detailed conversation with a discussion of the report |
| *6* | German classical philosophy (late XVIII-mid XIX centuries). | Independent work | Counseling and checking homework by e-mail |
| *7* | Russian philosophy | Lecture 1. | Introductory lecture using video materials |
| *8* | The main directions of foreign philosophy of the XIX-XX- centuries. | Workshop 1. | A detailed conversation with a discussion of the report |
| *9* | The main problems of philosophy.  Philosophy of being. | Independent work | Counseling and checking homework by e-mail |

**Assessment of planned learning outcomes**

5.1. Grading system

|  |  |  |
| --- | --- | --- |
| **Form of control** | **Max. Number of points** | |
| **For one job** | **Altogether** |
| Current control: |  |  |
| -poll | 5 points | 30 points |
| - participation in the discussion at the seminar | 5 points | 10 points |
| - test (topics 1-5) | 10 points | 10 points |
| - test (topics 6-9) | 10 points | 10 points |
| Intermediate certification  in the traditional form |  | 40 points |
| **Total for the semester** (discipline)  exam |  | 100 points |

The resulting aggregate result is converted into a traditional scale in accordance with the table:

|  |  |  |  |
| --- | --- | --- | --- |
| 100-point scale | Traditional scale | |  |
| 96 – 100 | It's cool | Credited |  |
|  |
| 76 - 95 | Ok |  |
| 51 – 75 | satisfactorily |  |
|  |
| 0 – 50 | unsatisfactorily | Not credited |  |
|  |

5.2. Criteria for grading the discipline[[1]](https://www.translatoruser.net/bvsandbox.aspx?&from=ru&to=en&csId=714acd4f-2207-4aba-a527-f7c0bb4625c0&usId=8197a1fa-7c23-4bae-bde0-6877cae2b742&ac=true&bvrpx=false&bvrpp=&dt=2023%2F6%2F6%2015%3A2" \l "_ftn1" \o ")

| **Scores/ECTS Scale** | **Discipline Assessment** | **Criteria for assessing learning outcomes in the discipline** |
| --- | --- | --- |
| 100-83/  A,B | "excellent"/  "Credited (excellent)"/  "Credited" | It is exhibited to the student, if he has deeply and firmly mastered the theoretical and practical material, can demonstrate this in the classroom and during the intermediate certification.  The student exhaustively and logically coherently presents the educational material, knows how to link theory with practice, copes with solving professional problems of a high level of complexity, and correctly justifies the decisions made.  Fluent in educational and professional literature.    The assessment of the discipline is given to the student, taking into account the results of the current and intermediate certification.  The competencies assigned to the discipline are formed at the level of "high". |
| 82-68/  C | "Good"/  "Credited (good)"/  "Credited" | It is exhibited to the student if he knows the theoretical and practical material, competently and essentially presents it in the classroom and during the intermediate certification, avoiding significant inaccuracies.  The student correctly applies theoretical provisions in solving practical problems of professional orientation of different levels of complexity, possesses the necessary skills and techniques for this.  He is quite well versed in educational and professional literature.  The assessment of the discipline is given to the student, taking into account the results of the current and intermediate certification.  The competencies assigned to the discipline are formed at the level of "good***»****.* |
| 67-50/  D,E | "satisfying"/  "Credited (satisfied)"/  "Credited" | It is exhibited to the student if he knows theoretical and practical material at a basic level, makes some mistakes in its presentation in the classroom and during intermediate certification.  The student experiences certain difficulties in the application of theoretical provisions in solving practical problems of a professional orientation of a standard level of complexity, possesses the basic skills and techniques necessary for this.  Demonstrates a sufficient level of knowledge of educational literature on the discipline.  The assessment of the discipline is given to the student, taking into account the results of the current and intermediate certification.  The competencies assigned to the discipline are formed at the level of "sufficient***»****.* |
| 49-0/  F,FX | "unsatisfactory"/  Not credited | It is exhibited to the student if he does not know the theoretical and practical material at the basic level, makes gross mistakes in its presentation in the classroom and during the intermediate certification.  The student experiences serious difficulties in applying theoretical provisions in solving practical problems of a professional orientation of a standard level of complexity, does not possess the necessary skills and techniques for this.  Demonstrates fragmentary knowledge of educational literature on the discipline.  The assessment of the discipline is given to the student, taking into account the results of the current and intermediate certification.  Competencies at the level of "sufficient***»*** assigned to discipline, are not formed. |

5.3. Evaluation tools (materials) for current monitoring of progress, intermediate certification of students in the discipline *(module)*

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Controlled sections (topics)** | **Name of the appraisal tool** |
| 1. | Philosophy, its subject and place in culture | Oral questioning, testing, information project (report) |
| 2. | Philosophy of the Ancient World | Oral questioning, testing, information project (report) |
| 3. | Philosophical thought of the European Middle Ages | Oral questioning, testing, information project (report) |
| 4. | Renaissance philosophy | Oral questioning, testing, information project (report) |
| 5. | Philosophy of the New Age | Oral questioning, testing, information project (report) |
| 6. | German classical philosophy (late XVIII-mid XIX centuries). | Oral questioning, testing, information project (report) |
| 7. | Russian philosophy | Oral questioning, testing, information project (report) |
| 8. | The main directions of foreign philosophy of the XIX-XX- centuries. | Oral questioning, testing, information project (report) |
| 9. | The main problems of philosophy.  Philosophy of being. | Oral questioning, testing, information project (report) |

5.2 Typical control tasks or other materials necessary to assess knowledge, skills, abilities and (or) experience in the process ofcurrent research

**Exemplary test tasks:**

**1. From Greek, the word "philosophy" is translated as:**

1. Love of truth

2. Love of wisdom

3. The Doctrine of Peace

4. Divine wisdom

**2. For the first time he used the word "philosophy" and called himself a "philosopher":**

1. Socrates

2. Aristotle

3. Pythagoras

4. Cicero

**3. Determine the time of origin of philosophy:**

1. the middle of the III millennium BC

2. VII-VI centuries BC

3. XVII-X VIII centuries

4. - centuries

**4. The worldview form of social consciousness, rationally justifying the ultimate foundations of being, including society and law:**

1. History

2. Philosophy

3. Sociology

4. Cultural Studies

**5. The worldview function of philosophy is that:**

1. Philosophy carries out a reflection of contemporary culture

2. Philosophy directs the activities of people to combat the shortcomings of the existing system

3. Philosophy contributes to the improvement of people's characters

4. Philosophy helps a person to understand himself, his place in the world

**6. Worldview is:**

1. The totality of knowledge possessed by a person

2. a set of views, assessments, emotions that characterize a person's attitude to the world and to himself

3. reflection by human consciousness of those social relations that objectively exist in society

4. The system of adequate preferences of a mature personality

**7. The defining feature of a religious worldview is:**

1. Belief in one creator God

2. The denial of human freedom, the belief that all actions are originally determined by God

3. contempt for the achievements of science, denial of their reliability

4. Belief in supernatural, otherworldly forces that have the ability to influence the course of events in the world

**5. The direction that denies the existence of God is called:**

1. Atheism

2. Skepticism

3. Agnosticism

4. Neo-Thomism

**8. Ontology is:**

1. The doctrine of the universal conditionality of phenomena

2. The doctrine of the essence and nature of science

3. The doctrine of being, of its fundamental principles

4. The doctrine of correct forms of thinking

**9. Epistemology is:**

1. The doctrine of the development and functioning of science

2. The doctrine of nature, the essence of knowledge

3. The doctrine of logical forms and laws of thinking

4. The doctrine of the essence of the world, its structure

**10. Axiology is:**

1. The Doctrine of Values

2. The Doctrine of Development

3. Theory of justice

4. The theory of the superiority of some groups of people over others

**11. Ethics is:**

1. The Doctrine of Development

2. The Doctrine of Being

3. The theory of the moral superiority of some people over others

4. The doctrine of morality and moral values

**12. According to Marxist philosophy, the essence of the basic question of philosophy is:**

1. the relation of consciousness to matter

2. the meaning of life

3. the relationship between the natural and social worlds

4. the driving forces of the development of society

**13. Idealism is characterized by the statement:**

1. Consciousness is primary, matter does not exist independently of consciousness

2. Matter and consciousness are two primordial principles that exist independently of each other

3. It is a rigorous, consistent system of judgments about nature

4. Consciousness is primary, matter does not exist

**14. Dualism is characterized by the thesis:**

1. Consciousness is primary, matter does not exist independently of consciousness

2. Matter and consciousness are two primordial principles that exist independently of each other

3. It is a rigorous, consistent system of judgments about nature

4. Consciousness is primary, matter does not exist

**15. What historical type of worldview are we talking about here: "This is a holistic worldview, in which various ideas are linked into a single figurative picture of the world, combining reality and fantasy, natural and supernatural, knowledge and faith, thought and emotions"?**

1. Mythologies

2. Religions

3. Philosophies

4. Science

**Oral Survey Questions by Topic:**

**Topic No. 1. Philosophy, its subject and place in culture**

Questions for preparation on the topic being studied:

1. The place and role of philosophy in the system of spiritual culture.

2. Philosophy and worldview.

3. The subject and basic question of philosophy.

4. The main functions of philosophy.

5. The structure of philosophical knowledge.

**Topic No. 2. Philosophy of the Ancient World**

Questions for preparation on the topic being studied:

1. Ancient Eastern religious and philosophical thought.

Philosophy of Ancient India. Philosophical traditions of Ancient India. Vedas. Jainism. Buddhism.

Philosophy of Ancient China. Periodization of the history of Chinese philosophy.

2. Ancient philosophy.

The formation of ancient philosophy.

Philosophical schools of pre-Socratics.

Problems and content of the exercises.

The classical stage in the development of Greek philosophy.

Philosophical schools of late antiquity.

**Topic No. 3. Philosophical thought of the European Middle Ages**

Questions for preparation on the topic being studied:

1. Medieval philosophy of the West: basic biblical ideas of philosophical significance; Medieval philosophy as a synthesis of two traditions: Christian revelation and ancient philosophy, the patristics of Augustine Aurelius; the scholasticism of Thomas Aquinas, the problem of nominalism and realism in medieval philosophy;

2. Classical Arab-Muslim philosophy: Worldview problems in the Qur'an: the doctrine of the origin of man, the concept of predestination and free will. The concept of knowledge in Islam. The Origins of Arab-Muslim Philosophy: Ancient Thought.

**Topic No. 4. Renaissance philosophy**

Questions for preparation on the topic being studied:

1. humanistic stage (XIV - ser. XV centuries.) - Dante Alighieri, F. Petrarch, L. Valla;

2. The Neoplatonic stage (ser. XV - the first floor. XVII centuries.) N. Cusa, M. Ficino, P. Mirandola;

3. Natural philosophical stage (second sex. XVI - beginning of XVII centuries) - B. Telesio, F. Patrizi, D. Bruno, T. Campanella;

4. skeptical stage (beginning of XVII century) - Erasmus of Rotterdam, Michel Montaigne

**Topic No. 5. Philosophy of the New Age**

Questions for preparation on the topic being studied:

1. Francis Bacon's empiricism.

2. Rationalism of Rene Descartes.

3. Empiricism and rationalism after Bacon and Descartes.

4. Philosophy of Enlightenment.

**Approximate topics of information projects (reports):**

1. Worldview as a way of mastering the world by man.

2. Mythological worldview: essence and features.

3. Philosophy as a theoretical form of worldview.

4. Philosophical schools of Ancient India.

5. The problem of man in the philosophy of Ancient India and Ancient China.

6. Buddhism as a religious and philosophical doctrine.

7. Socio-philosophical views of Confucius.

8. Taoism as a philosophical direction of Ancient China.

9. Features of the picture of the world in Chinese philosophy.

10. The problem of being in ancient philosophy.

11. The problem of man in the philosophy of the Sophists and Socrates.

12. Plato as the founder of Western theology.

13. Socio-political views of Plato.

14. Aristotle is the pinnacle of ancient Greek philosophy.

15. The era of Hellenism and the decline of ancient philosophy.

16. Neoplatonism and the transition to a new ideological era.

17. Apologetics and patristics of the early Middle Ages.

18. Theocentric medieval worldview.

19. The Christian optimism of Aurelius Augustine.

20. F. Aquinas' methods for achieving truth.

5.3 Methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) experience

**Verbal response**

Assessment of knowledge involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, mastery of oratory skills are evaluated.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of various points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of the material without factual errors.

The assessment of "*excellent"*is put in the case when the material is presented exhaustively, consistently, competently and logically coherently, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not find it difficult to answer, observes the culture of speech.

A *"good"* grade is given if the student firmly knows the material, competently and essentially presents it, knows the practical base, but when answering the question, he makes insignificant errors.

A *"satisfactory"* grade is given if the student has mastered only the basic material, but does not know certain details, makes inaccuracies, insufficiently correct formulations, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of a proper connection between analysis, argumentation and conclusions.

An *"unsatisfactory"* grade is given if the student does not answer the questions posed.

**Information project (report with presentation)**

An information project**is**a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project because it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- when grading, independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, complete answers to audience questions with examples are taken into account.

The "*different*" grade is given when the student fully reveals the question (problem), presents information in a systematized, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to the audience's questions with examples.

A *"good"* grade is given if the student reveals the question (problem), presents information systematically, consistently, logically, interconnectedly, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 mistakes in the presentation of the material, gives full or partially complete answers to questions from the audience.

A *"satisfactory"* grade is given if the student does not fully disclose the question (problem), presents information not systematized and not quite consistently, uses 1-2 professional terms, uses information technology, makes 3-4 mistakes in the presentation of the material, answers only elementary questions from the audience without explanation.

An *"unsatisfactory"* rating is given if the issue is not disclosed, the information provided is not logically related, professional terms are not used, makes more than 4 mistakes in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*the correct answer to the question

An *"excellent*" grade is given if 90-100% of the tasks are completed correctly

A *"good"* grade is given if 70-89% of the tasks are completed correctly

*A "satisfactory"* grade is given if 50-69% of the tasks are completed correctly

An *"unsatisfactory"* grade is given if less than 50% of the tasks are completed correctly

**6. Educational, methodological and information support of the discipline**

**6.1. List of sources and references**

1. History of philosophy [Electronic resource]: textbook / A.A. Borodich [and others]. — Electron. Textual data. — Minsk: Higher School, 2012. — 998 p. — 978-985-06-2107-8. — Access mode: <http://www.iprbookshop.ru/20215.html>

2. Makulin A.V. History of philosophy [Electronic resource]: textbook / A.V. Makulin. — Electron. Textual data. — Saratov: University Education, 2016. — 444 p. — 2227-8397. — Access mode: http://www.iprbookshop.ru/49884.htm

3. History of philosophy [Electronic resource]: textbook / A.V. Pertsev [and others]. — Electron. Textual data. — Ekaterinburg: Ural Federal University, 2014. — 324 p. — 978-5-7996-1177-4. — Access mode: http://www.iprbookshop.ru/68337.html

4. Sergodeeva E.A. History of philosophy [Electronic resource]: workshop / E.A. Sergodeeva, D.A. Erokhin, N.A. Popova. — Electron. Textual data. — Stavropol: North Caucasus Federal University, 2016. — 114 p. — 2227-8397. — Access mode: http://www.iprbookshop.ru/69388.html

5. Chanyshev A.N. History of philosophy of the Ancient World [Electronic resource]: textbook for universities / A.N. Chanyshev. — Electron. Textual data. Moscow: Akademicheskii proekt, 2016. — 608 p. — 978-5-8291-2522-6. — Access mode: http://www.iprbookshop.ru/60088.html

6. History of philosophy. A course of lectures in a concise presentation [Electronic resource]: a textbook / A.A. Akulova [and others]. — Electron. Textual data. — M. : Prometheus, 2014. — 98 p. — 978-5-9905886-2-2. — Access mode: http://www.iprbookshop.ru/30405.html

7. Makulin, A.V. Workbook. Philosophy. Part one. History of philosophy [Electronic resource] / A.V. Makulin. — Electron. Textual data. — Arkhangelsk: Northern State Medical University, 2015. — 235 p. — 978-5-91702-179-9. — Access mode: http://www.iprbookshop.ru/49885.html

8. History of philosophy. West-Russia-East. Book Two. Philosophy of the XV-XIX centuries. [Electronic resource]: textbook for universities / A.B. Ballaev [and others]. — Electron. Textual data. Moscow: Akademicheskii proekt, 2017. — 495 p. — 978-5-8291-2548-6. — Access mode: <http://www.iprbookshop.ru/36372.html>

9. Belyaev G.G. History of world and domestic philosophy [Electronic resource]: textbook / G.G. Belyaev, N.P. Kotlyar. — Electron. Textual data. Moscow: Moscow State Academy of Water Transport, 2016. — 64 p. — 2227-8397. — Access mode: http://www.iprbookshop.ru/65660.html

10. History of foreign philosophy. Middle Ages: apologetics and patristics [Electronic resource]: textbook / V.I. Kudryavtseva [and others]. — Electron. Text data. — Ekaterinburg: Ural Federal University, 2016. — 328 p. — 978-5-7996-1692-2. — Access mode: <http://www.iprbookshop.ru/68248.html>

11. Nester T.V. Fundamentals of philosophy [Electronic resource]: textbook / T.V. Nester. — Electron. Textual data. — Minsk: Republican Institute of Professional Education (RIPO), 2016. — 216 p. — 978-985-503-605-1. — Access mode: <http://www.iprbookshop.ru/67703.html>

12. Short course in philosophy [Electronic resource] / . — Electron. Textual data. — M. : RIPOL classic, Okay-book, 2016. — 160 p. — 978-5-386-089-57-3. — Access mode: <http://www.iprbookshop.ru/73421.html>

**Further reading:**

1. Reader on the history of philosophy [Electronic resource]: a textbook for students of universities of culture and art / — Electron. Textual data. — Saratov: Saratov State Conservatory named after L.V. Sobinov, 2015. — 404 p. — 978-5-94841-209-2. — Access mode: <http://www.iprbookshop.ru/54423.html>

2. Torchinov, E.A. Ways of philosophy of the East and the West. Cognition of the transcendent [Electronic resource] / E.A. Torchinov. — Electron. Text data. — St. Petersburg. : RIPOL classic, Palmyra, 2017. — 464 p. — 978-5-521-00291-7. — Access mode: http://www.iprbookshop.ru/73407.html

3. Sergodeeva E.A. Newest trends and directions of foreign philosophy [Electronic resource]: workshop / E.A. Sergodeeva. — Electron. Text data. — Stavropol: North Caucasus Federal University, 2016. — 122 p. — 2227-8397. — Access mode: <http://www.iprbookshop.ru/69411.html>

4. Grinenko, G. V. History of philosophy / G. V. Grinenko. – 3rd ed., Ispr. Moscow: Yurayt, 2011 – 689 p. – Series: Fundamentals of Science

5. Spirkin, A.G. Philosophy: textbook / A.G. Spirkin. – 3rd ed. Rev. and add. – M.: Yurayt, 2011. – 828 p. (Fundamentals of Sciences).

**6.2. List of resources of the information and telecommunication network "Internet".**

1.[http://www.iprbookshop.ru](http://www.iprbookshop.ru/)

2.[http://ivis.ru](http://ivis.ru/)

3.[http://www.studentlibrary.ru](http://www.studentlibrary.ru/)

**7. Material and technical support of the discipline *(module)***

For the implementation of the educational process in the discipline there is the following material and technical base:

1. auditoriums for lecture-type classes, seminar-type classes, course design, group and individual consultations, current control and intermediate certification, as well as rooms for independent work and rooms for storage and preventive maintenance of educational equipment. Special rooms are equipped with specialized furniture and technical teaching aids that serve to present educational information to a large audience.

2. For lecture-type classes, there are sets of demonstration equipment and teaching aids that provide thematic illustrations.

3. Premises for independent work of students are equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment of the organization.

4. library, reading room, access to library collections with scientific literature; access to the electronic library.

5. A set of licensed software, including a package of Microsoft Office application programs.

**8. Ensuring the educational process for persons with disabilities and disabled people**

During the implementation of the discipline, the following additional

Methods of training, current monitoring of progress and intermediate certification of students, depending on their individual characteristics:

* For the blind and visually impaired:

- lectures are issued in the form of an electronic document accessible using a computer with specialized software;

- written assignments are performed on a computer with specialized software, or can be replaced by an oral answer;

- individual uniform illumination of at least 300 lux is provided;

- if necessary, a magnifying device is provided to complete the task; it is also possible to use your own magnifying devices;

- written assignments are drawn up in an enlarged font;

- The exam and test are conducted orally or performed in writing on a computer.

* For the deaf and hard of hearing:

- lectures are issued in the form of an electronic document, or sound-amplifying equipment for individual use is provided;

- written assignments are performed on a computer in writing;

- the exam and test are conducted in writing on a computer; It is possible to conduct in the form of testing.

* For persons with musculoskeletal disorders:

- lectures are issued in the form of an electronic document accessible using a computer with specialized software;

- written assignments are performed on a computer with specialized software;

- The exam and test are conducted orally or performed in writing on a computer.

If necessary, an increase in the time for preparing a response is envisaged.

The procedure for conducting intermediate certification for students is established taking into account their individual psychophysical characteristics. Intermediate certification can be carried out in several stages.

When carrying out the procedure for assessing learning outcomes, the use of technical means necessary in connection with the individual characteristics of students is envisaged. These funds can be provided by the university,, or their own technical means can be used.

The procedure for assessing learning outcomes is allowed using distance learning technologies.

Access to information and bibliographic resources on the Internet is provided for each student in forms adapted to the limitations of their health and perception of information:

* For the blind and visually impaired:

- in printed form in enlarged font;

- in the form of an electronic document;

- in the form of an audio file.

* For the deaf and hard of hearing:

- in printed form;

- in the form of an electronic document.

* For students with musculoskeletal disorders:

- in printed form;

- in the form of an electronic document;

- in the form of an audio file.

Classrooms for all types of contact and independent work, a scientific library and other premises for training are equipped with special equipment and training places with technical teaching aids:

* For the blind and visually impaired:

- scanning and reading device with SARA CE camera;

- braille display PAC Mate 20;

- EmBraille ViewPlus braille printer;

* For the deaf and hard of hearing:

- an automated workplace for people with hearing impairment and hearing impaired;

- acoustic amplifier and speakers;

* For students with musculoskeletal disorders:

- mobile, adjustable ergonomic desks SI-1;

- computer equipment with special software.

   APPROVED

Minutes of the meeting of the department

No\_\_\_\_\_ from\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MINISTRY OF SCIENCE AND HIGHER EDUCATION

OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational

institution of higher education

"CHECHEN STATE UNIVERSITY"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

FACULTY OF MATHEMATICS AND COMPUTER TECHNOLOGIES

Department of Differential Equations

**WORK PROGRAM**

**ACADEMIC DISCIPLINE**

**"Mathematics and Mathematical Methods in Biology"**

|  |  |
| --- | --- |
| Direction of training (specialty) | Biology |
| Provisioning direction code  (specialties) | 06.03.01. |
| Provisioning Profile | Biology, microbiology, physiology |
| Graduate qualifications | Bachelor |
| Form of study | Full-time, full-time - part-time |

Grozny, 2022

Dzhambetova L.M. Work program of the discipline "Mathematics and mathematical methods in biology". L. M. Dzhambetova – Grozny: Chechen State University, 2022.

The work program was reviewed and approved at a meeting of the Department of Differential Equations, recommended for use in the educational process (protocol No. 09 dated September 03, 2021), drawn up in accordance with the requirements of the Federal State Educational Standard of Higher Education in the direction of training 06.03.01 "Biology", (level - bachelor's degree), approved by order of the Ministry of Education and Science of the Russian Federation dated August 07, 2020 No. 920

© L.M. Dzhambetova, 2022

© Chechen State University, 2022

**Content**

1. Goals and objectives of mastering the discipline;

2. The list of planned learning outcomes in the discipline (module),

correlated with the planned results of the development of educational

Program;

3. The place of the discipline (module) in the structure of the educational program;

4. The content of the discipline (module), structured by topic

(sections) with an indication of the number of academic documents allotted to them

or astronomical hours and types of training sessions;

5. The list of educational and methodological support for independent

work of students in the discipline (module);

6. Fund of appraisal tools for intermediate attestation

students in the discipline (module);

7. List of basic and additional educational literature,

necessary for the development of the discipline (module);

8. List of resources of the information and telecommunication network

"Internet" (hereinafter referred to as the "Internet") necessary for the development of

disciplines (modules);

9. Guidelines for students on the development of the discipline

(module);

10. List of information technologies used in

implementation of the educational process in the discipline (module),

including a list of software and information

help systems (if necessary);

11. Description of the material and technical base required for

implementation of the educational process in the discipline (module).

**1. Goals and objectives of mastering the discipline**

**The purpose of mastering the discipline** "Mathematics and mathematical methods in biology" is to study the basics of probability theory and mathematical statistics.

**The task of the discipline:**

- study of a set of methods of probability theory and mathematical statistics used in solving applied problems.

- as a result of studying the course, the student should know the theoretical foundations and practical applications of the sections of probability theory and mathematical statistics;

- have an idea of the applications of their various methods to the problems of biology and other natural sciences.

**2. The list of planned learning outcomes in the discipline, correlated with the planned results of mastering the educational program**

As a result of mastering the EP, the graduate must have general professional competence

OPK-6.1: knows the basic concepts and methods, modern trends in mathematics, physics, chemistry and earth sciences, current problems of biological sciences and prospects for interdisciplinary research;

OPK-6.2: knows how to use laboratory skills and methods of chemistry, physics, mathematical modeling and mathematical statistics in professional activities;

OPK-6.3: owns the methods of statistical evaluation and hypothesis testing, forecasting the prospects and social consequences of their professional activities.

As a result of mastering the discipline, the student must:

**To know:**

– basic concepts of probability theory and mathematical statistics;

– definitions and properties of mathematical objects in this area;

- formulations of statements, methods of their proof, possible areas of their applications.

**Can:**

– solve problems of computational and theoretical nature:

**Possess:**

– mathematical apparatus of the theory of mathematical methods in biology;

– methods of processing experimental data (observation results).

**3. The place of discipline in the structure of the educational program and the complexity of the discipline.**

The discipline "Mathematics and Mathematical Methods in Biology" is a discipline of the basic part of Block 1.

For its successful study, knowledge acquired as a result of mastering previous disciplines is necessary: "Mathematical Analysis", "Algebra". Disciplines"Mathematics and Mathematical Methods in Biology" is based on the following disciplines: "Probability Theory" and "Mathematical Statistics".

Mastering the discipline "Mathematics and mathematical methods in biology" is necessary for the subsequent study of the disciplines "Genetics", "Cell Biology", "Theory of Selection". The discipline "Mathematics and Mathematical Methods in Biology" is read in the first semester. The form of attestation is a test. The total labor intensity of the discipline is 4 credits, 144 academic hours, of which 62 hours are allocated for contact work with the teacher, 82 hours allocated for independent work.

**4. The content of the discipline (module), structured by topics (sections) with an indication of the number of academic studies allocated to them.  
or astronomical hours and types of training sessions.**

4.1. Structure of the discipline.

The total complexity of the discipline in this form of education  
is 4 credits (144 hours).

| Type of work | Labor intensity, hours | | |
| --- | --- | --- | --- |
| 1  semester | 2  semester | Altogether |
| **Total labor intensity** | **72** | **72** | **144** |
| **Classroom work:** | **34** | **28** | **62** |
| *Lectures (L)* | 17 | 14 | 31 |
| *Practical training (PZ)* | 17 | 14 | 31 |
| *Laboratory work (LR)* |  |  |  |
| **Independent work:** | **38** | **44** | **82** |
| Course project (CP), course work (KR) |  |  |  |
| Computational and graphical task (RGP) |  |  |  |
| Abstract (R) |  |  |  |
| Essay (E) |  |  |  |
| Self-study of sections | **38** | **44** | **82** |
| **Test/Exam** | Credit | Credit |  |

**4.1 The content of the sections of the discipline**

|  |  |  |  |
| --- | --- | --- | --- |
| **Section No.** | **Section name** | **The content of the section** | **Form of current control** |
| **1** | **2** | **3** | **4** |
| 1 | Statistical (variational) series of distribution, their graphical representation. | The subject of mathematical methods in biology. General and sample populations. Variation series of distribution, their graphic images. Empirical distribution function, cumulative distribution series and its graphical representations | **DZ, SR, RK** |
| 2 | Statistical estimation | Selective numerical characteristics of their properties. Averages, structural averages. Statistical characteristics in alternative grouping. Evaluation of unknown parameters. Point estimation and methods for finding point estimates. Interval estimation, confidence interval. Confidence probability, level of significance.  Laws of distribution. | **DZ, RK, SR** |
| 3 | Statistical hypothesis testing. | Statistical hypotheses and their testing. Parametric criteria. Nonparametric criteria. Chi-square criterion. | **DZ, RK, SR** |
| 4 | Analysis of variance | The essence of analysis of variance. Univariate analysis of variance. Two-factor analysis of variance. Dispersion complexes. | **DZ, RK, SR** |
| 5 | Correlation analysis | Parametric indicators of communication. Nonparametric indicators of communication. | **DZ, RK**, **WED** |
| 6 | Regression analysis | Linear regression. Nonlinear regression. Assessment of the reliability of regression indicators. |  |

**FULL-TIME EDUCATION**

**4.3. Sections of the discipline studied in the 1-st semester**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| №  time-  Case | Section names | Number of hours | | | | |
| Altogether | Classroom  Work | | | Out-of-audience. work  WED |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1. | Statistical series of distribution, their graphical representation | 20 | 5 | 5 |  | 10 |
| 2. | Statistical estimation | 26 | 6 | 6 |  | 14 |
| 3. | Statistical hypothesis testing | 26 | 6 | 6 |  | 14 |
|  | Total: | 72 | 17 | 17 |  | 38 |

**Sections of the discipline studied in the 2-nd semester**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| №  time-  Case | Section names | Number of hours | | | | |
| Altogether | Classroom  Work | | | Out-of-audience. work  WED |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 4. | Analysis of variance | 20 | 4 | 4 |  | 12 |
| 5. | Correlation analysis | 26 | 5 | 5 |  | 16 |
| 6. | Regression analysis | 26 | 5 | 5 |  | 16 |
|  | Total: | 72 | 14 | 14 |  | 44 |

 4.5. Practical (seminar) classes.

|  |  |  |  |
| --- | --- | --- | --- |
| Lesson No. | Section No. | Subject | Number of hours |
| 1 | 2 | 3 | 4 |
|  | 1 | Statistical (variational) distribution series, their graphical representation |  |
| 1 |  | Construction of variation series and their graphs | 5 |
|  | 2 | Statistical estimation |  |
| 2 |  | Calculation of sample numerical characteristics. Estimation of general parameters. | 6 |
|  | 3 | Statistical hypothesis testing |  |
| 3 |  | Calculation of the observed values of statistical criteria from samples. Testing parametric and nonparametric hypotheses. | 6 |
|  | 4 | Analysis of variance |  |
| 4 | 2 | Univariate analysis of variance. Testing the statistical hypothesis about the equality of several averages for samples of the same volume, different volumes. | 4 |
|  | 5 | Correlation analysis |  |
| 5 |  | Estimation of pairwise and multiple correlation coefficients | 5 |
|  | 6 | Regression analysis |  |
| 6 |  | Construction of linear regression equations | 5 |
| Total |  |  | 31 |

**FULL-TIME AND PART-TIME EDUCATION**

The total complexity of the discipline in this form of education  
is 3 credits (138 hours).

| Type of work | Labor intensity, hours | | |
| --- | --- | --- | --- |
| 5  semester |  | Altogether |
| **Total labor intensity** | **108** |  | **108** |
| **Classroom work:** | **32** |  | **32** |
| *Lectures (L)* | 16 |  | 16 |
| *Practical training (PZ)* | 16 |  | 16 |
| *Laboratory work (LR)* |  |  |  |
| **Independent work:** | **76** |  | **76** |
| Course project (CP), course work (KR) |  |  |  |
| Computational and graphical task (RGP) |  |  |  |
| Abstract (R) |  |  |  |
| Essay (E) |  |  |  |
| Self-study of sections | **76** |  | **76** |
| Exam/Test | Credit |  |  |

**4.3. Sections of the discipline studied in the 5th semester**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| №  time-  Case | Section names | Number of hours | | | | |
| Altogether | Classroom  Work | | | Out-of-audience. work  WED |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 2 | 6 | 7 |
| 1. | Statistical series of distribution, their graphical representation | 17 | 2 | 3 |  | 12 |
| 2. | Statistical estimation | 18 | 3 | 3 |  | 12 |
| 3. | Statistical hypothesis testing | 20 | 3 | 3 |  | 14 |
| 4. | Analysis of variance | 18 | 3 | 3 |  | 12 |
| 5. | Correlation analysis | 17 | 3 | 2 |  | 12 |
| 6. | Regression analysis | 18 | 2 | 2 |  | 14 |
|  | Total: | 108 | 16 | 16 |  | 76 |

4.5. Practical (seminar) classes.

|  |  |  |  |
| --- | --- | --- | --- |
| Lesson No. | Section No. | Subject | Number of hours |
| 1 | 2 | 3 | 4 |
|  | 1 | Statistical (variational) distribution series, their graphical representation |  |
| 1 |  | Construction of variation series and their graphs | 4 |
|  | 2 | Statistical estimation |  |
| 2 |  | Calculation of sample numerical characteristics. Estimation of general parameters. | 4 |
|  | 3 | Statistical hypothesis testing |  |
| 3 |  | Calculation of the observed values of statistical criteria from samples. Testing parametric and nonparametric hypotheses. | 2 |
|  | 4 | Analysis of variance |  |
| 4 | 2 | Univariate analysis of variance. Testing the statistical hypothesis about the equality of several averages for samples of the same volume, different volumes. | 2 |
|  | 5 | Correlation analysis |  |
| 5 |  | Estimation of paired and multiple correlation coefficients. | 2 |
|  | 6 | Regression analysis |  |
| 6 |  | Construction of linear regression equations | 2 |
| Total |  |  | 16 |

4.5. **Course project** **(course work)**

Not provided for by the curriculum

**5. The list of educational and methodological support for independent work of students in the discipline (module).**

**1**. G. V. Gorelova et al. Probability theory and mathematical statistics. Rostov-on-Don. Phoenix, 2006.

**2**. G.F. Lakin. Biometrics Moscow: Higher School, 1990.- 352 p.: ill., ISBN 5-06-000471-6.Shk., 1990

**3**. Dmitry Pismenny. Lecture notes on probability theory, mathematical statistics and random processes.Moscow, Iris Press, 2007

**4**. Kremer, N.Sh. Theory of probability and mathematical statistics: Textbook for universities. – M.: UNITY-DANA, 2001.

**5**. Kalinina, V.N., Pankin, V.F. Mathematical statistics. - M.: Vysshaya shkola, 2001.

**6**. Kolemayev V. A., Kalinina V. N. Theory of probability and mathematical statistics. Moscow, 1997.

**7**. Gikhman I.I., Skorokhod A.V., Yadrenko M.I. Theory of probability and mathematical statistics. Kiev: Vyshcha shkola, 1988.

**8**. Sevastyanov, B.A. Course of probability theory and mathematical statistics. Moscow: Nauka, 1982.

**7. List of basic and additional educational literature,  
necessary for the development of the discipline (module)**

**Bibliography**

1. Myatlev, V.D. Theory of probability and mathematical statistics. Mathematical models / Myatlev V.D., Panchenko L.A., Riznichenko G.Yu., Terekhin A.T.

2. G.F. Lakin. Biometrics Moscow: Higher. Shk., 1990

3. Dmitry Pismenny. Lecture notes on probability theory, mathematical

statistics and random processes. Moscow, Iris Press, 2007

4. Kremer, N.Sh. Theory of probability and mathematical statistics: Textbook for universities. – M.: UNITY-DANA, 2001.

5. Kalinina, V.N., Pankin, V.F. Mathematical statistics. - M.: Vysshaya shkola, 2001.

6. Kolemayev V. A., Kalinina V. N. Theory of probability and mathematical statistics. Moscow, 1997.

7. Gikhman, I.I., Skorokhod, A.V., Yadrenko, M.I. Theory of probability and mathematical statistics. Kiev: Vyshcha shkola, 1988.

8. Sevastyanov, B.A. Course of probability theory and mathematical statistics. Moscow: Nauka, 1982.

**Further reading:**

8. Gmurman, V.E. Guide to solving problems in the theory of probability and

mathematical statistics. - M. Vysshaya shkola, 2001 -400p.

9. Kolemayev V.A., Staroverov O.V., Turundaevsky V.B. Theory of probability and mathematical statistics. Moscow: Vysshaya shkola, 1990.

10. Pugachev, V.S. Theory of probability and mathematical statistics. – M.: Science, 1979.

**8**. **The list of resources of the information and telecommunication network "Internet" necessary for the development of the discipline.**

1. <http://www.nsu.ru/mmf/tvims/chernova/tv/> (N.I. Chernova, NSU, semester course of lectures on probability theory for students of the Faculty of Economics)

2. <http://www.nsu.ru/mmf/tvims/chernova/ms/index.html> (N.I. Chernova, NSU, semester course of lectures on mathematical statistics for students of the Faculty of Economics)

3. <http://teorver-online.narod.ru/> (A.D. Manita, Moscow State University, Internet textbook "Probability Theory and Mathematical Statistics" for students of natural faculties)

4. <http://www.ksu.ru/infres/volodin/> (I.N. Volodin, Kazan State University, lectures on probability theory and mathematical statistics)

5. <http://newasp.omskreg.ru/probability/> (Prof. Topchiy V.A., Dvorkin P.L., Prof. Vatutin V.A., Leonov I.V., Pechurin A.V., Nelin D.A.,  
OFIM SB RAS. Textbook on probability theory)

6. <http://elib.bsuir.unibel.by/repository/76b0cb072945fb2ea17badb8d268d9a2_1080731989_pdf_ru> (A.I. Volkovets, A.B. Gurinovich, Belarusian State University, lecture notes on probability theory and mathematical statistics)

**9. Guidelines for students on the development of the discipline (module).**

For more effective development and assimilation of the material, it is recommended to familiarize yourself with the theoretical material on a particular topic before the seminar.

Work with theoretical material on the topic using a textbook or lecture notes can be carried out according to the following scheme:

- the name of the topic;

- goals and objectives of the study of the topic;

- the main issues of the topic;

- characteristics of the basic concepts and definitions necessary for the assimilation of this topic;

- list of recommended literature;

- the most important fragments of the texts of the recommended sources, including tables, figures, diagrams, etc.;

- brief conclusions, focusing on a certain set of information,

basic ideas, key provisions, a system of evidence that needs to be learned.

**In the course of work on the theoretical material, the following is achieved:**

- understanding of the conceptual apparatus of the topic under consideration;

- reproduction of factual material;

- disclosure of cause-and-effect, temporal and other relationships;

- generalization and systematization of knowledge on the topic

**10. Technical means and material and technical support of the discipline (module).**

Auditorium with blackboard and chalk for lectures and practical classes.

**MINISTRY OF SCIENCE AND HIGHER EDUCATION**

**OF THE RUSSIAN FEDERATION  
FEDERAL STATE BUDGETARY EDUCATIONAL**

**INSTITUTION OF HIGHER EDUCATION**

**«CHECHEN STATE UNIVERSITY"**

**INSTITUTE OF MATHEMATICS, PHYSICS AND INFORMATION TECHNOLOGY**

**DEPARTMENT OF GENERAL PHYSICS**

**Work program of the discipline**

**"Physics"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | "Microbiology" |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competency group** | **Category of competencies** | **Code** |
| General professional competencies | General professional skills | OPK-6.1; OPK-6.2 |

2. **Competencies, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency Code** | **Code and name of the competency indicator** | **Learning Outcomes**  **By discipline** |
| **OPK-6.**  He is able to use the basic laws of physics, chemistry, earth sciences and biology in his professional activities, apply methods of mathematical analysis and modeling, theoretical and experimental research, acquire new mathematical and natural science knowledge using modern educational and information technologies | OPK-6.1. Knows the basic concepts and methods, modern areas of mathematics, physics, chemistry and earth sciences, current problems of biological sciences and prospects | **To know:**the basic principles, laws, methodology of the studied biological disciplines and the theoretical foundations of physical research methods.  **Be able to:**- use in practice the basic knowledge and methods of physical research to explain the results of biological phenomena.  **Possess:** the abilityto interpret the biological results obtained using the basic concepts of physical disciplines. |
| OPK-6.2. Knows how to use laboratory skills and methods of chemistry, physics, mathematical analysis in professional activities | **To know:**  - fundamental branches of physics (mechanics, molecular physics, thermodynamics, electrodynamics, optics, fundamentals of quantum mechanics);  - basic laws and concepts of physics;  **-**methods of laboratory work in physics.  **Can**:  - acquire new knowledge in the field of physics, including the use of modern educational and information technologies;  - plan and conduct laboratory work with adequate experimental methods, evaluate the accuracy and error of measurements.  **Possess:**  - mathematical and natural science culture in the field of physics, as part of professional and universal culture;  - basic theoretical and experimental methods of physical research. |

**3. Scope of discipline**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | | |
| ***Face-to-face*** | | ***Full-time and part-time*** | |
| **3** | **4** | **3** | **4** |
| **Total Labor Intensity**: Credits/Hours | | 72/2 | 108/3 | 72/2 | 108/3 |
| **Contact work**: | |  |  |  |  |
|  | Lecture-type classes | 17/0,5 | 18/0,5 | 17/0,5 | 17/0,5 |
| Seminar-type classes (laboratory work) | 17/0,5 | 18/0,5 | 17/0,5 | 17/0,5 |
| Intermediate Certification: Pass/**Pass** with Grade/**Exam**\* | **Credit** | Credit with grade | **Credit** | Credit with grade |
| **Independent work** (SRS) | | 38/1 | 72/2 | 38/1 | 74/2 |
| Of these, for the implementation of course work (course project) | | - | - | - | - |

\* - highlight the necessary in bold italics

Notes:

2. Credit and credit with assessment in full-time education shall be carried out within the framework of seminar-type classes. There are no hours allocated in the curriculum.

3. For part-time education, 4 hours are allocated for the preparation and delivery of a test or a test with an assessment.

4. From 9 to 54 hours are allocated for preparing for and passing the exam in full-time education, the specific number of hours is indicated in the working curriculum.

5. For part-time education, 9 hours are allocated to prepare for the exam and pass the exam, which is reflected in the curriculum.

4. **The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allotted for them and the types of training sessions**

**4.3. Distribution of hours by sections/topics and types of work**

**4.3.1. Full-time education**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No p/n** | **Partition** | **Types of educational work (in hours)** | | | | | | |
| **Contact work** | | | | | | **WED** |
| **Lecture-type classes** | | **Seminar-type classes** | | | |
| *Lecture* | *Other training sessions* | *Hands-on training* | *Seven bunks* | ***LR*** | *Other activities* |
| **Distribution of hours by sections/topics and types of work in the 3rd semester** | | | | | | | | |
| 1 | Kinematics | 2 |  |  |  | 2 |  | 4 |
| 2 | Fundamentals of Dynamics | 2 |  |  |  | 2 |  | 4 |
| 3 | Forces in nature | 2 |  |  |  | 2 |  | 4 |
| 4 | Conservation laws in mechanics | 2 |  |  |  | 2 |  | 4 |
| 5 | Mechanical vibrations and waves | 2 |  |  |  | 2 |  | 4 |
| 6 | Basic concepts of molecular-kinetic  Theories of matter | 2 |  |  |  | 2 |  | 4 |
| 7 | Ideal Gas | 2 |  |  |  | 2 |  | 4 |
| 8 | Distribution functions for ideal gas | 2 |  |  |  | 2 |  | 4 |
| 9 | Transport phenomena in gases | 1 |  |  |  | 1 |  | 4 |
|  | **Total for the 3rd semester** | **17** |  |  |  | **17** |  | **38** |
| **Distribution of hours by sections/topics and types of work in the 4th semester** | | | | | | | | |
| 1 | Electrostatics | 2 |  |  |  | 2 |  | 8 |
| 2 | Laws of Direct Current | 2 |  |  |  | 2 |  | 8 |
| 3 | Electric current in various media | 2 |  |  |  | 2 |  | 8 |
| 4 | Light waves | 2 |  |  |  | 2 |  | 8 |
| 5 | Radiation and spectra | 2 |  |  |  | 2 |  | 8 |
| 6 | Light quanta | 2 |  |  |  | 2 |  | 8 |
| 7 | Atomic Physics | 2 |  |  |  | 2 |  | 8 |
| 8 | Physics of the atomic nucleus | 2 |  |  |  | 2 |  | 8 |
| 9 | Elementary particles | 2 |  |  |  | 2 |  | 8 |
|  | **Total for the 4th semester** | **18** |  |  |  | **18** |  | **72** |
|  | **Total for the academic year** | **35** |  |  |  | **35** |  | **110** |

**4.3.2. Full-time and part-time education**

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No p/n** | **Partition** | **Types of educational work (in hours)** | | | | | | | |
| **Contact work** | | | | | | | **WED** |
| **Lecture-type classes** | | | **Seminar-type classes** | | | |
| *Lecture* | | *Other training sessions* | *Hands-on training* | *Seven bunks* | ***LR*** | *Other activities* |
| **Distribution of hours by sections/topics and types of work in the 3rd semester** | | | | | | | | | |
| 1 | Kinematics | | 2 |  |  |  | 2 |  | 4 |
| 2 | Fundamentals of Dynamics | | 2 |  |  |  | 2 |  | 4 |
| 3 | Forces in nature | | 2 |  |  |  | 2 |  | 4 |
| 4 | Conservation laws in mechanics | | 2 |  |  |  | 2 |  | 4 |
| 5 | Mechanical vibrations and waves | | 2 |  |  |  | 2 |  | 4 |
| 6 | Basic concepts of molecular-kinetic  Theories of matter | | 2 |  |  |  | 2 |  | 4 |
| 7 | Ideal Gas | | 2 |  |  |  | 2 |  | 4 |
| 8 | Distribution functions for ideal gas | | 2 |  |  |  | 2 |  | 4 |
| 9 | Transport phenomena in gases | | 1 |  |  |  | 1 |  | 4 |
|  | **Total for the 3rd semester** | | **17** |  |  |  | **17** |  | **38** |
| **Distribution of hours by sections/topics and types of work in the 4th semester** | | | | | | | | | |
| 1 | Electrostatics | 2 | |  |  |  | 11 |  | 8 |
| 2 | Laws of Direct Current | 2 | |  |  |  | 11 |  | 8 |
| 3 | Electric current in various media | 2 | |  |  |  | 11 |  | 8 |
| 4 | Light waves | 2 | |  |  |  | 3 |  | 8 |
| 5 | Radiation and spectra | 2 | |  |  |  | 3 |  | 8 |
| 6 | Light quanta | 2 | |  |  |  | 3 |  | 8 |
| 7 | Atomic Physics | 2 | |  |  |  | 3 |  | 8 |
| 8 | Physics of the atomic nucleus | 2 | |  |  |  | 3 |  | 8 |
| 9 | Elementary particles | 1 | |  |  |  | 3 |  | 8 |
|  | **Total for the 4th semester** | **17** | |  |  |  | **17** |  | **74** |
|  | **Total for the academic year** |  | |  |  |  |  |  |  |
|  |  |  |  |  |  |  |  |  |  |

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  |  |  |  |  |  |  |  |  |

**4.4. The program of the discipline, structured by topics / sections**

**4.4.1. Content of the lecture course (full-time)**

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| **Semester 3** | | |
| 1 | Kinematics | Frame of reference in Newtonian mechanics. The concept of a material point. The laws of motion, the trajectory of movement and the path traveled, displacement. Vectors of velocity, acceleration; tangential and normal components of acceleration. |
| 2 | Fundamentals of Dynamics | The concept of force. Newton's first law. Mass and its measurement. Newton's Second Law. Newton's third law. |
| 3 | Forces in nature | Gravity, elastic forces, frictional force. |
| 4 | Conservation laws in mechanics | Potential and kinetic energies. The law of conservation of mechanical energy |
| 5 | Basic concepts of molecular-kinetic  Theories of matter | Basic ideas of the MKT theory of gases. Molecular sizes |
| 6 | Ideal gas | Ideal gas. Clapeyron - Mendeleev equation. |
| 7 | Basic concepts of molecular-kinetic  Theories of matter | Isoprocesses in an ideal gas. Basic laws describing the behavior of ideal gases |
| 8 | Distribution functions for ideal gas | Measurement of molecular velocities. Maxwell velocity distribution. Barometric formula. The number of degrees of freedom of molecules and the law of uniform distribution of energy over degrees of freedom |
| 9 | Transport phenomena in gases | Diffusion (mass transfer), thermal conductivity (energy transfer) and viscosity, internal friction (momentum transfer). |
|  | **Altogether** | **17** |
|  | **Semester 4** | |
| 1 | Electrostatics | Electric charge. Coulomb's law. |
| 2 | Electrostatics | Electric field. Electric field strength. Gauss's theorem. |
| 3 | Electrostatics | Work in an electric field. Potential. Electrical capacity. Capacitors. |
| 4 | Laws of Direct Current | Electric current. Ohm's laws. Series and parallel connection of conductors. |
| 5 | Light waves | The law of rectilinear propagation of light. The law of light reflection. The law of refraction of light. |
| 6 | Light waves | Thin lenses. Thin lens formulas. The optical power of the lens. |
| 7 | Light waves | Rutherford's nuclear model. Bohr's postulates. |
| 8 | Physics of the atomic nucleus | Nuclear forces. The binding energy of atomic nuclei. The law of radioactive decay. Half-life. The structure of the atomic nucleus. |
| 9 | Elementary particles | Three stages in the development of elementary particle physics. Discovery of the positron. Antiparticles. |
|  | **Altogether** | **17** |

**4.2.3. Content of practical classes (face-to-face)**

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Name of the topic (section) of the discipline** | **The content of the laboratory lesson** |
| **Semester 3** | | |
| 1 |  | General rules for working in the laboratory. Safety engineering. Errors of measuring instruments and the measurements themselves. |
| 2 | Kinematics | Study of uniformly accelerated motion |
| 3 | Kinematics | Study of the movement of a body thrown horizontally |
| 4 | Kinematics | Determination of gravitational acceleration using a mathematical pendulum |
| 5 | Forces in nature | Determination of the spring stiffness coefficient by static and dynamic methods |
| 6 | Ideal gas | Determination of the density of solids of regular shape. |
| 7 | Ideal gas | Verification of gas laws. |
| 8 | Properties of the liquid | Determination of the specific heat of an aluminum cylinder. |
| 9 | Properties of the liquid | Determination of the coefficient of surface tension of the liquid by the method of droplet separation. |
|  | **Altogether** | **17** |
| **Semester 4** | | |
| 1 |  | General rules for working in the laboratory. Safety engineering. Errors of measuring instruments and the measurements themselves. |
| 2 | Electrostatics | Study of electrical measuring instruments. |
| 3 | Electrostatics | Study of the dependence of the useful power and efficiency of the battery on its load. |
| 4 | Laws of Direct Current | Measurement of EMF and internal resistance of the current source. |
| 5 | Electrostatics | Study of the dependence of the power consumed by an incandescent lamp on the voltage at its terminals. |
| 6 | Light waves | Measurement of the focal length of the collecting lens using the lens formula. |
| 7 | Light waves | Investigation of the phenomenon of light reflection. |
| 8 | Light waves | Investigation of the phenomenon of light refraction. |
| 9 | Light waves | Observation of the refraction of light of a plane-parallel plate, observation of the refraction of light through a prism. |
|  | **Altogether** | **18** |

**4.2.3. Content of the lecture course (full-time and part-time)**

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| **Semester 3** | | |
| 1 | Kinematics | Frame of reference in Newtonian mechanics. The concept of a material point. The laws of motion, the trajectory of movement and the path traveled, displacement. Vectors of velocity, acceleration; tangential and normal components of acceleration. |
| 2 | Fundamentals of Dynamics | The concept of force. Newton's first law. Mass and its measurement. Newton's Second Law. Newton's third law. |
| 3 | Forces in nature | Gravity, elastic forces, frictional force. |
| 4 | Conservation laws in mechanics | Potential and kinetic energies. The law of conservation of mechanical energy |
| 5 | Basic concepts of molecular-kinetic  Theories of matter | Basic ideas of the MKT theory of gases. Molecular sizes |
| 6 | Ideal gas | Ideal gas. Clapeyron - Mendeleev equation. |
| 7 | Basic concepts of molecular-kinetic  Theories of matter | Isoprocesses in an ideal gas. Basic laws describing the behavior of ideal gases |
| 8 | Distribution functions for ideal gas | Measurement of molecular velocities. Maxwell velocity distribution. Barometric formula. The number of degrees of freedom of molecules and the law of uniform distribution of energy over degrees of freedom |
| 9 | Transport phenomena in gases | Diffusion (mass transfer), thermal conductivity (energy transfer) and viscosity, internal friction (momentum transfer). |
|  | **Altogether** | **17** |
|  | **Semester 4** | |
| 1 | Electrostatics | Electric charge. Coulomb's law. |
| 2 | Electrostatics | Electric field. Electric field strength. Gauss's theorem. |
| 3 | Electrostatics | Work in an electric field. Potential. Electrical capacity. Capacitors. |
| 4 | Laws of Direct Current | Electric current. Ohm's laws. Series and parallel connection of conductors. |
| 5 | Light waves | The law of rectilinear propagation of light. The law of light reflection. The law of refraction of light. |
| 6 | Light waves | Thin lenses. Thin lens formulas. The optical power of the lens. |
| 7 | Light waves | Rutherford's nuclear model. Bohr's postulates. |
| 8 | Physics of the atomic nucleus | Nuclear forces. The binding energy of atomic nuclei. The law of radioactive decay. Half-life. The structure of the atomic nucleus. |
| 9 | Elementary particles | Three stages in the development of elementary particle physics. Discovery of the positron. Antiparticles. |
|  | **Altogether** | **17** |

**4.2.4. Content of practical classes (full-time and part-time)**

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Name of the topic (section) of the discipline** | **The content of the laboratory lesson** |
| **Semester 3** | | |
| 1 |  | General rules for working in the laboratory. Safety engineering. Errors of measuring instruments and the measurements themselves. |
| 2 | Kinematics | Study of uniformly accelerated motion |
| 3 | Kinematics | Study of the movement of a body thrown horizontally |
| 4 | Kinematics | Determination of gravitational acceleration using a mathematical pendulum |
| 5 | Forces in nature | Determination of the spring stiffness coefficient by static and dynamic methods |
| 6 | Ideal gas | Determination of the density of solids of regular shape. |
| 7 | Ideal gas | Verification of gas laws. |
| 8 | Properties of the liquid | Determination of the specific heat of an aluminum cylinder. |
| 9 | Properties of the liquid | Determination of the coefficient of surface tension of the liquid by the method of droplet separation. |
|  | **Altogether** | **17** |
| **Semester 4** | | |
| 1 |  | General rules for working in the laboratory. Safety engineering. Errors of measuring instruments and the measurements themselves. |
| 2 | Electrostatics | Study of electrical measuring instruments. |
| 3 | Electrostatics | Study of the dependence of the useful power and efficiency of the battery on its load. |
| 4 | Laws of Direct Current | Measurement of EMF and internal resistance of the current source. |
| 5 | Electrostatics | Study of the dependence of the power consumed by an incandescent lamp on the voltage at its terminals. |
| 6 | Light waves | Measurement of the focal length of the collecting lens using the lens formula. |
| 7 | Light waves | Investigation of the phenomenon of light reflection. |
| 8 | Light waves | Investigation of the phenomenon of light refraction. |
| 9 | Light waves | Observation of the refraction of light of a plane-parallel plate, observation of the refraction of light through a prism. |
|  | **Altogether** | **17** |

5. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control of the development of a particular discipline are provided:

- current monitoring of progress

- intermediate certification of students in the discipline

**5.1 Passport of the fund of evaluation tools for the current certification of the discipline (module)**

|  |  |  |
| --- | --- | --- |
| **No p/n** | **Controlled sections (topics)** | **Name of the appraisal tool** |
| **Semester 3** | | |
| 1. | Kinematics | Oral questioning  WGR Report (Lab. Slave) |
| 2. | Fundamentals of Dynamics | Oral questioning  WGR Report (Lab. Slave) |
| 3. | Forces in nature | Oral questioning  WGR Report (Lab. Slave) |
| 4. | Conservation laws in mechanics | Oral questioning  WGR Report (Lab. Slave) |
| 5. | Mechanical vibrations and waves | Oral questioning  WGR Report (Lab. Slave) |
| 6. | Basic concepts of molecular-kinetic  Theories of matter | Oral questioning  WGR Report (Lab. Slave) |
| 7. | Ideal gas | Oral questioning  WGR Report (Lab. Slave) |
| 8. | Distribution functions for ideal gas | Oral questioning  WGR Report (Lab. Slave) |
| 9. | Transport phenomena in gases | Oral questioning  WGR Report (Lab. Slave) |
| **Semester 4** | | |
| 1 | Electrostatics | Oral questioning  WGR Report (Lab. Slave) |
| 2 | Laws of Direct Current | Oral questioning  WGR Report (Lab. Slave) |
| 3 | Electric current in various media | Oral questioning  WGR Report (Lab. Slave) |
| 4 | Light waves | Oral questioning  WGR Report (Lab. Slave) |
| 5 | Radiation and spectra | Oral questioning  WGR Report (Lab. Slave) |
| 6 | Light quanta | Oral questioning  WGR Report (Lab. Slave) |
| 7 | Atomic Physics | Oral questioning  WGR Report (Lab. Slave) |
| 8 | Physics of the atomic nucleus | Oral questioning  WGR Report (Lab. Slave) |
| 9 | Elementary particles | Oral questioning  WGR Report (Lab. Slave) |

**5.2 Standard control tasks or other materials necessary to assess knowledge, skills, skills and (or) experience in the process of current control**

Assessment of students' progress within the framework of the rating system is carried out in the course of current, midterm and intermediate monitoring of progress and control of student attendance by accruing appropriate points.

***Current control of*** knowledge, skills and abilities of students is carried out in the course of training (classroom) classes conducted according to the schedule.

The type of *current control* of the discipline "Physics" is the performance and delivery *of laboratory work.*

**The list of tasks of current control in the discipline "Physics"**

**1. Laboratory work «Study of uniformly accelerated motion".**

*The purpose of the work is* to determine the value of the velocity of a body moving in a straight line and uniformly accelerated at a given point in its trajectory and the amount of acceleration with which the body slides off an inclined plane, and to prove that it moves in an equally accelerated manner. Verification of one of the basic equations of rectilinear uniformly accelerated motion, which relates the displacement of a body with its initial velocity, acceleration and time of motion.

*Equipment:* a device for studying rectilinear movement, a tripod.

**2. Laboratory work "Study of the movement of a body thrown horizontally"**

*The aim of the work is* to study the dependence of the flight range of a body thrown horizontally on the height from which it began to move.

*Equipment:* a tripod with a clutch and a foot, an arcuate chute, a steel ball, a film-marker, a guide for studying rectilinear movement, adhesive tape.

**3. Laboratory work "Determination of the density of solids".**

*Objective:* Determination of the density of solids of different geometric shapes.

*Equipment:* scales, weights, measuring cylinder, solids, the densities of which are to be determined, thread.

**4. Laboratory work** "**Gas laws"**

*Objective:* To check the relationship between changes in volume and pressure during its isothermal compression.

*Equipment:* transparent tube with two taps at the ends; measuring tape; barometer-aneroid, measuring cylinder.

**5. Laboratory work "Study of electrical measuring instruments"**

*The purpose* of the work: familiarization with the main systems of electrical measuring instruments, with their characteristics.

*Equipment:* electrical measuring instruments of various systems.

**6.** **Laboratory work "Measurement of EMF and internal resistance of the current source"**

*The purpose of the work:* to study the method of measuring the electromotive force and internal resistance of the current source, based on the use of a voltmeter, ammeter and rheostat.

*Equipment:* direct current source type VU-4, laboratory ammeter, laboratory voltmeter, laboratory rheostat, key, connecting wires.

**7. Laboratory work "Investigation of the law of reflection and refraction"**

*Objective:*Determination of the refractive index and confirmation of the reflection law

*Equipment:*limb, lenses, tablet, connecting wires, light bulb, power supply, slit screen. etc.

**Midterm control**is carried out in more or less independent sections - training modules of the course and is carried out at the end of the study of the module material at a predetermined time.

*Midterm control* of students' knowledge is carried out at the 8th and 16th academic weeks of each semester, during classroom classes, in *the form of an oral survey.*

**Questions to prepare for the first midterm control**

**Semester 3**

1. The subject of mechanics. Basic concepts and definitions.

2. Speed. Acceleration.

3. Circumferential movement.

4. Newton's laws.

5. The Law of Universal Gravitation

6. Elastic force. Hooke's law.

7. Frictional forces.

8. Kinetic and potential energy.

9. The law of conservation of energy.

10. The law of conservation of momentum.

11. Spring and mathematical pendulums.

**Questions to prepare for the second milestone control**

**Semester 3**

1. The main ideas of the MKT theory of gases and their experimental justification

2. Gas laws.

3. Gas pressure. Absolute temperature.

4. Ideal gas. Clapeyron - Mendeleev equation.

5. Measurement of the velocities of molecules. Maxwell velocity distribution.

6. Barometric formula.

7. Distribution of the energy of molecules according to degrees of freedom.

**Questions to prepare for the first midterm control**

**Semester 4**

1. Electric charge. Coulomb's law

2. Electric field. Tension.

3. Gauss's theorem.

4. Work in an electric field. Potential.

5. Conductors and dielectrics in an electric field. Polarization of dielectrics.

6. Electrical capacitance. Capacitors.

7. Electric current. Amperage.

8. Ohm's law for the circuit section. Resistance.

9. Series and parallel connection of conductors

10. Electromotive force. Ohm's law for a complete circuit.

11. Electronic conductivity of metals.

12. Electric current in semiconductors.

13. Electric current through the contact of p- and n-type semiconductors.

14. Electric current in liquids.

15. Law of electrolysis

16. Electric current in gases.

**Questions to prepare for the second milestone control**

**Semester 4**

1. Huygens principle. Laws of reflection of light.

2. Laws of refraction of light.

3. Full reflection.

4. Lens. Construction of the image in the lens.

5. Thin lens formula. Lens magnification.

6. Light interference.

7. Light diffraction.

8. Light polarization.

9. Photo effect.

10. Photons.

11. The structure of the atom. Rutherford's experiments.

12. Bohr's quantum postulates. Bohr model of the hydrogen atom.

13. The law of radioactive decay. Half-life.

14. The structure of the atomic nucleus.

15. Nuclear forces.

16. Binding energy of atomic nuclei.

17. Three stages in the development of elementary particle physics.

18. Discovery of the positron. Antiparticles.

**List of questions of intermediate control in the discipline "Physics"**

**Semester 3**

**Questions to prepare for the test**

8. The subject of mechanics. Basic concepts and definitions.

9. Speed. Acceleration.

10. Circumferential movement.

11. Newton's laws.

12. The Law of Universal Gravitation

13. Elastic force. Hooke's law.

14. Frictional forces.

15. Kinetic and potential energy.

16. The law of conservation of energy.

17. The law of conservation of momentum.

18. Spring and mathematical pendulums.

19. The main ideas of the ILC theory of gases and their experimental justification

20. Gas laws.

21. Gas pressure. Absolute temperature.

22. Ideal gas. Clapeyron - Mendeleev equation.

23. Measurement of molecular velocities. Maxwell velocity distribution.

24. Barometric formula.

25. Distribution of the energy of molecules according to degrees of freedom.

**Semester 4**

**Questions to prepare for the test with a grade**

1. Electric charge and its properties.

2. Electric charge. The law of conservation of electric charge.

3. Coulomb's law.

4. Electric field. Electric field lines. Electric field strength. The principle of superposition of electric field strength.

5. Flux Φ of the tension vector. Gauss's theorem.

6. Electrical capacitance. The electrical capacity of a flat capacitor.

7. Capacitors. Parallel connection of capacitors. Series connection of capacitors.

8. Electric current. Amperage.

9. Ohm's law for a homogeneous section of the circuit. Electrical resistance.

10. Third-party forces. The electromotive force of the source. Ohm's law for a complete chain.

10. Serial connection of conductors. Parallel connection of conductors.

11. Kirchhoff's rules for branched chains.

12. Electric current in metals.

13. Electric current in semiconductors.

14. Electronic conductivity in semiconductors.

15. Magnetic interaction of currents.

16. Magnetic induction vector. Magnetic induction lines of permanent magnet fields and current coils.

17. Ampere's law. The rule of the left hand, to determine the strength of Ampere.

18. The magnetic field of a rectilinear conductor with current. Buravchik's rule. Lorentz force.

19. Electromagnetic induction. Lenz's rule. Self-induction. Magnetic field energy.

20. Forced oscillations. Alternating current.

21. Ohm's law for a section of the circuit.

22. Ohm's law for an inhomogeneous section of the chain.

23. The principle of the farm. Straightness of light rays.

24. Laws of reflection. Specular and diffusion reflections.

25. Laws of refraction of light. Absolute refractive index. Relative refractive index. Proof of the laws of reflection and refraction of light using the Huygens principle.

26. Total internal reflection. The limiting angle of total internal reflection.

27. Collecting lenses. Diffusing lenses.

28. Construction in lenses. Formula in a thin lens. The optical power of the lens.

29. Light as an electromagnetic wave. The speed of light propagation.

30. Interference of two coherent waves. Conditions of maximum and minimum interference.

31. Diffraction of light.

32. Polarization of light. Types of polarization of light. The basic theorem of the theory of polarization.

33. Natural and polarized light. Malus's law.

34. Spectral devices. Diffraction grating.

35. Dispersion of light. Decomposition of white light into a spectrum.

36. Introduction to Atomic Physics. Rutherford's Experience.

37. Nuclear (planetary) model of the structure of the atom by Rutherford.

38. Thomson's model of the atom.

39. Composition and main characteristics of atomic nuclei.

40. The first quantum postulate of Niels Bohr.

41. The second quantum postulate of Niels Bohr.

42. The third quantum postulate of Niels Bohr.

43. Bohr model of the hydrogen atom.

44. Nuclear forces. Binding energy of the nucleus.

45. Interaction of nucleons in the nucleus, properties and nature of nuclear forces.

46. Stable and unstable isotopes. Radioactivity.

47. The law of radioactive decay. Half-life. Activity.

48. Alpha, beta and gamma decay.

49. Nuclear reactions. Types of nuclear reactions.

50. Fission of heavy nuclei.

51. Thermonuclear reaction. The principle of star life.

52. Nuclear reactor devices.

53. Main characteristics of elementary particles.

54. Three stages in the development of elementary particle physics.

55. Classification of elementary particles.

56. Types of interaction of elementary particles.

57. Mutual transformations of elementary particles.

58. The concept of fermions.

59. The concept of antiparticles.

60. The concept of quarks and leptons.

Evaluation tools for the results of mastering the discipline, criteria for evaluating the performance of tasks are presented in the document "Fund of evaluation tools for current control and intermediate certification in the discipline "Physics".

**5.3 Methodological materials defining the procedures for assessing knowledge, skills, abilities and (or) experience**

**Oral questioning**

Oral questioning is the most common type of testing of knowledge and skills, which allows you to follow the student's train of thought, the development of his speech and logical thinking. At the same time, it is possible to fully identify gaps in the student's knowledge, the difficulties encountered by him and outline ways to overcome them. Therefore, an oral survey of academic performance should take place in most physics classes, no matter how different their goals are and no matter what technical means of control are at the disposal of the teacher; It is important only by a high organization to ensure the rational use of study time for oral questioning.

An oral survey can be conducted at the beginning of the lesson in order to check the students' homework and their readiness to learn new material. To do this, the teacher poses several questions to the group that establish a connection with previously studied concepts. At the same time, being an "introduction" to new educational material, an oral survey serves at the same time as a means of identifying the state of knowledge of students and the success of each of them.

Depending on the time allotted to check the progress of the lesson, the educational situation and the sequential solution of the problems of developmental training, an individual or frontal survey is used, as well as control and self-control, tests.

*In this*case, the teacher poses a question to the whole group and (if necessary) gives a general plan of the answer or specific instructions (make a drawing, assemble a chain, demonstrate experiments, etc.), then gives students 1-2 minutes to think and calls the student to the board, etc. D.

With *an individual survey, questions can be divided into main and additional.*The first requires a more or less detailed story, solving the problem, setting and explaining the experience; If the student finds it difficult to answer it or needs to find out whether he is systematically working on the educational material, he is asked additional questions. In order forthe questions to be of interest to all students, it is useful to put those that require not only a retelling of a part of a paragraph or a statement set forth by the teacher, but also an analysis of known phenomena in conditions that have not yet been considered, independent application of what has been studied, and manifestations of ingenuity.

The survey of the student (regardless of his academic performance) should not be lengthy; if large gaps in his knowledge are found, you need to interrupt the answer, addressing the students with the question: "What do you think?", And call another to the board (you should not "pull" the answer from a clearly unprepared student).

Assessment of knowledge involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, mastery of oratory skills are evaluated.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of the material without factual errors.

The assessment of "*excellent"*is put in the case when the material is presented exhaustively, consistently, competently and logically coherently, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not find it difficult to answer, observes the culture of speech.

A *"good"* grade is given if the student firmly knows the material, competently and essentially presents it, knows the practical base, but when answering the question, he makes insignificant errors.

A *"satisfactory"* grade is given if the student has mastered only the basic material, but does not know individual details, makes inaccuracies, insufficiently correct formulations, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of a proper connection between analysis, argumentation and conclusions.

An *"unsatisfactory"* grade is given if the student does not answer the questions posed.

**Computational and graphic work (laboratory work)**

Intermediate certification in the discipline is carried out in the form of a test and an exam.

At the end of each semester of the discipline, the student must receive a credit or exam in the relevant section of the course based on the results of work in the laboratory. To receive a credit or exam, the student must complete the experimental part, process the results obtained, submit *reports* on all laboratory work and pass oral admission to laboratory work in *the form of an oral answer to control questions*.

For the purpose of effective control, control questions have been drawn up for students' independent studies in different sections, according to which students will be interviewed when they are admitted to perform laboratory work and submit a report on them.

The nature of the work performed determines the different requirements for the measurement and processing of measurement results in each work.

As a rule, when measuring a physical quantity, systematic and random errors occur. The number of measurements of any physical quantity is determined by the ratio between systematic and random errors. If the systematic error is very large, then two measurements are sufficient, if the errors are close to each other, each measurement should be made 3-4 times. With a small value of the systematic error in relation to the random one, it is necessary to increase the number of measurements.

*The lab report* should contain:

- serial number and name of the work;

- purpose of the work;

- a list of equipment used with an indication of the main characteristics;

- functional and schematic diagrams of the laboratory installation;

- basic theoretical information and calculation formulas used in the performance of this work;

- results of direct measurements and calculations recorded in tables;

- graphs of experimental and calculated dependences, drawn on graph paper with an indication of errors in both axes;

- the final results of the study with an indication of the measurement error (absolute or relative);

- brief conclusions containing critical comparisons of the results of the experiment and theoretical prerequisites with an explanation of the discrepancy between them (if any);

- a list of references used in preparation for the work and analysis of the results obtained.

*Evaluation criteria: independence of preparation and conduct of work, calculation of the result of work.*

"5" (excellent): all the tasks of practical (laboratory) work have been completed, the student has answered all the control questions clearly and without errors.

"4" (good): all tasks of practical (laboratory) work have been completed; The student answered all the control questions with comments.

"3" (satisfactory): all tasks of practical (laboratory) work with comments have been completed; The student answered all the control questions with comments.

"2" (unsatisfactory): the student did not complete or performed incorrectly the tasks of practical (laboratory) work; The student answered the test questions with errors or did not answer the test questions.

**Guidelines for preparation for intermediate certification (offset)**

The test is an integral part of the educational process and is designed to consolidate and streamline the student's knowledge gained in the classroom and independently. Passing the test is preceded by the student's work in lectures, practical classes and independent work on the study of the subject and the implementation of tests.

Preparation for the test is carried out on the basis of methodological recommendations on the discipline and a list of questions of the discipline being studied, lecture notes, textbooks and teaching aids.

Consider the guidelines for preparing for the test.

1. Preparation for the test consists in the study and thorough study by the student of the educational material of the discipline, taking into account textbooks and lectures, grouped in the form of control questions.

2. Credit for the course is carried out orally on issues.

3. On the course credit, the student is obliged to provide:

- full lecture notes (even in cases where free attendance of training sessions is allowed);

- summaries of additional literature on the course (at the request of the student).

4. At the test, the student gives answers to the test questions after preliminary preparation. The student is given the right to answer questions without preparation at his request.

The teacher has the right to ask additional questions if the student has not fully covered the topic of the question, if it is difficult to unambiguously evaluate the answer, if the student cannot answer the question, if the student was absent from classes in the semester.

It is necessary to prepare for the test on the questions to it, which are provided to students a month before the intermediate certification.

Based on the results of all types of work of a controlling nature***, the rating of mastering the discipline*** is displayed.

*Typical evaluation criteria for credit:*

"Credited" - the assessment corresponds to an increased and threshold level and is given to the student if he has deeply and firmly mastered the program material, exhaustively, consistently, clearly and logically coherently sets it out, knows how to closely link theory with practice, freely copes with tasks, questions and other types of application of knowledge, and does not find it difficult to answer when modifying tasks, uses the material of monographic literature in the answer, correctly justifies the decision, possesses versatile skills and techniques for performing practical tasks - 51 points.

"Not credited" - the grade is given to a student who does not reach the threshold level, demonstrates a lack of understanding of the problem, does not know a significant part of the program material, makes significant mistakes, uncertainly, with great difficulty performs practical work - less than 51 points.

**Guidelines for preparing for the intermediate certification exam** **(differentiated test)**

*A test with an assessment*in the discipline is carried out orally on tickets. The ticket contains theoretical questions (TV) to test the acquired knowledge, practical tasks (PZ) to test the acquired skills and complex tasks (KZ) to control the level of acquired possessions of all declared disciplinary competencies.

By the beginning of the exam in the academic discipline, the following documents must be prepared:

- examination tickets (control and evaluation tools);

- visual aids, reference materials, regulatory documents and samples of equipment approved for use in the exam;

- examination sheet;

- journal of training sessions;

- record books.

The *test with the assessment* is carried out in specially prepared rooms. The student is given no more than 30 minutes to prepare an oral assignment on a ticket.

No more than one third of the academic hour for each student is provided for passing the oral *differentiated test*.

*Differentiated credit* is accepted by the teacher who conducted training sessions in this discipline.

*Credit with assessment* ***-***a form of identifying and evaluating the results of the educational process.

*The purpose*of the *assessment* is to complete the course of study of this discipline, to check the student's system of knowledge and to assess the degree of its assimilation.

The main functions of *differentiated offsetting* are:

-Educational;

- evaluating;

-Educational.

*The educational value* is manifested, first of all, in the fact that during the examination session the student refers to the material covered, concentrated in lecture notes, textbooks and other sources of information.

*The evaluation function* is that it sums up not only the specific knowledge of students, but also to a certain extent the entire system of educational work on the course.

*The educational function* is that the exam should be conducted objectively, benevolently, with respect for the personality and opinion of the student. In this case, exams stimulate students' hard work, integrity, responsible attitude to business, develop a sense of justice, self-esteem, respect for science and teaching.

*Credit with assessment* as a special form of the educational process has its own characteristics, specific features and some aspects that the student needs to know and take into account in his work. These are, first of all:

- what and how to remember when preparing for a test with an assessment;

- from what sources and how to prepare;

- what to focus on;

- how to make the most of the course program;

- what and how to write down, and what to learn verbatim, etc.

In *preparation for the test with the assessment,* it is necessary to memorize and memorize information with the expectation of the help of certain auxiliary teaching aids and manuals.

The best option for *preparing for a test with an assessment* is when the student begins to prepare for it from the first classes in this course. Such opportunities are created by the teacher.

In *preparation for the test with an assessment* on the most complex issues, key problems and the most important concepts, it is necessary to make brief written notes in the form of theses, plans, definitions.

Particular attention should be paid to lecture notes in *preparation for the test with evaluation*, because they have a number of advantages over printed materials. At the same time, training on one lecture note is insufficient, it is necessary to use two or more textbooks.

Among the main criteria for evaluating a student's response are the following:

- the correctness of the answer to the question, that is, the correct, clear and sufficiently deep presentation of ideas, concepts, facts;

- completeness and at the same time conciseness of the answer;

- the novelty of educational information, the degree of use of the latest scientific achievements and regulatory sources;

- the ability to connect theory with practice and creatively apply knowledge to the assessment of the current situation;

- logic and reasoning of presentation;

- competent commenting, giving examples and analogies;

- culture of speech.

All this allows the teacher to evaluate both knowledge and the form of presentation of the material.

In the event that the ownership component is evaluated according to the integral results of the midterm control, the test ticket may not contain the 3rd task.

Assessment of learning outcomes in the discipline in the form of a level formed by the components to *know, be able to, possess* the declared disciplinary competencies is carried out on a 4-point assessment scale by selective control during the final intermediate certification in the form of an exam.

*Typical evaluation criteria for differentiated credit:*

The exam (differentiated test) in the discipline ends with the assessment of the student, according to his knowledge.

An "excellent" grade is given if the student has deeply and firmly mastered the program material of the course, discovered a comprehensive, systematic and in-depth knowledge of educational and regulatory material, logically, clearly and harmoniously sets it out, knows how to closely link theory with practice, freely performs the tasks provided for by the program, has mastered the main and is familiar with the additional literature recommended by the department, freely copes with additional questions, and does not find it difficult to answer when modification of tasks, correctly justifies the decisions made, possesses versatile skills and techniques for performing practical tasks.

A "good" grade is given if the student firmly knows the educational material of the course, competently and essentially presents it, avoiding significant inaccuracies in the answer to the question, correctly applies the theoretical provisions, owns the necessary methods of their application, capable of independent replenishment and updating of knowledge in the course of further educational work and professional activity, copes with additional questions.

A "satisfactory" grade is given to a student who has shown knowledge of the basic educational material to the extent necessary for further study and in the upcoming work in the profession, violating the logical sequence in the presentation of the material for the course, coping with the tasks provided for by the program, allowing errors in the answer on the test and in the performance of the tasks issued, not of a fundamental nature, answering additional questions with leading prompts.

An assessment of "unsatisfactory" and "fail" in the discipline is given if the student has found gaps in the knowledge of the main educational material and at the same time has not mastered its details, makes inaccuracies, insufficiently correct formulations, violations of the logical sequence in the presentation of the program material, has difficulty answering questions.

96 – 100 – "excellent";

76 – 95 – "good";

51–75 – "satisfactory";

**6. The list of basic and additional educational literature, periodicals necessary for the development of the discipline (module)**

**6.1. Main literature**

1. Buruchenko, A. E. General physics. Applied aspects of atomic physics: a textbook / A. E. Buruchenko, A. K. Moskalev, A. E. Sokolov. — Krasnoyarsk: Siberian Federal University, 2019. — 76 p. — ISBN 978-5-7638-4082-7. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/100064.html

2. Geometric optics. Vision: a textbook for secondary vocational education / O. E. Belousova, A. P. Sherstyakov, E. A. Mironova, V. N. Kitaev. — Saratov: Vocational education, 2021. — 121 p. — ISBN 978-5-4488-1212-5. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/106610.html

3. Zyuzin, A. V. Physics. Part 1. Mechanics: a textbook for universities / A. V. Zyuzin, S. B. Moskovsky, V. E. Turov. — Moscow: Academic Project, 2020. — 435 p. — ISBN 978-5-8291-3483-9. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/110169.html

4. Kazantseva, A. B. Molecular physics: laboratory workshop / A. B. Kazantseva. Moscow: Moscow State Pedagogical University, 2019. — 108 p. — ISBN 978-5-4263-0790-2. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/94656.html

5. Koltsov, R. Y. Practicum on physics. In 2 parts. Part 1. Mechanics. Molecular Physics and Thermodynamics: A Teaching Aid for Students of Specialized Classes / R. Y. Koltsov. — Tambov: Tambov State University named after G.R. Derzhavin, 2019. — 120 p. — ISBN 978-5-00078-260-6. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/109763.html

6. Kuzmicheva, V. A. Optics: a course of lectures / V. A. Kuzmicheva. Moscow: Moscow State Academy of Water Transport, 2020. — 79 p. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/97317.html

7. Letuta, S. N. Physics. Electrostatics: a textbook for SPO / S. N. Letuta, A. A. Chakak. — Saratov : Vocational education, 2020. — 177 p. — ISBN 978-5-4488-0591-2. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/92190.html

8. General physical workshop. Electricity and magnetism: laboratory workshop / compiled by D. V. Gladkikh [et al.]. — Stavropol: North Caucasus Federal University, 2018. — 290 p. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/92711.html

9. Perminov, A. V. General physics. Problems with solutions: a problem book / A. V. Perminov, Y. A. Barkov. — Saratov: University education, 2020. — 725 p. — ISBN 978-5-4487-0603-5. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/95156.html

10. Sabylinsky, A. V. Physics. Part 1. Mechanics, molecular physics, thermodynamics: laboratory workshop / A. V. Sabylinsky, A. N. Akupiyan. - Belgorod: Belgorod State Technological University named after V.G. Shukhov, EBS ASV, 2019. — 142 p. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/106206.html

11. Stepanova, V. A. Physics. Mechanics and molecular physics: a textbook for practical classes / V. A. Stepanova, I. F. Uvarova. Moscow: MISIS Publishing House, 2020. — 104 p. — ISBN 978-5-907226-68-5. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/106744.html

12. Stepina S. P., Butko N. B., Terletsky A. Ya. — Moscow: Peoples' Friendship University of Russia, 2018. — 52 p. — ISBN 978-5-209-08734-2. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/104229.html

13. Chakak, A. A. Molecular physics: a textbook for SPO / A. A. Chakak; edited by M. G. Kucherenko. — Saratov: Vocational education, 2020. — 377 p. — ISBN 978-5-4488-0670-4. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/91895.html

14. Chakak, A. A. Physics. Electricity and magnetism: a textbook for SPO / A. A. Chakak. — Saratov: Vocational education, 2020. — 237 p. — ISBN 978-5-4488-0675-9. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/91904.html

**6.2. Further reading**

1. General physics. Physics of the atomic nucleus and elementary particles: a textbook for bachelors of the direction of training 03.03.02 "Physics" (profile "Physics of condensed matter of matter") and 44.03.01 "Pedagogical education" (profile "Physical education") / N. I. Anisimova, Y. A. Gorokhovatsky, E. A. Karulina [and others]; edited by Y. A. Gorokhovatsky. - St. Petersburg: Herzen State Pedagogical University of Russia, 2018. — 184 c. — ISBN 978-5-8064-2540-0. - Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/98604.html

2. Palygina, A. V. Physics: laboratory workshop / A. V. Palygina. - 2nd ed. - Komsomolsk-on-Amur, Saratov: Amur Humanitarian and Pedagogical State University, IPR Media, 2019. — 84 p. — ISBN 978-5-85094-464-3, 978-5-4497-0150-3. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/85834.html

3. Chakak, A. A. Physics: a textbook for SPO / A. A. Chakak, S. N. Letuta. — Saratov: Vocational education, 2020. — 541 p. — ISBN 978-5-4488-0667-4. — Text: electronic // Electronic library system IPR BOOKS: [site]. — URL: https://www.iprbookshop.ru/92191.html

**6.3. List of Internet resources necessary for mastering the discipline**

1. Electronic library system IPRbooks ( [www.iprbookshop.ru](http://www.iprbookshop.ru/))

2. Educational platform "URAIT" <https://urait.ru/>).

3. Electronic library system "Lan" (<https://e.lanbook.com/>).

4. OIE (Interuniversity Electronic Library) NSPU. (<https://icdlib.nspu.ru/>).

5. SCIENTIFIC ELECTRONIC LIBRARY eLIBRARY.. RU (<https://www.elibrary.ru/>)

6. ATP "ConsultantPlus" (<http://www.consultant.ru/>)

**7. Modern professional databases and information reference systems**

1. EBS IPRbooks

2. Sistema GARANT: elektronnyi periodicheskii spravochnik [Electronic resource].

3. Consultant Plus: reference - search engine [Electronic resource]. –

4. Scientific Electronic Library LLC. An integrated scientific information portal in the Russian zone of the Internet, including databases of scientific publications and services for information support of science and higher education. http://elibrary.ru/

5. Information system "Single window of access to educational resources" (<http://window.edu.ru/>).

**8. Composition of the software**

1. Unified electronic educational system -

2. Anti-plagiarism

3. Windows Operating System

**9. Equipment and technical means of training**

1. Lectures are held in room B2-02 of the lecture building (B) (campus building) of the Chechen State University, which is also equipped with presentation equipment.

2. Laboratory work is carried out in educational laboratories (2-23, etc.), which are equipped with basic laboratory equipment.

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**Chemistry**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | "Microbiology" |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | General professional skills | GPC-6 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPC-6.1 | GPC-6.1  Knows the basic concepts and methods, modern areas of mathematics, physics, chemistry and earth sciences, current problems of biological sciences and prospects for interdisciplinary research | ***Know:*** - basic concepts and laws of chemistry; - the structure of the atom;  - classification of inorganic compounds; - features of chemical reactions; - patterns of chemical processes;  - theory of electrolytic dissociation;  - theoretical foundations of analytical chemistry.  - principles and methods of chemical qualitative analysis (fractional and systematic) - principles and methods of chemical quantitative analysis (gravimetry and titrimetry)  -theoretical foundations of physicochemical (instrumental) methods of analysis, their application to determine the qualitative and quantitative composition of the analyzed objects.  **Be able to:**  **-**work independently with educational, reference and methodological literature on analytical chemistry  - obtain correct information about the chemical process and its parameters from the reaction equation;  - describe, explain, predict chemical processes based on the basic theories of general and inorganic chemistry;  - solve calculation problems on all topics studied;  - in exercises on the compilation of redox reactions  – independently evaluate the most probable reaction products;  - correctly choose the method of analysis in accordance with the analytical task and the specified accuracy of determination.  - master the technique and carry out various gravimetric and titrimetric determinations  *Own:*  - methodology for conducting experimental studies  Get work experience  -correctly calculate the results of the analysis and evaluate them using mathematical processing methods  - work with devices  - analytical balances, pH meters, ionomers, installations for electrochemical methods of analysis, photocolorimeters and spectrophotometers  - apply the acquired knowledge to the analysis of compounds of inorganic and organic nature |
| GPC-6.2 | GPC-6.2 Able to use the skills of laboratory work and methods of chemistry, physics, mathematical analysis in professional activities | ***Know:*** - basic concepts and laws of chemistry; - the structure of the atom;  - classification of inorganic compounds; - features of chemical reactions; - patterns of chemical processes;  - theory of electrolytic dissociation;  - theoretical foundations of analytical chemistry.  - principles and methods of chemical qualitative analysis (fractional and systematic) - principles and methods of chemical quantitative analysis (gravimetry and titrimetry)  -theoretical foundations of physicochemical (instrumental) methods of analysis, their application to determine the qualitative and quantitative composition of the analyzed objects.  **Be able to:**  **-**work independently with educational, reference and methodological literature on analytical chemistry  - obtain correct information about the chemical process and its parameters from the reaction equation;  - describe, explain, predict chemical processes based on the basic theories of general and inorganic chemistry;  - solve calculation problems on all topics studied;  - in exercises on the compilation of redox reactions  – independently evaluate the most probable reaction products;  - correctly choose the method of analysis in accordance with the analytical task and the specified accuracy of determination.  - master the technique and carry out various gravimetric and titrimetric determinations  *Own:*  - methodology for conducting experimental studies  Get work experience  -correctly calculate the results of the analysis and evaluate them using mathematical processing methods  - work with devices  - analytical balances, pH meters, ionomers, installations for electrochemical methods of analysis, photocolorimeters and spectrophotometers  - apply the acquired knowledge to the analysis of compounds of inorganic and organic nature |

1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | |  | 9/324 |  |
| **contact work**: | |  | 48 |  |
|  | Lecture-type classes |  | 48 |  |
| Seminar type classes |  |  |  |
| Intermediate certification: credit / credit with grade / exam \* |  | 72 |  |
| **Independent work**(SRS) | |  | 298 |  |
| Of which for course work (course project) | |  |  |  |

1. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***
   1. Distribution of hours by sections/topics and types of work
      1. Part-time education

**Sections of disciplines and types of classes studied in I semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | **Section 1. Basic concepts and laws of chemistry**  The subject of chemistry. Basic concepts and laws of chemistry The main classes of inorganic compounds. | 2 |  |  |  | 2 |  | 5 |
| 2. | **Section 2. The structure of the atom and the periodic law.** The structure of the atom. Period. law and p. system of elements of D.I. Mendeleev. | 2 |  |  |  | 2 |  | 5 |
| 3. | **Section 3. Chemical bond**  The main types of chemical bonds. | 2 |  |  |  | 2 |  | 5 |
| 4. | **Section 4. Patterns of the course of chemical processes.** Patterns of the course of chemical processes. Thermochemistry. | 2 |  |  |  | 2 |  | 5 |
| 5. | **Section 5. Solutions.** Electrolytic dissociation. solutions of weak electrolytes. | 2 |  |  |  | 2 |  | 5 |
| 6. | Strong electrolytes. Activity. Solutions. Con-ion of solutions | 2 |  |  |  | 2 |  | 5 |
| 7. | Ionic product of water. Hydrolysis. biological role. | 2 |  |  |  | 2 |  | 5 |
| 8. | **Sections 10-13. Chemistry of s, p, d, f-elements**  Chemistry of s-, p-elements. biological role. | 2 |  |  |  | 2 |  | 5 |
| 9. | Chemistry of d-, f-elements. biological role. | 1 |  |  |  | 1 |  | 4 |
| 10. | **TOTALFOR I SEMESTER:** | 17 |  |  |  | 17 |  | 44 |

**Sections of disciplines and types of classes studied inII semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | 3. Acid-basic balance.Bronsted's protolithic theory-Lowry. acid. and basic properties of solvents. | 2 |  | - |  | 2 |  | 2 |
| 2. | 4. Buffer solutions.Calculation of pH and capacity of buffer solutions.Biologically important buffers. | 2 |  | - |  | 2 |  | 2 |
| 3. | 5. Oxidative-reduction reactions in chemical analysis. Electrode potential.Nernst equation. | 2 |  | - |  | 2 |  | 2 |
| 4 | 8. Basic principles of qualitative analysis. requirements for analytics. reactions. | 2 |  | - |  | 2 |  | eleven |
| 5. | 9. Tasks of quantitative analysis in biology.Methods of quantitative analysis.11. Titrimetric method of analysis | 2 |  | - |  | 2 |  | eleven |
| 6. | 15. Optical methods of analysis. | 2 |  | - |  | 2 |  | eleven |
| 7. | 16. Electrochemical methods of analysis | 2 |  | - |  | 2 |  | eleven |
| 8. | **TOTAL for 2 semester:** | 14 |  | - |  | 14 |  | 74 |

**Sections of disciplines and types of classes studied in III semester**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | **Section 5. Solutions**. Acid-base equilibrium. Topics 13-22  The doctrine of solutions. Methods for expressing the composition of solutions. | 2 |  | - |  | 2 |  | 4 |
| 2. | electrolyte solutions. Strong and weak electrolytes | 2 |  | - |  | 2 |  | 4 |
| 3. | Determination of the concentration of solutions by acid-base titration | 2 |  | - |  | 2 |  | 4 |
| 4. | Calculation of pH and pOH in solutions of weak acids and bases | 1 |  | - |  | 1 |  | 4 |
| 5. | Indicators. Theory of indicators. Color transition area of ​​the indicator. | 2 |  | - |  | 2 |  | 4 |
| 6. | buffer solutions. Calculation of the pH of buffer systems formed by a weak acid and its salt, using an acetate buffer as an example. | 2 |  | - |  | 2 |  | 4 |
| 7 | Calculation of the pH of buffer systems formed by a weak base and its salt, using the example of an ammonia buffer | 2 |  | - |  | 2 |  | 4 |
| 8 | Hydrolysis in the system sodium acetate + water. Anion hydrolysis | 2 |  | - |  | 2 |  | 4 |
| 9. | Hydrolysis in the system ammonium chloride + water. Hydrolysis by cation | 2 |  | - |  | 2 |  | 4 |
|  | **TOTAL:** | **17** |  |  |  | **17** |  | **74** |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | **Section 1. Basic concepts and laws of chemistry** | **Topic 1. Introduction.Subject and tasks of chemistry.**  The main stages in the development of chemistry. Relationship between chemistry and biology. Chemistry and the problem of environmental protection.  **Topic 2Basic concepts and laws of chemistry.**  The concepts of atom and molecule. Chemical element. Isotopes. Distribution of elements in the earth's crust. Relative atomic and molecular masses. A mole is a unit of quantity of a substance. Molar mass. Molar volume of gas. Simple and complex substances. Allotropy. The law of constancy of composition. The law of conservation of mass of matter. Equivalent. equivalent mass. The law of equivalents. |
|  | **Section 2. The structure of the atom and the periodic law of D.I. Mendeleev** | **Topic 3.Corpuscular-wave dualism.**  Atom as a complex microsystem. Atomic nucleus as a dynamic system of protons and neutrons. Corpuscular-wave dualism.  **Topic 4.quantum numbers.**  The main quantum number is n. Orbital (side, azimuthal) quantum number - l. Magnetic quantum. number - ml. Magnetic spin number - ms  **Topic 5.Electronic configurations of atoms.**  Pauli principle. The rule of least energy. Klechkovsky's rule. Hund's rule. Electronic formulas of atoms.  **Topic 6.Periodic Law**  Discovery of the Periodic Law. Modern wording. Periodic system of chemical elements. Periods. Groups and subgroups. Periodicity of change in the chemical properties of elements. Effective atomic radii. Ionization energy. Electron affinity energy. Electronegativity. |
|  | **Section 3. Chemical bond** | Topic 7.**The method of valence bonds.**  covalent bond. Donor-acceptor mechanism of covalent bond formation. Properties of a covalent bond: saturation, directivity, polarizability. Valence of atoms. Hybridization of atomic orbitals. Types of hybridization.  **Topic 8.Theory of molecular orbitals**  Method of molecular orbitals. Conditions for the interaction of atomic orbitals. Rules for filling the MO with electrons.  **Topic 9.Some types of chemical bonds**  Ionic bond. Cations and anions. Hydrogen bond. Its effect on the physical properties of matter. Importance of hydrogen bond in biological processes. Intermolecular interactions. |
|  | **Section 4. Patterns of the flow of chemical processes** | **Topic 10.Thermochemistry.**  Reactions are endothermic and exothermic. Kinds and types of energy. The first law of thermodynamics. Thermodynamic quantities. Internal energy and enthalpy. Entropy and Gibbs energy. Standard thermodynamic quantities. Chemical-thermodynamic calculations. Hess' law. Consequences from the law of Hess. direction of a chemical reaction.  **Topic 11.Chemical kinetics**  The rate of a chemical reaction. Dependence of the rate on the concentration of reactants. Speed ​​law. Reaction rate constant. Molecularity of the reaction. Reaction order. Effect of temperature on the reaction rate. Van't Hoff's rule. The concept of active molecules and activation energy. Types of catalysis: homogeneous, heterogeneous, autocatalysis. Enzymes. The role of enzymes in biological processes.  **Topic 12.Chemical equilibrium**  Reversible and irreversible reactions. chemical balance. The law of action of the masses. Chemical equilibrium constant. Equilibrium shift. Le Chatelier's principle. |
|  | **Section 5. Solutions**. | **Topic 13.Solution concentration**  Solutions. Thermal effect of dissolution. The concentration of solutions. Ways of expressing concentration. Calculations for the preparation of solutions of various concentrations.  **Topic 14. The phenomenon of osmosis**  The phenomenon of osmosis. osmotic pressure. The biological role of the phenomenon of osmosis. Dialysis.  **Topic 15. Electrolytic dissociation**  electrolytes. Non-electrolytes. Basic provisions of the theory of electrolytic dissociation. Degree of dissociation. Weak and strong electrolytes. Ionic reaction equations.  **Topic 16. Dissociation of weak electrolytes**  Dissociation constant. Ostwald dilution law. Influence of a common ion on the dissociation of a weak electrolyte.  **Topic 17. Dissociation of strong electrolytes**  Ion activity. Activity coefficient. Ionic strength of solution  **Topic 18. Ionic product of water. Hydrogen index.**  Electrolytic dissociation of water. Ionic product of water. Hydrogen index. Indicators.  **Topic 19. Buffer solutions.**  Buffer solutions of a weak acid and its salt with a strong base. Buffer solutions of a weak base and its salt with a strong acid.  **Topic 20. Salt hydrolysis**  Salt hydrolysis. Various cases of hydrolysis. Reactions of the environment in aqueous solutions of salts. Degree and constant of hydrolysis.  **Topic 21. Protolytic theory of acids and bases**  Protolysis. protolytic balance. Acid and base in the light of the protolytic theory. Ampholytes. |
|  | **Section 6. Solubility constant. Solubility.** | **. Topic 22. Solubility constant. Solubility.**  Solubility. Solubility constant. Precipitation and dissolution conditions. Common ion effect. salt effect. |
|  | **Section 7. Redox reactions** | **Topic 23. Redox reactions**  Redox reactions. The most important oxidizing and reducing agents. Standard redox potentials. Orientation of OVR in solution. Nernst equation. Classification of redox reactions. Rules for compiling the OVR .. |
|  | **Section 8. Coordination compounds** | **Topic 24. Coordination compounds**  The main provisions of the coordination theory. Basic types and nomenclature of CS. Chemical bond of CS. Geometry of the CS. Stability. Dissociation of the CS. |
|  | **Section 9. The prevalence of chemical elements in nature.** | **Topic 25.** The prevalence of chemical elements in nature. biogenic elements. Metals and non-metals in the periodic system |
|  | **Section 10. Chemistry of s-elements** | **Topic 26. Chemistry of hydrogen.**Hydrogen. A special position among the elements of the periodic system. Isotopes of hydrogen. Methods for producing hydrogen. Physical and chemical properties of hydrogen.  **Topic 27. Chemistry of elements of group IA.**  alkali metals. Electronic structure. Finding in nature. Chemical properties of alkali metals. Chemical properties of alkali metal compounds  **Topic 28. Chemistry of elements of group IIA.**  alkaline earth metals. Electronic structure. Properties. Finding in nature. Chem. properties of alkaline earth metals. Chem. properties of their compounds. |
|  | **Section 11. Chemistry of p-elements** | **Topic 29. Chemistry of Group IIIA elements**  General characteristics of the elements. Electronic structures of atoms. Bor. Boron in nature. Properties of boron and its compounds. The role of boron as a trace element. Aluminum. Getting in the industry. Properties of aluminum and its compounds. The practical importance of aluminum and its compounds.  **Topic 30. Chemistry of Group IVA elements**  General characteristics of the elements. Electronic structures of atoms. carbon in nature. Allotropy of carbon. Properties of carbon and its compounds. Silicon. Getting silicon. Properties of silicon and its compounds. Properties of tin and lead compounds  **Topic 31. Chemistry of elements of the VA group**  General characteristics of the elements. Electronic structures of atoms. nitrogen in nature. Obtaining and properties of nitrogen. Ammonia. Synthesis of ammonia. Phys. and chem. properties of ammonia. Ammonium salts. nitrogen oxides. Getting and properties. Nitrous acid. Properties of nitrous acid and its salts. Nitric acid. Receipt. Properties of nitric acid and its salts. The use of nitrates and ammonium salts.  Phosphorus. The role of phosphorus in living organisms. Phosphorus in nature. Allotropy of phosphorus. Preparation and properties of phosphorus. Phosphine and its properties. Oxygen compounds of phosphorus. Phosphorus oxides. Phosphorus acids. Salts of orthophosphoric acid.  Practical use of phosphorus and its compounds.  **Topic 32. Chemistry of VIA Group Elements**  General characteristics of the elements. Electronic structures of atoms. Oxygen. Finding in nature. Methods for obtaining oxygen. The role of oxygen in the life of plants and animals. properties of oxygen. Allotropy.  Ozone, its oxidative activity, formation in nature.  Hydrogen compounds of oxygen. Properties of hydrogen peroxide. Sulfur. Sulfur in nature. Sulfur allotropy. Obtaining and properties of sulfur. Hydrogen sulfide. Properties of hydrogen sulfide and its salts. Oxygen compounds of sulfur. Sulfur oxide (IV), sulfurous acid and its salts. Getting and properties.  Sulfur(VI) oxide. Sulfuric acid. Obtaining and properties of sulfuric acid. sulfates. |
|  | **SECTION 12.Chemistry of elements of group VIIA** | **Topic 33. Chemistry of elements of group VIIA**  General characteristics of the elements. Electronic structures of atoms. Fluorine. Physical and chemical properties of fluorine. Hydrogen fluoride, hydrofluoric acid. Chlorine. Finding chlorine in nature. Preparation and properties of chlorine. Hydrogen chloride. Hydrochloric acid. Its properties and application. Chlorides. Oxygen compounds of chlorine. Comparison of the strength and oxidizing properties of oxygen-containing chlorine acids. Bromine. Iodine. Finding in nature. Getting and properties. Hydrogen bromide. Hydrogen iodide. Getting and properties. |
|  | **Section 13. Chemistry of d-elements.** | **Topic 34. Chemistry of d-elements**  Comparative characteristics of d-elements. Electronic structures of atoms. Chromium. Finding in nature. Obtaining and properties of chromium. Acid-base properties of oxides and hydroxides of chromium (II, III, VI). OK-in-tion characteristics of chromium compounds. Chromates and dichromates.  Manganese. Finding in nature. properties of manganese. Acid-base characteristics of manganese in different oxidation states. Ok-vos-e properties of manganese compounds.  Iron. iron in nature. properties of iron. Oxides and hydroxides of iron (II) and (III). The most important salts of iron. Complex compounds of iron. The role of iron in biological processes.  Copper. Finding in nature. Obtaining and properties of copper. Oxygen compounds of copper and their derivatives. Complex s. The role of copper in physiological processes.  Zinc. Obtaining and physical-chemical properties of zinc. Amphotericity of zinc oxide and hydroxide. The role of zinc as a trace element |
|  | **Section 14.Chemistry of f-elements** | **Topic 35. Chemistryf-elements**  The lanthanide family. Lanthanide compounds. The actinide family. actinide compounds. |
|  | **Section 15** Fundamentals of Analytical Chemistry | Introduction. Subject of Analytical Chemistry,its goals and objectives. The importance of analytical chemistry in the development of natural sciences and the national economy. Place and role of analytical chemistry in biology. Qualitative and quantitative analysis of inorg. and org. substances. Chem-ie,physical and biol methods of analysis. Analytical signal.Modern requirements for methods of analysis:right, reproducibility, selectivity, express, possibility of automation. Relationship between object and analysis method. Analytical control in the nature protection service, biology and medicine.  THEORETICAL FOUNDATIONS OF CHEMICAL METHODS OF ANALYSIS. Chemical equilibrium.Main types of reactions, used in analytical chemistry:acidic-main,oxidation-recovery,complexation;sedimentation processes-dissolution.Activity and concentration.Ionic strength of solution.The concept of competing reactions.General (analytical) concentration. Competing reaction coefficient (mole fraction). Equilibrium constants:term-kaya,real and conditional,their relationship.Factors, affecting balance:reactant concentration,temperature, ionic strength,the nature of the solvent,competing reactions. acidic-basic balance. Protolithic theory. Bronsted-Lowry:acid concepts,grounds, ampholyte, conjugate acid-main pair.The role of the solvent in the chemical reaction of proton transfer.Acid and basic properties of solvents.Autoprotolysis of amphiprotic solvents.acidic-basic equilibria in non-aqueous solvents.Influence of the nature of the solvent on the strength of acids and bases.Leveling and differential action of solvents.Calculation of pH in solutions of strong and weak acids and bases,ampholytes.buffer solutions.Calculation of pH and capacity of buffer solutions.Biologically important buffers.acidic-basic equilibrium in amino acid solutions.Equilibrium in solutions of complex compounds.Complex compounds and their characteristics.Types of complex compounds,used in analytical chemistry. Coordination number of the complexing agent. Ligand denticity. Thermodynamic and kinetic stability of complex compounds.Stepwise and general stability constants.Using Complex Compounds for Discovery,masking,separation,concentration and determination of elements.  OK-second balance. Electrode potential. Nernst equation. The concept of standard and real oxidation-recovery potential. Factors, affecting the amount of oxidative-recovery potential: concentrations of oxidized and reduced forms, ionic strength,temperature,hydrogen ion concentration,formation of complex and sparingly soluble compounds.Direction of oxidation reactions-recovery.  Equilibrium constant. Her association with ok-restore potentials. Examples of oxidizing-recovery processes in biological systems. Equilibrium in the solution system-sediment. Solubility product. Relationship between solubility and solubility product. Factors, affecting solubility.The most important organic and inorganic precipitants.Organic reagents in analytical chemistry.Theoretical foundations of the action of organic reagents.The concept of functional analytic groups.  Main types of connections, formed with the participation of organic reagents. Chelates and their properties. Complex compounds of metal ions with organic ligands as models of biologically important systems (on the example of porphyrin macrocycles).The most important organic reagents,used in the analysis.  METROLOGICAL FOUNDATIONS OF ANALYTICAL CHEMISTRY  Analytical signal. Classification of analysis errors. Systematic and random errors. Correctness and reproducibility.Methods for assessing the correctness of the analysis:use of standard samples,additive method,comparison with other methods of analysis.Assessment of the reproducibility of the analysis results:dispersion,standard deviation.Excluding results.Confidence interval at a given confidence level.Comparison of methods for reproducibility.Fisher's criterion. Comparison of means of two sample sets, t-distribution. Sensitivity characteristics of analysis methods: detection limit, lower and upper limits of determined contents. Graphical representation of analysis data. Construction of a calibration graph,least square method.  METHODS OF DETERMINATION  Tasks of quantitative analysis in biology. Methods of quantitative analysis: chemical(gravimetric and titrimetric)and physical-chemical.Expressing Analysis Results. Analysis steps. Choice of analysis method. Sampling(average sample,its representativeness and size). Sample preparation for analysis(decomposition of a biological object;wet and dry decomposition methods;analysis without decomposition;separation of interfering components).Analytical signal measurement.Processing of measurement results.Titrimetric analysis.General information about titrimetric methods.Their advantages and application in the analysis of biological objects.Classification of methods.Requirements,applied to reactions in titrimetric analysis.Calculation of molar mass equivalents in various methods of titrimetric analysis.Titration types.Equivalence point and end point of titration.Titration Endpoint Detection Methods.Sources of error in titrimetric analysis.Primary standards,requirements,presented to them.Fixanaly.secondary standards.acidic-basic titration. Calculation of pH at various points in the titration. Construction of titration curves for strong and weak acids and bases. Titration of polybasic acids and bases. Titration in non-aqueous and mixed media.acidic-main indicators.Indicator color transition interval.Selecting an indicator to establish the end point of the titration.Titration errors.  Preparation of working solutions of acid and alkali.Primary standards.Practical application of the acid method-basic titration.Determination of removable and permanent water hardness.Determination of ammonium nitrogen by various methods.Definition of common,protein and nitrate nitrogen in biological materials.Definition of phosphoric,hydrochloric and acetic acids.OK-re-titration.Calculation ok-8th potential at different points of titration.Construction of titration curves.Titration Endpoint Detection Methods.RH indicators.  Iodometry.General characteristics of the method. Conditions for the determination of oxidizing and reducing agents. Preparation and properties of sodium thiosulfate solution.Primary standards.Starch as an indicator.Iodometric determination of arsenates,arsenites,copper,ascorbic acid,sugars.  permanganatometry. General characteristics of the method.Preparation of potassium permanganate solution and its stability.Primary standards in permanganatometry.Standardization of potassium permanganate solution.Determination of iron salts,nitrite,hydrogen peroxide, "oxidizability"water.  Bichromatometry.General characteristics of the method. End point detection.Determination of iron salts.Complexometric titration.The use of amino-polycarboxylic acids and their salts(complexones)in titrimetric analysis.Methods of complexometric titration.Endpoint titration detection.Metal-chromic indicators.The role of pH in complexometry.Determination of calcium,magnesium,gland,copper,aluminum.  **Physico-chemical methods of analysis**  General characteristics and classification of physical-chemical methods of analysis. Spectroscopic and electrochemical methods. Use of physics-chemical methods in the study of biological systems and processes.  Spectroscopic methods of analysis  Introduction to Spectroscopic Methods of Analysis.The main characteristics of electro-magnetic radiation.  Method Usage Examples: determination of biologically active elements-potassium, calcium, magnesium,boron,heavy metal ions.  Methods of molecular spectroscopy. Spectrophotometry.Basic law of light absorption. Choice of optimal conditions for photometry. Determination of trace elements:phosphorus,gland,manganese,nickel,titanium, etc..  Luminescent methods of analysis. Their classification.Basic laws of luminescence,metrological characteristics,Areas of use.Identification and determination of chlorophylls and vitamins by the luminescent method.Electrochemical methods of analysis  Introduction to Electrochemical Methods of Analysis.Theoretical foundations of electrochemical methods.Electrochemical cell.Classification of electrochemical methods of analysis.Indicator and reference electrodes. |

* + 1. The content of practical classes (1st semester)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
|  | T.B. when working in chemistry. laboratories. | Weighing and mathematical processing of measurement results. |
|  | Methods for purification of substances. | Purification of solids by recrystallization and sublimation methods. Purification of liquids by distillation. Gas purification. |
|  | Basic stoichiometric laws of chemistry. gas laws. | Determination of atomic and equivalent masses of simple and complex substances. Test: The law of equivalents. gas laws. |
|  | Classes of inorganic compounds | Preparation and properties of oxides, hydroxides and salts |
|  | The structure of the atom. Chemical bond. | Compilation of electronic formulas of atoms and ions. Colloquium: The structure of the atom and the chemical bond. |
|  | Chemical thermodynamics. | Determination of heats of neutralization and precipitation. |
|  | Chemical kinetics. | The rate of chemical reactions. chemical balance. |
|  | Chemical thermodynamics. Kinetics | Colloquium: Chemical thermodynamics and kinetics. |
|  | Solutions. | Preparation of solutions and determination of their concentration |
|  | electrolytic dissociation. | electrolytic dissociation. |
|  | Equilibria in electrolyte solutions | Equilibria in electrolyte solutions. Heterogeneous equilibria. |
|  | Hydrolysis | .Hydrolysis of salts. Test: Equilibrium in aqueous solutions. |
|  | Solutions. electrolytic dissociation. | Colloquium: Solutions. electrolytic dissociation. |
|  | Complex compounds | complex compounds. |
|  | Redox reactions. | Compilation of OVR equations by the methods of electronic and electron-ion balance.  Influence of the environment on the course of OVR. |
|  | Redox reactions. | Lab. work: Redox reactions. |
|  | Electrochemical properties of solutions. Electrolysis. | Lab. work: Electrochemical processes. |
|  | T.B. when working in chemistry. laboratories. | Weighing and mathematical processing of measurement results. |

* + 1. The content of practical classes (2nd semester)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
|  | Oxygen, hydrogen, water, hydrogen peroxide. | Oxygen, hydrogen, water, hydrogen peroxide. |
|  | Elements of group VII ch. subgroups | Halogens. |
|  | Chalcogens. | Sulfur, selenium. |
|  | p-elements of group V. | Nitrogen. |
|  | Chemical connection in compounds of elements of the main subgroups of groups V - VII | Lab. work: Phosphorus, antimony, bismuth.  Colloquium: OVR, chem. connection in the compounds of elements Ch. subgroups V - VII groups. |
|  | p-elements of group IV. | Carbon, silicon, tin, lead. |
|  | p-elements of group III. | Lab. work: Boron, aluminium. |
|  | s-elements of I and II groups. | Lab. work: Alkaline earth metals. Alkali metals. Beryllium, magnesium. |
|  | Complex compounds of d-elements | Colloquium: Complex compounds of d-elements |
|  | Elements of the secondary subgroup of group IV. | Lab. work: Titan. |
|  | Elements of a secondary subgroup of group V. | Lab. work: Vanadium. |
|  | Elements of a secondary subgroup of group VI. | Lab. work: Chrome, molybdenum, tungsten. |
|  | Elements of a secondary subgroup of group VIII. | Lab. work: Iron, cobalt, nickel. |
|  | Elements of the secondary subgroup of group I. | Lab. work: Copper, silver. |
|  | Elements of the secondary subgroup of group II. | Lab. work: Zinc, cadmium. |
|  | Chemistry of the elements | Final lesson |

* + 1. The content of practical classes (2nd semester)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
| 1. | **Section 5. Solutions**. Acid-base equilibrium. Topics 13-22The doctrine of solutions. Methods for expressing the composition of solutions. | Lab. work: Ways of expressing the composition of solutions. |
| 2. | electrolyte solutions. Strong and weak electrolytes | Lab. Job: . Strong and weak electrolytes. |
| 3. | Determination of the concentration of solutions by acid-base titration | Lab. work: Determination of the concentration of solutions by acid-base titration |
| 4. | Calculation of pH and pOH in solutions of weak acids and bases | Lab. work: Calculation of pH and pOH in solutions of weak acids and bases |
| 5. | Indicators. Theory of indicators. Color transition area of ​​the indicator. | Lab. work: Indicators. Theory of indicators. Color transition area of ​​the indicator. |
| 6. | buffer solutions. Calculation of the pH of buffer systems formed by a weak acid and its salt, using an acetate buffer as an example. | Lab. work: Calculation of the pH of buffer systems formed by a weak acid and its salt, using an acetate buffer as an example.. |
| 7 | Calculation of the pH of buffer systems formed by a weak base and its salt, using the example of an ammonia buffer | Lab. work: Calculation of the pH of buffer systems formed by a weak base and its salt, using the example of an ammonia buffer |
| 8 | Hydrolysis in the system sodium acetate + water. Anion hydrolysis | Lab. work: Hydrolysis in the system sodium acetate + water. Anion hydrolysis. |
| 9. | Hydrolysis in the system ammonium chloride + water. Hydrolysis by cation | Lab. work: Hydrolysis in the system ammonium chloride + water. Hydrolysis by cation |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Basic concepts and laws of chemistry | *Oral survey, Test* |
| 2. | Section 2. The structure of the atom and the periodic law of D.I. Mendeleev | *oral questioning,*Testing, Cases, Testing |
| 3. | Section 3. Chemical bond | *oral questioning,*Testing |
| 4. | Section 4. Patterns of the flow of chemical processes | *oral questioning,*Test |
| 5. | Section 5. Solutions. | *oral questioning,*Cases, Testing |
| 6. | Section 6. Solubility constant. Solubility. | *oral questioning* |
| 7. | Section 7. Redox reactions | *oral questioning,*Control work, Cases |
| 8. | Section 8. Coordination compounds | *oral questioning* |
| 9. | Section 9. The prevalence of chemical elements in nature. | *oral questioning* |
| 10. | Section 10. Chemistry of s-elements | *oral questioning,*Testing, Cases, Testing |
| eleven. | Section 11. Chemistry of p-elements | *oral questioning,*Test, Business game, Cases |
| 12. | SECTION 12. Chemistry of elements of group VIIA | *oral questioning,*Cases, Testing |
| 13. | Section 13. Chemistry of d-elements. | *oral questioning,*Test, Business game, Cases |
| 14. | Section 14.Chemistry of f-elements | *oral questioning,*Control work, Cases |
|  |  |  |
|  |  |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

***Test papers:***

**Test 1. Thermodynamics and kinetics**

Option 1.

1. Determine the standard H of the reaction: CO(g) + ½ O2(g) = CO2(g)
2. Determine the possibility of the reaction NH4Cl(t) + NaOH(t) = NaCl(t) + H2O(g) + NH3(g) under standard conditions and at elevated temperature.
3. Determine the enthalpy of formation of H2O (g) at 500 °C based on the standard heat of formation (-241.60 kJ/mol) and considering the gases involved in the reaction as ideal.
4. Determine the temperature coefficient and activation energy of the reaction, if it is known that when the temperature changes from 20 ° C to 45 ° C, its rate increases by 6 times.

Option 2.

1. Determine the standard H reaction: BaO(t) + H2O(l) = Ba(OH)2(t)
2. Determine the possibility of the reaction 3H2(g) + N2(g) = 2NH3(g) under standard conditions and at elevated temperature.
3. Determine the enthalpy of formation of hydrogen chloride at 800 °C based on the standard heat of formation (-92.96 kJ/mol) and considering the gases involved in the reaction as ideal.
4. Determine the temperature coefficient and activation energy of the reaction if its rate constant at 30 °C is 6.410-4 l/(mols), and at 75 °C = 1.610-2 l/(mols).

Option 3.

* Determine the standard H of the reaction: CaCO3(t) = CaO(t) + CO2(g).
* Determine the possibility of the reaction NH4NO3(t) = 2H2O(g) + N2O(g) under standard conditions and at elevated temperature.
* Determine the enthalpy of formation of ozone at 800 °C based on the standard heat of formation (142.54 kJ/mol) and considering the gases involved in the reaction to be ideal.
* Determine the temperature coefficient and activation energy of the reaction if its rate constant at 20 °C is 2.410-4 l/(mols), and at 85 °C = 2.410-2 l/(mols).

Option 4.

1. Determine the standard H reaction: Ca(t) + 2H2O(l) = Ca(OH)2(t) + H2(g)
2. Determine the possibility of the reaction HCl(g) + NaOH(t) = NaCl(t) + H2O(g) under standard conditions and at elevated temperature.
3. Determine the enthalpy of formation of ammonia at 400 °C based on the standard heat of formation (-45.98 kJ / mol) and considering the gases involved in the reaction as ideal.
4. Determine the temperature coefficient and activation energy of the reaction, if it is known that when the temperature changes from 25 ° C to 80 ° C, its rate increases by 50 times.

**Test 2. Solutions**

**OPTION 1**

1. 50 g of CuSO4.5H2O were dissolved in 450 g of water. Calculate the percentage of crystalline hydrate and anhydrous salt in the solution.
2. What volume of 96% sulfuric acid (=1.84 g/ml) is needed to prepare 0.5 l of a 1.5M solution?
3. Calculate the percentage of sulfuric acid in its 5M solution (=1.29 g/cm3).

**OPTION 2**

1. What mass of salt and water is contained in 800 g of a 12% sodium nitrate solution?
2. What is the mass of dry salt NaClO4 needed to prepare 0.5 l of 1.5M solution?
3. Calculate the molar concentration and the molar concentration of the equivalent of a 49% H3PO4 solution (=1.33 g/cm3).

**OPTION 3**

1. How many grams of a 3% magnesium sulfate solution can be prepared from 100 g of MgSO4.7H2O?
2. Determine the molar concentration and the molar concentration of the equivalent of a 40% solution of nitric acid (=1250 kg/m3).
3. What volume of hydrochloric acid with a molar equivalent concentration of 4 mol/l is required to neutralize 10 g of NaOH?

**OPTION 4**

1. How many grams of a 5% solution can be prepared from KOH and 100 g of H2O?
2. What mass of 30% KOH must be added to 200 g of a 90% solution to obtain a 50% KOH solution?
3. How many ml of 0.4 N H2SO4 can be neutralized by adding 800 ml of 0.25 N NaOH?

**Test 3. Hydrolysis**

***Option number 1***

1. Which of the following salts undergo hydrolysis: NaCN, KNO3, KClO? For each of the hydrolyzable salts, write the hydrolysis equations in ionic and molecular forms.

2. Which of the salts has pH<7 in aqueous solution due to hydrolysis? Write the corresponding hydrolysis reaction equations in molecular and ionic forms.

1) potassium sulfide 2) potassium sulfate. 3) chromium (III) sulfide. 4) iron (II) sulfate.

***Option number 2***

1. Which of the following salts undergo hydrolysis: NH4Br, NaClO4, HCOOK? For each of the hydrolyzable salts, write the hydrolysis equations in ionic and molecular forms and find the pH of its 0.1 M aqueous solution.

2. Which of the salts has a pH> 7 in an aqueous solution due to hydrolysis? Write the corresponding hydrolysis reaction equations in molecular and ionic forms. 1) aluminum carbonate; 2) sodium carbonate; 3) aluminum chloride; 4) sodium chloride; 5) potassium chloride.

***Option number 3***

1. Which of the following salts undergo hydrolysis: NaCN, KNO3, KClO? For each of the hydrolyzable salts, write the hydrolysis equations in ionic and molecular forms and find the pH of its 0.1 M aqueous solution.

Which salt has pH>7 in aqueous solution due to hydrolysis? Write the corresponding hydrolysis reaction equations in molecular and ionic forms. 1) aluminum carbonate; 2) sodium carbonate; 3) aluminum chloride; 4) sodium chloride; 5) potassium chloride.

***Option number 4***

1. Which of the following salts undergo hydrolysis: NH4Cl, K2CO3, NaNO2? For each of the hydrolyzable salts, write the hydrolysis equations in ionic and molecular forms and find the pH of its 0.1 M aqueous solution.

2. Which of the salts has pH<7 in aqueous solution due to hydrolysis? Write the corresponding hydrolysis reaction equations in molecular and ionic forms.

1) potassium sulfide 2) potassium sulfate 3) chromium(III) sulfide 4) iron(II) sulfate.

**Test 4. Redox reactions**

***Option 1***

1. Calculate the value of the electrode potential of hydrogen in a 0.05M solution of sulfuric acid; in 0.001M sodium hydroxide solution.

2. Complete the reaction equations, determine the direction of their flow under standard conditions: 1.Fe2++Hg2+ →Fe3++Hg22+;

2.Cr2O72– + H+ + Sn2+→Cr3+ + Sn4+ +H2O.

3. Determine the direction of the reaction

2Co3+ + Pb2+= 2Co2+ + Pb4+ if the concentrations are equal: [Co3+]= 10–4 mol/l, [Pb2+] = 10–6 mol/l, [Co2+]= 10–2 mol/l, [Pb4+]= 10 –2 mol/l.

4. Determine whether it is possible to prepare an aqueous solution containing both potassium permanganate and potassium sulfite. Support your answer with a calculation.

***Option 2***

1. Calculate the potential of the electrode, which is a copper plate dipped in a solution of 0.01M copper (II) sulfate.

2. Finish the reaction equations, determine the direction of their flow under standard conditions:

1) Fe2++MnO4–+H+ → Fe3++Mn2++H2O;

2) Cl2 + Br2 + H2O → Cl– + BrO3– + H+ .

3. Determine the direction in which the reaction can proceed:

6Br– + IO3–+ 6H+ = 3Br2 + I– +3H2O

if the concentrations are: [Br–]=0.01 mol/l, [IO3–]=0.01 mol/l, [Br2]=1 mol/l, [I–]=0.001 mol/l, and the pH of the solution is 2.

4. Determine whether it is possible to prepare an aqueous solution containing both potassium nitrite and hydrogen iodide. Support your answer with a calculation.

***Option 3***

1. Calculate how much the electrode potential of zinc changes if the concentration of the zinc sulfate solution in which the zinc plate is immersed decreases from 0.1 M to 0.01 M.

2. Finish the reaction equations, determine the direction of their flow under standard conditions:

1. Co2++MnO4–+H+→ Co3++Mn2++H2O;
2. I2 + Fe(OH)2 + OH– →I– + Fe(OH)3.

3. Estimate the most probable product of the oxidation of iodide ions (I2, HOI, IO3–) in an acidic medium under the action of dichromate ions and iron(III) ions.

4. Establish whether it is possible to prepare an aqueous solution containing both iron(III) nitrate and sodium iodide. Support your answer with a calculation.

Option 4

1. Calculate the value of the redox potential of the Cr3+ + e = Cr2+ system for the case when [Cr2+]=0.01mol/l and [Cr3+]=0.001mol/l.

2. Complete the reaction equations, determine the direction of their flow under standard conditions: 1.MnO4– + H+ + Sn2+ → Mn2+ + Sn4+ + H2O; 2.Fe2+ + Cl2 →Fe3+ + Cl– .

3. How to explain that permanganate is capable of oxidizing iodides (but not bromides and chlorides) in solutions with pH 5–6, oxidizing iodides and bromides (but not chlorides) in solutions with pH 3, and chlorides only in solutions with pH < 3 ?

4. Determine whether it is possible to prepare an aqueous solution containing both potassium chromate and sodium sulfite. Support your answer with a calculation.

**An approximate list of questions submitted for final control (exam)**

1. Classes of inorganic compounds. binary connections.

2. Classes of inorganic compounds. Oxides.3. Classes of inorganic compounds. Acids. Properties. Classification. Nomenclature (names). 4. Classes of inorganic compounds. Foundations. Properties. Classification. Nomenclature (names). 5. Classes of inorganic compounds. Salt. Properties. Classification. Nomenclature (names). 6. Chemical kinetics. The rate of chemical reactions. 7. Speed ​​of chemical reactions. The law of action of (acting) masses. 8. Chemical balance. Derivation of the reaction equilibrium constant (kinetic approach). The law of chemical equilibrium. 9. Hydrolysis in the system sodium acetate + water. Anion hydrolysis. 10. Hydrolysis in the system ammonium chloride + water. Hydrolysis with a cation. 11. Chemical balance. Le Chatelier's principle. 12. Strong and weak electrolytes. Degree of dissociation. 13. Dissociation (ionization) constant of the electrolyte. 14. Relationship between the constant and the degree of electrolyte dissociation. Ostwald dilution law for a binary electrolyte. 15. Solutions of electrolytes. 16. Theory of electrolytic dissociation by S. Arrhenius. Degree of dissociation. 17. Dissociation of water. Ionic product of water. 18. Hydrogen and hydroxide indicators (pH and pOH). 19. Proton (protolytic) theory of acids and bases. 20. Lewis electronic theory of acids and bases. 21. Autoprotolysis. Autoprotolysis constant. 22. Conclusion of formulas for calculating pH. Calculation of pH of pure water. 23. Conclusion of formulas for calculating the pH of strong acids. 24. Derivation of formulas for calculating pH and pOH of strong bases. 25. The concept of buffer systems. 26. The mechanism of action of buffer systems. 27. Calculation of the pH of buffer systems formed by a weak acid and its salt using an acetate buffer as an example. 28. Calculation of the pH of buffer systems formed by a weak base and its salt using the example of an ammonia buffer. 29.Henderson-Hasselbach equation. Strength indicator of acid 30. The role of electrolytes in vital processes. 31. Calculate α of acetic acid at a concentration of 0.1 mol / l (). 32. Calculate α of acetic acid at a concentration of 0.01 mol / l (). Calculate α of acetic acid at a concentration of 0.1 mol / l (). 32. Calculate α of acetic acid at a concentration of 0.01 mol / l (). Calculate α of acetic acid at a concentration of 0.1 mol / l (). 32. Calculate α of acetic acid at a concentration of 0.01 mol / l ().

33. Calculate α of acetic acid at a concentration of 0.001 mol / l ().

34. Calculate α of acetic acid at a concentration of 1 mol / l ().

35. Calculate α formic acid at a concentration of 0.1 mol / l (). 36. Calculate α formic acid at a concentration equal to 0.01 mol / l ().

37. Calculate α formic acid at a concentration of 0.001 mol / l ().

38. Calculate α of formic acid at a concentration of 1 mol / l ().

39. Calculate α hydrocyanic acid at a concentration equal to 0.001 mol / l ().

40. Calculate α hydrocyanic acid at a concentration of 0.01 mol / l ().

41. Calculate α hydrocyanic acid at a concentration of 0.1 mol / l ().

42. Calculate α hydrocyanic acid at a concentration of 1 mol / l ().

43. Find [H+] in a solution of acetic acid at a concentration = 0.1 mol / l ().

44. Find [H +] in a solution of acetic acid at a concentration = 0.01 mol / l ().

45. Find [H +] in a solution of acetic acid at a concentration = 0.001 mol / l ().

46. ​​Find [H +] in a solution of acetic acid at a concentration = 1 mol / l ().

47. Find [H+] in a solution of formic acid at a concentration = 0.1 mol / l ().

48. Find [H+] in a solution of formic acid at a concentration = 0.01 mol / l (). 49. Find [H+] in a solution of formic acid at a concentration of = 0.001 mol / l ().

50. Find [H+] in a formic acid solution at a concentration = 1 mol / l ().

51. Find [H+] in a solution of hydrocyanic acid at a concentration of = 0.001 mol / l ().

52. Find [H+] in a hydrocyanic acid solution at a concentration = 0.01 mol / l ().

53. Find [H+] in a hydrocyanic acid solution at a concentration = 0.1 mol / l ().

54. Find [H+] in hydrocyanic acid solution at concentration=1mol/l().

55. Find [H+] and calculate the pH of the solution if the concentration of [OH-] = 10-8. 56. Find [H+] and calculate the pH of the solution if the concentration of [OH-] = 10-9.

57. Find [H+] and calculate the pH of the solution if the concentration of [OH-] = 10-12.

58. Find [OH-] and calculate the pOH of the solution if the concentration of [H+] = 10-4.

59. Find [OH-] and calculate the pOH of the solution if the concentration of [H+] = 10-3.

60. Find [OH-] and calculate the pOH of the solution if the concentration of [H+] = 10-10.

*Questions for admission and protection of laboratory work*

Questions for admission and for the protection of laboratory work are given in the manual:

Isaeva E.L., Mutuzova M.Kh., Shamsutdinova M.Kh., Khadasheva Z.S. Inorganic chemistry. Laboratory workshop on the course "Inorganic chemistry". part II, Grozny, 2012, 36s

Students who know the safety rules and understand the methodology for conducting experiments are allowed to perform laboratory work. The defense of laboratory work is carried out in the presence of a report (with a brief description of the methodology for conducting experiments, reaction equations, observations, conclusions).

Laboratory work includes:

- permission to work

- performance of work, including preparation of a report

- work protection

*Colloquium*

Control questions for the colloquium on the topic “Structure of the atom. Chemical bond»

*The structure of the atom*

1. The first theories of the structure of the atom. Radioactivity. Atomic spectra.

2. The structure of the atom according to Bohr. Bohr's postulates. Principal quantum number and explanation of the spectrum of the hydrogen atom. Bohr-Sommerfeld theory.

3. Corpuscular and wave properties of particles. De Broglie ratio. Heisenberg's uncertainty principle.

4. Schrödinger equation. Types of solutions to the Schrödinger equation in the simplest cases. The concept of an orbital.

5. polyatomic atoms. Principle of Pauli, Gund, Klechkovsky.

6. Periodic law D.I. Mendeleev, modern formulation of the law. The structure of the periodic system. Explanation of the structure in terms of the principles of Pauli, Gund, Klechkovsky. Periods, groups, s-, p-, d-, f elements.

7. The periodicity of the properties of elements - radii, ionization potentials. Influence of the nuclear charge, atomic radius, screening effect of internal electrons, penetration depth of external electrons on the ionization potential. Affinity for an electron.

*chemical bond*

1. The nature of the chemical bond. Types of chemical bond.

2. Overlapping of valence orbitals during the formation of a chemical bond. Types of overlap.

5. Orientation of the covalent bond (σ-, π-, δ-bonds). Spatial configuration of molecules (linear, angular, pyramidal).

6. Theory of hybridization, structures of molecules with hybrid orbitals. 7. Participation in the hybridization of unshared electron pairs (Gillespie's theory). The interaction of various electron pairs of the central atom and the explanation of the configuration of molecules. 8. The structure of molecules with multiple bonds.

eleven. Ionic bond. Nondirectivity and unsaturation of the ionic bond.

12. Metal connection.

13. Intermolecular forces of interaction. Hydrogen bond and van der Waals forces.

*Examples of tickets for the colloquium:*

*Option 1.*

1. The structure of the atom according to Bohr. Bohr's postulates. Principal quantum number and explanation of the spectrum of the hydrogen atom. Bohr-Sommerfeld theory.

2. Ionic bond (non-directivity and unsaturation of ionic bond). Metal connection.

3. Determine, according to the Klechkovsky rule, the sequence of filling sublevels in atoms with electrons, if (n + l) is equal to 7. Based on the Pauli principle, find the maximum number of electrons in an atom with n=3.

4. Explain the nature of the change in the ionization potential in the series:

Li Be B N O C Ne

P.I., eV 5.39 9.38 8.30 14.53 13.61 17.42 21.56

Why does the ionization potential increase unevenly?

Option 2.

1. Corpuscular and wave properties of particles. De Broglie ratio. Heisenberg's uncertainty principle.

2. Communication polarity. Electronegativity. Dipole moment of the bond, molecules.

3. Write the electronic configurations of atoms in the excited state, preceding the formation of bonds in the molecules of PCl5, GaCl3, SiH4, Cl2O7.

4. Compose the values ​​of quantum numbers for valence electrons in element No. 48.

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Creative task**

*Essay*is a small written work that combines free, subjective reasoning on a particular topic with elements of scientific analysis. The text should be easy to read, but deliberately colloquial style, slang, and formulaic phrases should be avoided. The volume of the essay is approximately 2 - 2.5 pages 12 in single-spaced font (excluding the title page).

*Evaluation criteria*- the assessment takes into account the observance of the genre specifics of the essay, the presence of a logical structure for constructing the text, the presence of the author's position, its scientific nature and connection with the modern understanding of the issue, the adequacy of the arguments, the style of presentation, the design of the work. It should be remembered that direct borrowing (without quoting) of text from the Internet or an electronic library is unacceptable.

The mark "excellent" is given in the case when it is determined: the presence of a logical structure for the construction of the text (introduction with a statement of the problem; the main part, divided according to the main ideas; conclusion with conclusions obtained as a result of reasoning); the presence of a clearly defined personal position on the topic of the essay; the adequacy of the arguments in substantiating a personal position, the style of presentation.

The “good” rating is given when, on the whole, it is determined: the presence of a logical structure for constructing a text (introduction with a problem statement; the main part, divided according to the main ideas; conclusion with conclusions obtained as a result of reasoning); but there is no clearly defined personal position on the topic of the essay; not enough arguments to justify a personal position

The “satisfactory” rating is given when, on the whole, it is determined: the presence of a logical structure for constructing the text (introduction with a problem statement; the main part, divided by main ideas; conclusion). But clear conclusions are not traced, the style of presentation is violated

An "unsatisfactory" rating is given if none of the requirements are met.

**Cases (situations and tasks with given conditions)**

The student should be able to highlight the main provisions from the text of the problem that require analysis and serve as conditions for the solution. Based on the question posed in the problem, try to define the problem as accurately as possible and solve it accordingly.

Problems can be solved orally and/or in writing. When solving problems, it is also important to correctly formulate and write down questions, starting with more general and ending with particular ones.

*Evaluation criteria*- the assessment takes into account the methods and means used in solving a situational, problematic task.

The mark "excellent" is given in the case when the student completed the task (solved the problem), using in full the theoretical knowledge and practical skills gained in the learning process.

The mark "good" is given if the student as a whole fulfilled all the requirements, but the reliance on the theoretical provisions set forth in the scientific literature on this issue is not clearly defined.

The grade "satisfactory" is given if the student showed positive results in the process of solving the problem.

The mark "unsatisfactory" is given if the student has not fulfilled all the requirements.

**business game**

It is necessary to break into several teams, which must alternately express their opinion on each of the questions asked. The opinion of the speaking team is counted if the opposite team does not refute it with counterarguments. The team whose opinion is counted as correct (did not receive convincing counterarguments from opposing teams) receives one point. The team that refuted the opinion of the opposing team with its counterarguments also receives one point. The team with the maximum number of points wins.

A role-playing game usually has a plot (situation, incident), roles are distributed, preparation is carried out 2-3 weeks before the game.

*Evaluation criteria -*the actions of all group members are evaluated. Understanding the problem, statements and actions are fully consistent with the set goals. Correspondence to the reality of the decisions developed during the game. Proficiency in terminology, demonstration of mastery of educational material on the topic of the game, possession of argumentation methods, ability to work in a group (listening skills, constructive conversation, persuasion, time management, conflict-free communication), achievement of game goals, (role-matching - in role-playing game). Clarity and style of presentation.

An “excellent” rating is given if all criteria are met.

The grade "good" is given if the students as a whole demonstrate an understanding of the problem, statements and actions are fully consistent with the set goals. The decisions developed during the game are fully consistent with reality. But some explanations are not entirely reasoned, the norms of communication are violated, the time frame is violated, the style of presentation is violated.

The grade “satisfactory” is given if the students as a whole demonstrate an understanding of the problem, statements and actions generally correspond to the set goals. However, the solutions developed during the game do not quite correspond to reality. Some explanations are not entirely reasoned, time frames are violated, the style of presentation is violated.

The mark "unsatisfactory" is given if the students do not understand the problem, their statements do not correspond to the set goals.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Debate Procedures**

*Round table, discussion, controversy, dispute, debate, mini-conferences*are means to include students in the process of discussing a controversial issue, problems and assess their ability to argue their own point of view. The task is given in advance, the range of issues for discussion, the group of participants in this discussion is determined.

Discussion procedures can be used to ensure that students:

- better understood the material being digested against the background of various positions and opinions, not necessarily reaching a common opinion;

- were able to comprehend the meaning of the material being studied, which is sometimes felt intuitively, but they cannot express it verbally, clearly and clearly, or construct a new meaning, a new position;

– were able to agree on their position or actions on the issue under discussion.

*Evaluation criteria -*the actions of all group members are evaluated. Understanding the problem, statements and actions are fully consistent with the set goals. Correspondence to the reality of the decisions developed during the game. Proficiency in terminology, demonstration of mastery of educational material on the topic of the game, possession of argumentation methods, ability to work in a group (listening skills, constructive conversation, persuasion, time management, conflict-free communication), achievement of game goals, (role-matching - in role-playing game). Clarity and style of presentation.

An “excellent” rating is given when all requirements are met in full.

The grade "good" is given if the students as a whole demonstrate an understanding of the problem, statements and actions are fully consistent with the set goals. The decisions developed during the game are fully consistent with reality. But some explanations are not entirely reasoned, the norms of communication are violated, the time frame is violated, the style of presentation is violated.

The grade “satisfactory” is given if the students as a whole demonstrate an understanding of the problem, statements and actions generally correspond to the set goals. However, the solutions developed during the game do not quite correspond to reality. Some explanations are not entirely reasoned, time frames are violated, the style of presentation is violated.

The mark "unsatisfactory" is given if the students do not understand the problem, their statements do not correspond to the set goals.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**Test**

Not only the depth of knowledge of the questions posed is evaluated, but also the ability to state in writing.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of various points of view, independent generalization of the material. Presentation of material without factual errors.

An "excellent" rating is given when all criteria are met.

The “good” mark is given if the student knows the material well, presents it competently and to the point, knows the practical base, but makes minor errors.

The grade "satisfactory" is given if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows a lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

1. **The list of basic and additional educational literature necessary for the development of the discipline (module).**
   1. ***Main literature***

1. Rosin I.V., Tomina L.D. General and inorganic chemistry. modern course. Textbook for academic baccalaureate. 2014 1338 s  
*Series: Bachelor. academic course*

2. Glinka N.L. General Chemistry 19th ed., trans. and additional Textbook for academic baccalaureate.2015 900 p. Series: Bachelor. Academic course.

4. Glinka N.L. Workshop on General Chemistry. Textbook for academic baccalaureate.2015 248 p. Series: Bachelor. academic course

7.2 Further reading

1. Akhmetov N.S. General and inorganic chemistry, Moscow: Higher school, 1998.

2. Golbraikh Z.E. Maslov G.I. "Collection of tasks and exercises in chemistry" M.: Vyssh. School, 1997.

3. Dickerson R., Gray G., Hayt J. Basic laws of chemistry, M.: Mir, 1982.

4. Olenin S.S., Fadeev G.N. Inorganic chemistry, M .: Higher school,

5. Pavlov N.N. General and inorganic chemistry, Moscow: Drofa, 2006.

* 1. Periodicals

The list should include a list of required journals in the discipline profile available in the library.

8. List of resources of the information and telecommunications network Internet Site: www.urait.ru

EBS Urayt: www.biblio-online.ru

1. <http://scholar.google.com>
2. [www.chemport.ru/](http://www.chemport.ru/)
3. [www.students.chemport.ru/](http://www.students.chemport.ru/)
4. [www.xumuk.ru/encyklopedia](http://www.xumuk.ru/encyklopedia)
5. [www.chem.msu.su/rus/teaching/inorg.html](http://www.chem.msu.su/rus/teaching/inorg.html)
6. [www.inorg.chem.msu.ru](http://www.inorg.chem.msu.ru)
7. Wikipedia. Free encyclopedia [electron. resource]/ Access mode:[http://en.wikipedia.org/wiki/](http://ru.wikipedia.org/wiki/)
8. Chemical encyclopedia in 5 volumes [Electron. resource] / - M .: Soviet Encyclopedia. - Access mode:<http://books.tr200.ru/v.php?id=152880>
9. Explanatory Dictionary of Chemistry[Electron. resource]/ Access mode: [www.alhimikov.net/slovar/bukva\_a.html](http://www.alhimikov.net/slovar/bukva_a.html)
10. Russian education – Federal portal[Electron. resource]/ Access mode: http://www.edu.ru –http://www.elementy.
11. Online Encyclopedia Around the World[Electron. resource]/ Access mode:<http://www.krugosvet.ru>.
12. Internet Educational Resources - Chemistry[Electron. resource]/ Access mode:<http://www.alleng.ru/edu/chem9.htm>
13. www.chem.msu.ru
14. [www.xumuk.ru](http://www.xumuk.ru)
15. **Software Composition**

1 System software:

Microsoft Windows XP, Microsoft Vista.

Applied software: Microsoft Office 2010 Pro, FireFox.

Specialized chemistry programs, etc.

b) databases, information-reference and search systems: educational resources of the Internet - Chemistry, catalog of educational Internet resources http://www.edu.ru/

Chemical catalog: Runet chemical resources http://www.ximicat.com/

Portal of fundamental chemistry education in Russia http://www.chemnet.ru XuMuK: website about chemistry for chemists http://www.xumuk.ru/

Chemical servers http://www.Himhelp.ru, ChemWeb, Chem Express Online, Chem Net.com www.urait.ru EBS Urayt: www.biblio-online.ru www.chem.msu.ru

1. **Equipment and technical training aids**

**Lecture classes**are held in a classroom (B.2-02) specially prepared for demonstrating experiments in the educational building (campus) of the Chechen State University, which is also equipped with presentation equipment.

**Laboratory works** are held in the educational laboratories of the Department of Chemistry (2-16 and 2-25), which are equipped with fume hoods-? and basic laboratory equipment:

*for weighing*- scalestechnochemical and analytical;

for filtering - glass, porcelain funnels, Bunsen flasks, Kamovsky pumps, vacuum pumps;

*for drying and calcining substances*- desiccators, Petri dishes, porcelain cups, crucibles, spirit lamps, drying cabinets, muffle furnaces;

for the preparation of solutions - glasses, volumetric flasks, volumetric cylinders, pipettes, sets of hydrometers;

*for conducting various experiments on obtaining substances and revealing their chemical properties*– glass test tubes, beakers, flasks and retorts; Wurtz flasks; drip funnels, Drexel, Tishchenko flasks and other washing flasks;

porcelain cups, glasses, crucibles, mortars with pestles; Kipp devices, gasometers, ozonizers, calorimeters, thermometers, heating mantles; water, oil and sand baths; Liebig refrigerators, air coolers, crystallizers; instruments for monitoring electrical conductivity, for electrolysis; galvanic elements; voltmeters, thermocouples, laboratory autotransformers; mixing device, centrifuge, heating mantles;

tables laboratory and wall with summed up - water and alternating current 220 V;

chemical storage cabinets: reagents; dishes; appliances; gowns, outerwear, fume hoods, a set of hydrometers, a calorimeter, a pH meter, a spectrophotometer, a photocolorimeter, a laboratory microscope.

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"General Biology"**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | B1.O.08 |
| *Orientation (profile)* | Microbiology |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to use in professional activities the basic laws of physics, chemistry, earth sciences and biology, apply the methods of mathematical analysis and modeling, theoretical and experimental research, acquire new mathematical and natural science knowledge using modern educational and information technologies; | GPC-6.1 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPK-6 | GPC-6.1 | **Knows** basic concepts and methods, modern trends in mathematics, physics, chemistry and geosciences, topical problems of biological sciences and prospects for interdisciplinary research  **Can** apply the methods of theoretical and experimental research, acquire new natural science knowledge  **owns**modern educational and information technologies |

1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 108/3 | 108/3 |  |
| **contact work**: | | 51 | 34 |  |
|  | Lecture-type classes | 17 | 17 |  |
| Seminar type classes | 34 | 17 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 21 | 38 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

1. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***
   1. Distribution of hours by sections/topics and types of work
      1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 1. Introduction.Subject and tasks of biology | 2 |  |  |  | 4 |  |  |
| 2. | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP. Nucleic acids. Protein biosynthesis | 2 |  |  |  | 4 |  |  |
| 3. | Section 3. Basic cell forms. Non-cellular life forms - viruses, bacteriophage | 2 |  |  |  | 4 |  |  |
| 4. | Section 4. The structure and functions of germ cells (gametes). Asexual reproduction. Forms and biological role. Hollow reproduction. Its forms and biological role | 2 |  |  |  | 4 |  |  |
| 5. | Section 5. Cell life cycle. Mitosis.Meiosis: characteristics, biological significance | 2 |  |  |  | 4 |  |  |
| 6. | Section 6Gametogenesis. Ontogenesis | 2 |  |  |  | 4 |  |  |
| 7. | Section 7Laws of inheritance. Heredity. Heredity and variability | 2 |  |  |  | 4 |  |  |
| 8. | Section 8Plant selection. Animal breeding | 2 |  |  |  | 4 |  |  |
| 9. | Section 9Structure and functions of the biosphere | 1 |  |  |  | 2 |  |  |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 1. Introduction.Subject and tasks of biology | 2 |  |  |  | 2 |  |  |
| 2. | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP. Nucleic acids. Protein biosynthesis | 2 |  |  |  | 6 |  |  |
| 3. | Section 3. Basic cell forms. Non-cellular life forms - viruses, bacteriophage | 2 |  |  |  |  |  |  |
| 4. | Section 4. The structure and functions of germ cells (gametes). Asexual reproduction. Forms and biological role. Hollow reproduction. Its forms and biological role | 2 |  |  |  |  |  |  |
| 5. | Section 5. Cell life cycle. Mitosis.Meiosis: characteristics, biological significance | 2 |  |  |  | 2 |  |  |
| 6. | Section 6Gametogenesis. Ontogenesis | 2 |  |  |  | 2 |  |  |
| 7. | Section 7Laws of inheritance. Heredity. Heredity and variability | 2 |  |  |  | 2 |  |  |
| 8. | Section 8Plant selection. Animal breeding | 2 |  |  |  | 3 |  |  |
| 9. | Section 9Structure and functions of the biosphere | 1 |  |  |  |  |  |  |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Section 1. Introduction.Subject and tasks of biology | Prerequisites for the creation of cell theory. A cell is an elementary structural-functional and genetic unit of the living. Cell theory, the main stages of its formation and the current state. Precellular forms of living things. Prokaryotic and eukaryotic cells. The cell as an open system. Entry of substances into the cell. transport proteins. Anabolic and catabolic systems of the cell. The flow of matter and energy in the cell. The value of cell theory. Definition of modern life. Fundamental properties of living matter. levels of organization of life. Microsystems. Mesosystems. Macrosystems. Elementary unit. Molecular genetic level. subcellular level. Cellular level. tissue level. Organ level. Organismic (ontogenetic) level. Population-species level. Biocenotic (ecosystem) level. Biosphere (global) level. nospheric level |
| 2 | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP | An overview of the chemical structure of the cell. Macronutrients. Microelements. Ultramicroelements. Chemical compounds. Biopolymers. Squirrels.[Functions of proteins.](http://lib.rus.ec/b/165930/read#t8)Carbohydrates. Functions of carbohydrates. Fats (lipids). Functions of lipids |
| 3 | Section 2. Nucleic acids. Protein biosynthesis | DNA. Functions of DNA. RNA (3 types of RNA: informational, transport and ribosomal).  regulation of protein biosynthesis. Transcription. Processing. Broadcast. A unit of the genetic code (codon). Characteristic properties of the genetic code (universality, specificity, degeneracy |
| 4 | Section 3. Basic cell forms | Prokaryotes. General information about the eukaryotic cell. Functions and structure of the cytoplasmic membrane. Structure and functions of the cell nucleus Structure and functions of semi-autonomous cell structures: mitochondria and plastids. The main functions of mitochondria. Structure and function of lysosomes and peroxisomes. Lysosomes. Microbodies. The structure and functions of the endoplasmic reticulum, the golgi complex.[Rough EPS. Smooth EPS. Structure](http://lib.rus.ec/b/165930/read#t20) and functions of non-membrane cell structures (microtubules and microfilaments, cell center). Ribosome. [Hyalloplasm - the internal environment of the cell. Hyaloplasm functions.](http://lib.rus.ec/b/165930/read#t22)Cytoplasmic inclusions |
| 5 | Section 3. Non-cellular life forms - viruses, bacteriophages | The structure of viruses. Virions. capsid. Super-capsid shell built from protein. Genetic material represented by a nucleic acid. DNA viruses.RNA viruses. Reproduction of viruses. bacteriophages |
| 6 | Section 4. The structure and functions of germ cells (gametes) | General properties of gametes. The structure and function of the egg. The structure and function of spermatozoa. Fertilization. Two types of insemination (external and internal). Three stages of fertilization: convergence of gametes, activation of the egg, fusion of gametes |
| 7 | Section 4. Asexual reproduction. Forms and biological role | The biological role of asexual reproduction. Forms of asexual reproduction - endogony, schizogony (multiple division) and budding, sporulation. Vegetative form of reproduction (a special form of asexual reproduction - strobilation (in polyps)) |
| 8 | Section 4. Hollow reproduction. Its forms and biological role | The evolutionary meaning of sexual reproduction. Sexual process. The process of formation of germ cells is gametogenesis (ovogenesis in females and spermatogenesis in males). True and false hermaphroditism. Types of sexual reproduction. Two forms of sexual reproduction in unicellular organisms: copulation and conjugation. Differences between gametes. Parthenogenesis (virgin reproduction). The meaning of parthenogenesis. Types of parthenogenesis: 1) obligate (mandatory) parthenogenesis. 2) cyclic (seasonal) parthenogenesis (in aphids, daphnia, rotifers). 3) facultative (optional) parthenogenesis. (wasps, bees, ants). Gynogenesis (in bony fish and some amphibians). Androgenesis. Polyembryony |
| 9 | Section 5. Cell life cycle. Mitosis | The concept of the life cycle. mitotic cycle. Interphase period. Biological significance of the life cycle. Main stages of mitosis. Phases of the cell cycle: presynthetic (G1), synthetic (S), postsynthetic (G2) and preprophase. Mitosis. Characteristics of the main stages. The phases of mitosis are prophase, metaphase, anaphase, and telophase. Atypical forms of mitosis: Amitosis. Endomitosis. Politenia |
| 10 | Section 5Meiosis: characteristics, biological significance | meiosis stages. The first division of meiosis (reduction). The second division of meiosis (equation). The biological significance of meiosis |
| eleven | Section 6Gametogenesis | Concepts of gametogenesis. Stages of gametogenesis:reproduction stage, growth stage, maturation stage, formation stage |
| 12 | Section 6Ontogenesis | The concept of ontogenesis. Three periods of ontogeny: pre-reproductive, reproductive and post-reproductive. 4 periods of the pre-reproductive period: embryonic, larval, metamorphosis period and juvenile. Embryonic development periods of embryonic development: cleavage, gastrulation, neurula |
| 13 | Section 7Laws of Succession | G. Mendel's laws. Qualitative (monogenic) and quantitative (polygenic) traits. Autosomal type of inheritance. Dominant, recessive and codominant autosomal inheritance pattern. Sex-linked (sex-linked) type of inheritance. X-linked (dominant or recessive) inheritance and Y-linked inheritance. Mendel's first law. Mendel's second law. hybridological analysis. Di- and polyhybrid crosses. independent inheritance. Mendel's third law. Interactions of allelic genes. Complete dominance. incomplete dominance. Codominance. Interallelic complementation. Inheritance of blood groups of the ABO system. I, II, III and IV blood group |
| 14 | Section 7 Heredity | Non-allelic genes. Complementarity; epistasis; polymerism. Cumulative and non-cumulative. recessive epistasis. Sex genetics. Inheritance of sex-linked traits. Sex-linked traits. X-linked and Y-linked (Holandric) inheritance. |
| 15 | Section 7 Heredity and variability | Types of variability. Hereditary and non-hereditary variability. reaction rate. Combination variability. Factors of combinative variability. 1. Independent and random segregation of homologous chromosomes in anaphase I of meiosis. 2. Crossing over. 3. Random combination of gametes during fertilization.4. Random selection of parent organisms. Mutations: 1) spontaneous and induced; 2) harmful, useful and neutral; 3) somatic and generative; 4) gene, chromosomal and genomic. Heteroploidy is a change in the number of individual chromosomes in the karyotype. Methods for studying human heredity. genealogical method. cytogenetic methods. biochemical methods. quality methods. quantitative methods. DNA diagnostics. twin method |
|  | Section 8 plant breeding | Mass selection. Individual selection. Natural selection. distant hybridization. Use of somatic mutations |
|  | Section 8 Animal breeding | Intrabreeding. Interbreeding. Using the effect of heterosis. Artificial insemination. Hormonal superovulation and embryo transfer. distant hybridization |
|  | Section 9 Structure and functions of the biosphere | The concept of the noosphere. Human impact on the biosphereAtmosphere. Lithosphere. Hydrobionts Limiting factors. Parasitism as an ecological phenomenon Ways of parasitism emergence. Transition of free-living forms (predators) to ectoparasitism. Transition from commensalism to endoparasitism Primary endoparasitism Peculiarities of the habitat of parasites Peculiarities of parasites. Classification of parasites Features of vital activity of parasites Mechanisms of transmission of the parasite: fecal-oral, airborne, transmissible, contagious |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of laboratory classes*** |
| 1 | Section 1. Introduction.Subject and tasks of biology | 1. Light microscope device, temporary preparations, drawing. The structure of the cell of the epidermis of the juicy scales of the onion bulb. |
| 2 | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP. Nucleic acids. Protein biosynthesis | 1. Plastids, their functions in a plant cell, chloroplasts, leukoplasts, chromoplasts.  2. The phenomenon of plasmolysis in Elodea leaf cells, reserve starch. Aleurone grains in endosperm cells of wheat grains and bean cotyledons  3.Chemical composition of the cell, metabolism and energy generation. Photosynthesis. |
| 3 | Section 4. The structure and functions of germ cells (gametes). Asexual reproduction. Forms and biological role. Hollow reproduction. Its forms and biological role |  |
| 4 | Section 5. Cell life cycle. Mitosis.Meiosis: characteristics, biological significance | Mitotic (cellular) cycle in onion root tip cells |
| 5 | Section 6Gametogenesis. Ontogenesis | Protein biosynthesis, determination of protein with a biuret reagent in blood serum |
| 6 | Section 7Laws of inheritance. Heredity. Heredity and variability | Genetic analysis. Laws of Mendel. |
| 7 | Section 8Plant selection. Animal breeding | Chromosomal theory of heredity, non-chromosomal theory of inheritance, mutations. |
| 8 | Section 9Structure and functions of the biosphere |  |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Introduction.Subject and tasks of biology | OR, R, T, RP |
| 2. | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP. Nucleic acids. Protein biosynthesis | OR, R, T, RP |
| 3. | Section 3. Basic cell forms. Non-cellular life forms - viruses, bacteriophage | OR, R, T, RP |
| 4. | Section 4. The structure and functions of germ cells (gametes). Asexual reproduction. Forms and biological role. Hollow reproduction. Its forms and biological role | OR, R, T, RP |
| 5. | Section 5. Cell life cycle. Mitosis.Meiosis: characteristics, biological significance | OR, R, T, RP |
| 6. | Section 6. Gametogenesis. Ontogenesis | OR, R, T, RP |
| 7. | Section 7. Laws of inheritance. Heredity. Heredity and variability | OR, R, T, RP |
| 8. | Section 8. Plant selection. Animal breeding | OR, R, T, RP |
| 9. | Section 9. Structure and functions of the biosphere | OR, R, T, RP |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

* 1. Basic educational literature

1. Biology: Textbook for students of institutions of higher education. honey. prof. Education / T.V. Viktorova, A.Yu. Asanov. - M .: Publishing Center "Academy", 2013.- 320s.

2. Molecular Biology: Proc. for stud. ped. universities / A.S. Konichev, G.A. Sevastyanova. - 2nd ed., erased. - M .: Publishing Center "Academy", 2005.- 400 p.

3. Biology with the basics of ecology: Textbook. - St. Petersburg: Publishing house "Lan", 2002.

4. General biology / V.M. Konstantinov, A.G. Rezanov, E.O. Fadeev; ed. V.M. Konstantinov, -12th ed., Ster.-M.: Publishing Center "Academy", 2014.

5. Biology / ed. V. N. Yarygin (in the 2nd edition). Moscow: Yurayt Publishing House; ID URAIT, 2012

6. General biology and microbiology [Electronic resource]: study guide / A.Yu. Prosekov [i dr.]. — Electron. text data. - St. Petersburg: Prospekt Nauki, 2017. - 320 p. - Access mode: http://www.iprbookshop.ru/35796.html. — EBS «IPRbooks»

7. Sych V.F. General biology [Electronic resource]: textbook / Sych VF - Electron. text data. - M .: Academic Project, Culture, 2007. - 336 p. - Access mode: http://www.iprbookshop.ru/36438.html. — EBS «IPRbooks»

8. Kurbatova N.S. General biology [Electronic resource]: textbook / Kurbatova N.S., Kozlova E.A.— Electron. text data. - Saratov: Scientific book, 2019. - 159 p. - Access mode: http://www.iprbookshop.ru/81072.html. — EBS «IPRbooks»

* 1. Additional educational literature:

1. General biology: Mamontov S.G. Textbook. - 6th ed., Sr. - M .: Higher School, 2004
2. Taylor, D.Biology (in 3 volumes) / D. Taylor, N. Green, W. Stout. M., 2004.
3. Biology: Taisumov M.A., Dzhambetova P.M. textbook for students of biological specialties and entrants. Nazran: Pilgrim, 2006
   1. Periodicals

1. "Biological Diversity of the Caucasus" (Grozny, Chechen State University, October 27-29, 2011) Publishing house of ChGU, 2011. - 388s

2. Actual problems of general parasitology: Studies of the scientific school of academician KI Skryabin. - M.: Nauka, 2000

1. **Modern professional databases and information reference systems**

Windows operating system

Electronic library system "IPRbooks"<http://www.iprbookshop.ru/index.ph>

Student consultant (http://www.studentlibrary.ru)

EBS "Lan" - services for inclusive education (https://e.lanbook.com)

Polpred.com-Internet resources

‒ www.pubmed.com

‒ www.medline.ru

‒ www.elibrary.ru

‒ http://biblioclub.ru

‒ 19http://znanium.com/

‒ http://e.lanbook.com/

**8.Composition of software**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

**Characteristics of the available instrumental (instrumental) base**

**laboratories of microbiology and virology**

|  |  |
| --- | --- |
| No.  p/n | Name of the complex, installation, system |
| 1 | Bactericidal ultraviolet irradiator for local irradiation OUFb-04 "Sun". |
| 2 | Medical laboratory centrifuge |
| 3 | Laboratory microscope LUM |
| 4 | Biological microscope Mikromed S-11 with accessories |
| 5 | Biological microscope Micromed R-1 with accessories - 2 pcs. |
| 6 | ToupCam 5.1 MP video eyepiece |

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Microbiology with Virology and Immunology"**

|  |  |
| --- | --- |
| ***Direction of training*** | **Biology** |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to apply knowledge of biological diversity and use methods of observation, identification, classification, reproduction and cultivation of living objects to solve professional problems | GPC -1.1  GPC -1.2  GPC-1.4 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPC -1.1  GPC -1.2  GPC-1.4 | GPC-1.1 - knows the theoretical foundations of microbiology and virology, botany, zoology and uses them to study the life and properties of living objects, their identification and cultivation  GPC-1.2 - is able to apply methods of observation, classification, reproduction of biological objects in natural and laboratory conditions; use the acquired knowledge to analyze the interactions of organisms of various species with each other and with the environment  GPC-1.4 - understand the role of biological diversity as a leading factor in the sustainability of living systems and the biosphere as a whole | * **Know:** structural organization of the prokaryotic cell; * principles of classification of prokaryotes; * genetics of prokaryotes; * the influence of physical and chemical factors on microorganisms, the relationship of microorganisms, the relationship of microorganisms with plants, humans and animals; * the chemical composition of the prokaryotic cell, the nutritional needs of prokaryotes, the mechanism of nutrient entry into the prokaryotic cell, types of nutrition; * metabolic processes of prokaryotes; * about the role of microorganisms in the cycle of substances. * the history of the discovery of viruses; * morphology and structure of viruses; * chemical composition of viruses; * stages of productive interaction of viruses with a cell; * taxonomy and classification of viruses; * features of viral infections; * manifestation of the cytopathic effect of the virus in infected target cells during a productive viral infection; * what are slow infections and their distinctive features.   theoretical foundations of microbiology and virology, botany, zoology and uses them to study the life and properties of living objects, their identification and cultivation  **Be able to:** prepare native preparations;   * prepare a fixed smear and stain it with simple and complex staining methods; * isolate a pure culture of bacteria, study its biochemical properties, followed by identification of the species; * sow soil, water and air; * to obtain an enrichment culture of denitrifying bacteria, ammonifier microorganisms and free-living nitrogen-fixing bacteria * carry out the indication of the virus by its CPP and determine the titer of the virus; * carry out identification of the virus by neutralizing the CPE; * identify the virus in the haemadsorption delay reaction; * identify the virus by plaque and antibody titration * **Own:** the notion that microorganisms play an important role in soil-forming processes; * microorganisms play an important role in the cycle of substances in nature; * microorganisms play an important role in the food chain;   -microorganisms regulate the population of plant and animal organisms |

1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 11/396 | 17/396 |  |
| **contact work**: | |  |  |  |
|  | Lecture-type classes | 68 | 47 |  |
| Seminar type classes | 102(lab) | 64 (lab) |  |
| Intermediate certification: credit / credit with grade / exam \* | 54 |  |  |
| **Independent work**(SRS) | | 172 | 231 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

1. credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.
2. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***
   1. Distribution of hours by sections/topics and types of work
      1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  |  |  | 2 |
| 2. | Morphology and structure of prokaryotic microorganisms | 4 |  |  |  |  |  | 4 |
| 3. | Classification of prokaryotes | 4 |  |  |  |  |  | 2 |
| 4. | Physiology of prokaryotic microorganisms. Chemical composition of microorganisms. Types and mechanisms of nutrition of microorganisms | 4 |  |  |  |  |  | 6 |
| 5. | Enzymes of microorganisms | 4 |  |  |  |  |  | 6 |
| 6. | Metabolism of prokaryotic microorganisms | 4 |  |  |  |  |  | 8 |
| 7. | Growth and reproduction of microorganisms | 4 |  |  |  |  |  | 8 |
| 8. | Influence of physical and chemical factors on microorganisms | 4 |  |  |  |  |  | 4 |
| 9. | Subject and tasks of virology.  A Brief History of the Development of Virology | 2 |  |  |  |  |  | 10 |
| 10. | General characteristics of viruses. | 2 |  |  |  |  |  | 10 |
| eleven. | Interaction of the virus with the host cell. Reproduction | 2 |  |  |  |  |  | 10 |
| 12. | bacteriophage | 2 |  |  |  |  |  | 10 |
| 13. | Classification of viruses. Virus nomenclature | 2 |  |  |  |  |  | 10 |
| 14. | Virus genetics | 2 |  |  |  |  |  | 15 |
| 15. | Basic Virus Cultivation Methods | 2 |  |  |  |  |  | 10 |
| 16. | Viral infections | 4 |  |  |  |  |  | 15 |
| 17. | Subject and tasks of immunology | 2 |  |  |  |  |  | 2 |
| 18. | Antigens. Antibodies | 2 |  |  |  |  |  | 4 |
| 19. | The immune system | 2 |  |  |  |  |  | 4 |
| 20. | The evolution of immunity | 2 |  |  |  |  |  | 4 |
| 21. | The main phenomena of cellular and humoral immunity | 2 |  |  |  |  |  | 4 |
| 22. | transplant immunity | 2 |  |  |  |  |  | 8 |
| 23. | Immunity to tumors | 2 |  |  |  |  |  | 8 |
| 24. | Immunodeficiency states | 2 |  |  |  |  |  | 8 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  |  |  | 2 |
| 2. | Morphology and structure of prokaryotic microorganisms | 2 |  |  |  |  |  | 4 |
| 3. | Classification of prokaryotes | 2 |  |  |  |  |  | 2 |
| 4. | Physiology of prokaryotic microorganisms. Chemical composition of microorganisms. Types and mechanisms of nutrition of microorganisms | 3 |  |  |  |  |  | 15 |
| 5. | Enzymes of microorganisms | 2 |  |  |  |  |  | 8 |
| 6. | Metabolism of prokaryotic microorganisms | 2 |  |  |  |  |  | 8 |
| 7. | Growth and reproduction of microorganisms | 2 |  |  |  |  |  | 8 |
| 8. | Influence of physical and chemical factors on microorganisms | 2 |  |  |  |  |  | 10 |
| 9. | Subject and tasks of virology.  A Brief History of the Development of Virology | 1 |  |  |  |  |  | 10 |
| 10. | General characteristics of viruses. | 2 |  |  |  |  |  | 10 |
| eleven. | Interaction of the virus with the host cell. Reproduction | 2 |  |  |  |  |  | 14 |
| 12. | bacteriophage | 2 |  |  |  |  |  | 10 |
| 13. | Classification of viruses. Virus nomenclature | 2 |  |  |  |  |  | 10 |
| 14. | Virus genetics | 2 |  |  |  |  |  | 20 |
| 15. | Basic Virus Cultivation Methods | 2 |  |  |  |  |  | 10 |
| 16. | Viral infections | 2 |  |  |  |  |  | thirty |
| 17. | Subject and tasks of immunology | 1 |  |  |  |  |  | 4 |
| 18. | Antigens. Antibodies | 2 |  |  |  |  |  | 8 |
| 19. | The immune system | 2 |  |  |  |  |  | 8 |
| 20. | The evolution of immunity | 2 |  |  |  |  |  | 8 |
| 21. | The main phenomena of cellular and humoral immunity | 2 |  |  |  |  |  | 8 |
| 22. | transplant immunity | 2 |  |  |  |  |  | 8 |
| 23. | Immunity to tumors | 2 |  |  |  |  |  | 8 |
| 24. | Immunodeficiency states | 2 |  |  |  |  |  | 8 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Introduction. Subject and tasks of the discipline | Microbiology as a science. Subject and tasks of microbiology. History of development of microbiology. Stages of development of microbiology. Modern development of microbiology and its significance |
|  | Morphology and structure of prokaryotic microorganisms | Shape and size of prokaryotes. Structures of a prokaryotic cell. Principal features of the cellular organization of prokaryotes |
|  | Classification of prokaryotes | Principles of constructing the classification of prokaryotes. Classification of prokaryotes according to the Bergi determinant |
|  | Physiology of prokaryotic microorganisms. Chemical composition of microorganisms. Types and mechanisms of nutrition of microorganisms | Chemical composition of microorganisms. Types and mechanisms of nutrition of microorganisms. Autotrophs. Heterotrophs. Saprophytes. Parasites. Power mechanisms. simple diffusion. Facilitated diffusion. active transport. Translocation |
|  | Enzymes of microorganisms | Chemical nature and mechanism of action, classification, localization. Endoenzymes and exoenzymes. Constitutive and inducible enzymes. The role of enzymes |
|  | Metabolism of prokaryotic microorganisms | The concept of metabolism. Assimilation and dissimilation as the basis of metabolism. Features of metabolism and nutrition of microorganisms. Breath. Aerobic respiration. Anaerobic respiration. Glycolysis Fermentation. Chemistry and energy. The main types of fermentation. Similarities and differences between respiration and fermentation. The practical significance of fermentation |
|  | Growth and reproduction of microorganisms | Growth of individual microorganisms and populations (cultures). Balanced and unbalanced growth. Growth curve, features of individual phases. Characterization of the phases of the bacterial culture growth curve. flow culture |
|  | Influence of physical and chemical factors on microorganisms | Growth of microorganisms depending on temperature. Psychrophiles, mesophiles and thermophiles. Use of high temperatures for sterilization. The effect of low temperatures on the survival of microorganisms. Influence of hydrostatic pressure. Growth of microorganisms depending on water activity. Resistance of microorganisms to drying. Lyophization. osmotic pressure. Features of osmophiles. Halophiles. Methods of osmoregulation in different microorganisms.The effect of chemical factors on microorganisms: carbon dioxide, oxygen, salts of heavy metals, chemical dyes |
|  | Subject and tasks of virology.  A Brief History of the Development of Virology | Introduction: properties of viruses. The history of the discovery of viruses. Origin of viruses. Virus cultivation. |
|  | General characteristics of viruses. | Morphology and structure of simple viruses. Morphology and structure of complex viruses. The chemical composition of the virion. Supercapsid |
|  | Interaction of the virus with the host cell. Reproduction | Interaction of a virus with a cell: productive type, abortive type, integrative type. Productive type of interaction: adsorption of the virus on the cell; penetration of the virus into the cell; "undressing" the virus; biosynthesis of viral components in the cell; the formation of viruses; release of viruses from the cell. |
|  | bacteriophage | Bacteriophage is a virus of bacteria. The structure of a bacteriophage. Entry of a bacteriophage into a bacterial cell.  The meaning of bacteriophage. |
|  | Classification of viruses. Virus nomenclature | Modern classification of viruses.  Classification of viruses according to Baltimore.  Classification of viruses according to the content of nucleic acids. |
|  | Virus genetics | Virus genome. Phenotypic and genotypic variability of viruses |
|  | Basic Virus Cultivation Methods | Chicken embryos. laboratory animals.  Cell cultures (transplantable, diploid, polyploid) |
|  | Viral infections | Features of viral infections. Viral infections at the cellular level. The manifestation of the cytopathic effect of the virus in infected target cells during a productive viral infection. Viral infections at the level of the body. Slow infections. The pathogenesis of prion infections (features of the interaction of prions with cells). |
|  | Subject and tasks of immunology | Subject and tasks of immunology; its place and role in modern biology,  medicine and national economy. Fundamental and applied value  immunology. Socio-economic and scientific foundations of the emergence  immunology and its relationship with molecular biology, genetics, biochemistry,  biophysics, biotechnology, physiology and mathematical modeling of processes.  Historical stages in the development of immunology. Works by E. Jenner. Birth of immunology as a science. Founders of scientific immunology  L. Pasteur, E. Behring, R. Koch. The emergence of non-infectious immunology I.I. Mechnikov, P. Erlich, J. Brode, N.N. Chistovich, K. Landsteiner and others.  The traditional definition of immunity. Formation of modern immunology. A new definition of immunity. Levels of learning and manifestation  immunological reactivity. The biological meaning of immunity and the biological content of immunology. Discovery of immunological tolerance in 1953 (P. Medawar and M. Hasek).  The role of Russian scientists in the development of immunology (I.I. Mechnikov, N.F. Gamaleya, A.A. Maksimov, S. Metalnikov, L.L. Zilber, P.N. Kosyakov, A.A. Ado, R.V. . Petrov and others).  The main stages and directions of development of modern immunology.  Creation and use of a vaccine, stimulation of immunity in infections, artificial antigens and vaccines.  Nobel laureates in immunology: I.I. Mechnikov, P. Erlich, K. Landsteiner, F.M. Burnet, P. Medawar, D. Edelman, R. Porter, B.  Benacerraf, J. Dosset, D. Snell, R. Zinkernagel, P. Dougherty.  Theories of immunity  The historical aspect of instructive and selective theories of immunity.  P. Ehrlich's theory of side chains. Pauling's instructional theory. Theory  natural selection N. Jerne. The theory of indirect matrix F. Burnet and F.  Fenner. Clonal selection theory of F. Burnet. Explanation  immunological phenomena from the standpoint of each theory. |
|  | Antigens. Antibodies | Basic concepts of antigens.  The structure of antigenic specificity.  Types of antigenic specificity: species, group, heterospecificity, type specificity, stage specificity, functional specificity,  pathological specificity, antigenicity and immunogenicity. Gaptens and hapten specificity. Synthetic antigens (polyamino acids).  Conjugated antigens, carriers. Adjuvants. Thymus-dependent and thymus-independent antigens. Human isoantigens: systems  antigens of erythrocytes, lymphocytes, granulocytes, platelets, plasma proteins.  Antigens of the major histocompatibility complex in humans and animals.  H-2 system and HLA system: inheritance, tissue distribution, function.  Antigens as inducers of the immune response.  Basic concepts of antibodies. History of discovery and study. Physico-chemical characteristics of antibodies. Molecular structure. The role of biochemistry and molecular biology in deciphering the structure and synthesis of antibodies.  Specificity and heterogeneity of antibodies. Structure of immunoglobulin, light and heavy chains, variable and constant regions. Active sites of an antibody molecule. Classes and subclasses of immunoglobulins: IgM, IgG, IgA, IgE, IgD. Functional and physico-chemical characteristics of each class. Heterogeneity of immunoglobulins. myeloid proteins. Synthesis of antibodies in vitro and hybridomas. Isotypes, allotypes and idiotypes. Genetic control of the structure of immunoglobulins.  Mechanisms of formation of immune responses  The concept of non-specific and specific (immunological) factors of body defense. Non-specific protective factors and  body resistance: barrier structures of the skin and mucous membranes, bactericidal activity of enzymes and juices, inflammatory reactions, complement, lysozyme, interferon, B-lysines, phagocytosis and others.  specific protective factors. Cellular and humoral immunity.  Types of immunity in various representatives of the animal world: constitutional (innate) and acquired (active and passive), etc.  Effector mechanisms of immunity  The role of cytotoxic T-lymphocytes, activated macrophages, eosinophils, neutrophils, basophils and other cell types. The role of proteolytic enzymes and regulatory proteins in the implementation of immune responses, including the complement system. Receptors of T- and B-lymphocytes.  Mediators and hormones of the immune system.  Interaction of cells in the immune response  afferent stage. The role of the receptor apparatus of T- and B-lymphocytes in antigen recognition and the participation of macrophages in antigen processing.  Central stage. Genesis and mechanism of interaction between T- and B-lymphocytes in the peripheral organs of the immune system. The main stages of cellular  reactions occurring in the lymphoid organs.  efferent stage. Realization and the concept of immunological memory.  The role of cell interaction in primary and secondary immune response.  regulation of immunopoiesis. Communication of the immune, endocrine and nervous systems in maintaining homeostasis.  Three-cell interaction system. Double recognition.  Antigen recognition, antigen-antibody reaction  Phenomena of agglutination, precipitation, lysis, cytotoxic reactions, complement fixation reactions, etc.  Immunodiffusion analysis, immunoelectrophoresis. The principle of methods.  Determination of the concentration of immunoglobulins in blood serum and in secrets by radial immunodiffusion. Obtaining monospecific antisera against immunoglobulins of different classes. Immunosorption and immunosorbents. The value of immunological reactions in laboratory diagnostics in the detection of antigens and antibodies. The specificity of the antigen-antibody reaction. The concentration of reagents. Biological activity of complexes. |
|  | The immune system | Lymphoid organs, tissues and cells of the immune system. Central and  peripheral organs of the immune system. Structural-functional  relationship. The thymus and its central role in immunity. History of study  The main hormones of the thymus. Immunobiotechnology - obtaining and using various hormones and thymus fractions. Bone marrow. Fabricius bag.  Group lymphatic follicles (Peyer's patches). The lymph nodes. Spleen. Blood. Cells of the immune system. thymus-dependent pathway  development of T-lymphocytes. Thymus-independent pathway of B-lymphocyte development. T-lymphocytes and their subpopulations. B-lymphocytes and their subpopulations. |
|  | The evolution of immunity | Phylogeny of the immune response. Development of immunological reactivity in phylogenesis. Evolution of the lymphoid system. Stem hematopoietic cell and its differentiation.  Formation and differentiation of T-, B- and A-cell systems. Evolution of immunoglobulins.  Ontogeny of the immune response  Development of immunological reactivity in ontogeny. Formation of immunity in the embryonic period. Development of lymphoid organs.  Composition and structure of the central organs of the immune system. Embryogenesis of bone marrow and thymus. Composition and structure of peripheral lymphoid  organs, recirculation of lymphocytes.  Formation of the antigenic structure of vertebrate tissues during embryogenesis. Aging. immune deficiency. Immunogenetic bases of aging. Causes and mechanisms of impaired immunity in old age.  Possible mechanisms of congenital (primary) immunodeficiency. Classification. Congenital defects of the phagocytic system and system  complement. |
|  | The main phenomena of cellular and humoral immunity | Hypersensitivity of the immediate and delayed types  Mechanism of immediate type hypersensitivity reaction.  Allergic antibodies - reagins and immunoglobulins E. Main  principles of the doctrine of allergies. Types of allergies, anaphylaxis. Allergy and  immunity. Allergen classification. Cellular Foundations  delayed-type hypersensitivity (DTH). Difference between HRT and reaction  hypersensitivity of immediate type. Transfer of cellular immunity.  Sensitization and desensitization. |
|  | transplant immunity | The history of the formation of transplantation immunology. A. Karel, P.  Medawar. Definition of the concept of "transplantation immunity".  Purebred animals. Genetic laws of tissue compatibility.  Autotransplantation. Syngeneic and allogeneic transplantation.  Xenotransplantation. Immunological nature of rejection. Dynamics  rejection. Mechanism of graft destruction. The value of the H-2 system and  HLA in organ transplantation. Cellular phenomena of transplantation  immunity.  The phenomenon of increased graft growth. Phenomena of allogeneic  inhibition, cytopathogenic action of lymphocytes and other phenomena.  Genetic control of the immune response  Dynamics of antibody genesis. Genetic aspects of antibody genesis. Stages  synthesis of immunoglobulins, immunological memory. clonality  populations of antibody producers. Individual differences in immune strength  response. Immune response genes (Ir - genes) and their links to the major histocompatibility system. Ia - antigens, localization, structure and participation in antigen presentation to lymphocytes. Genetic control of the immune response at the level of T-, B-cells and macrophages.  Immunological tolerance  The history of the development of the doctrine of tolerance. Concept definition  tolerance. Embryonic period of formation of tolerance. Immune unresponsiveness in adulthood. The role of individual cell types in the induction of tolerance. High and low dose tolerance.  Tolerance induction after irradiation. The role of the genotype in induction tolerance. Cancellation of tolerance, autoimmune pathology. Immunology of reproduction. immunological relationships in mother-fetus system. Immunological mechanisms of fertilization. Immunology implantation. Embryo as an allograft. Immunological relationships between the mother and fetus during a normal pregnancy. Immunological reactivity during pregnancy. The role of the trophoblast and placenta. Amniotic membranes and fluids in the regulation of immunological relations mother-placenta-fetus. The role of humoral and cellular factors during the entire period pregnancy up to childbirth. The disease of "small stature". Immunological conflict between mother and fetus. Hemolytic disease newborns. The ability to form Rh antibodies. Prevention of anti-rhesus sensitization. |
|  | Immunity to tumors | Antigenic characteristics of tumor cells. Immunological  surveillance and mechanisms of antitumor immunity. Overcoming immunological surveillance by tumor cells. Development of methods for immunotherapy of malignant tumors. |
|  | Immunodeficiency states | Immunodeficiency states Primary (congenital) immunological deficiency: defectsphagocytic cells, insufficiency of the complement system, deficiency  complement components C1 - C9, B-lymphocyte deficiency, T-lymphocyte deficiency, stem cell deficiency.  Secondary immunodeficiency: viral infections, chemical and physical factors, nutrition (iron deficiency), chronic infections, stress and others.  Acquired immunodeficiency syndrome (AIDS). Human immunodeficiency virus (HIV).  Specific immunocorrection.  HT, R, OR |

* + 1. The content of practical classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
| 1 | 1 | Safety precautions in the microbiological laboratory. The structure of the microscope. Microbiological laboratory device. |
|  |  | Preparation of a fixed preparation. |
| 2 | 2 | Preparation of the drug crushed drop. |
| 3 | 3 | Preparation of the drug "hanging drop" |
|  |  | Simple and complex coloring methods |
| 4 | 4 | Gram staining of fixed preparations. |
|  |  | Romanovsky-Giemsa staining |
|  |  | Types of culture media |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Introduction. Subject and tasks of the discipline | *oral questioning* |
| 2. | Morphology and structure of prokaryotic microorganisms | *Information project (report*) |
| 3. | Classification of prokaryotes | *oral questioning* |
| 4. | Physiology of prokaryotic microorganisms. Chemical composition of microorganisms. Types and mechanisms of nutrition of microorganisms | *Research project (abstract)* |
| 5. | Enzymes of microorganisms | *Information project (report)* |
| 6. | Metabolism of prokaryotic microorganisms | *oral questioning* |
| 7. | Growth and reproduction of microorganisms | *oral questioning* |
| 8. | Influence of physical and chemical factors on microorganisms | *Research project (abstract)* |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

* 1. Basic educational literature

1. Lebedev V.N. Microbiology with the basics of virology. Part I. Fundamentals of General Virology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data. - St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 62 p.- Access mode: http://www.iprbookshop.ru/22556.html.- ELS "IPRbooks"
2. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook / Tyumentseva E.Yu.— Electron. text data. - Omsk: Omsk State Service Institute, Omsk State Technical University, 2015. - 123 pp. - Access mode: http://www.iprbookshop.ru/32788.html. — EBS «IPRbooks»
3. General biology and microbiology [Electronic resource]: study guide / A.Yu. Prosekov [i dr.]. — Electron. text data. - St. Petersburg: Prospekt Nauki, 2017. - 320 p. - Access mode: http://www.iprbookshop.ru/35796.html. — EBS «IPRbooks»

4. Immunology: textbook / R.M. Khaitov.-2nd ed., revised. and additional – M.: GEOTAR-Media, 2015.-528s.

5. Korotyaev A.I. Medical microbiology, immunology and virology [Electronic resource] / Korotyaev A.I., Babichev S.A. — Electron. text data.— St. Petersburg: SpetsLit, 2012.— 760 p.— Access mode: http://www.iprbookshop.ru/45694.html.— EBS “IPRbooks

6. Fundamentals of General Immunology [Electronic resource]: a textbook for medical students / L.V. Gankovskaya [et al.]. Electron. text data.— M.: Pediatr, 2014.— 124 p.— Access mode: http://www.iprbookshop.ru/70802.html.— EBS “IPRbooks”

7. Chkhenkeli V.A. Immunology [Electronic resource]: textbook / Chkhenkeli V.A.— Electron. text data.— St. Petersburg: Prospekt Nauki, 2015.— 144 p.— Access mode: http://www.iprbookshop.ru/80076.html.— EBS “IPRbooks”

* 1. Additional educational literature:

1. Bukhar M. Popular about microbiology [Electronic resource] / Bukhar M.— Electron. text data. - M .: Alpina Publisher, Alpina non-fiction, 2016. - 218 p. - Access mode: http://www.iprbookshop.ru/48576.html. — EBS «IPRbooks»
2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [et al.]. Electron. text data.— Voronezh: Voronezh State University of Engineering Technologies, 2017.— 316 p.— Access mode: http://www.iprbookshop.ru/70810.html.— EBS “IPRbooks”
3. Kovalev N.A. The World of Microorganisms in the Biosphere [Electronic resource]/ Kovalev N.A., Krasochko P.A., Litvinov V.F.— Electron. text data. - Minsk: Belarusian Science, 2014. - 532 p. - Access mode: http://www.iprbookshop.ru/29476.html. – EBS
   1. Periodicals
4. "Biological membranes"
5. "Biochemistry", "Biophysics", "Biotechnology"
6. "Proceedings of the Russian Academy of Sciences. Biological Series»
7. "Microbiology, epidemiology, immunology",
8. "Molecular biology",
9. "Applied Biochemistry and Microbiology".

**7.Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

1. **Software Composition**

Office suite, email client, Internet browser

1. **Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

Classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

Seminar-type classroom, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive board-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1);

Rooms for independent work with Internet access (Classroom board, study furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces) ) (for independent work) (room No. 07 of the TsKP).

Educational Laboratory for Microbiology and Virology (4-15)

Equipment:

1. Sterilizer steam BES -15L-LED-N automatic
2. Drying cabinet ShS-40 (40l. 180C)
3. Shaker medical series S:S -3. 02LA20
4. Air irradiator-recycler ultraviolet
5. Medical laboratory centrifuge
6. Biological microscope Mikromed S-11 with accessories
7. Scales Mass-1
8. Electric water distiller
9. Support for test tubes ShPU Kront
10. Water bath Senco, W-2- 1003 p
11. Electric stove Irit IR-8201 1 burner with thermostat
12. Measuring technology
13. Savochek laboratory
14. Porcelain cups of various sizes
15. Small plastic petri dishes
16. Large plastic petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"ZOOLOGY"**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.01.03 |
| *Orientation (profile)* | Microbiology |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to apply knowledge of biological diversity and use methods of observation, identification, classification, reproduction and cultivation of living objects to solve professional problems | GPC-1.1;  GPC-1.2;  GPC-1.3;  GPC-1.4 |

* + - 1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPC -1 | GPC-1.1;  GPC-1.2;  GPC-1.3;  GPC-1.4 | **Knows** theoretical foundations of microbiology and virology, botany, zoology and uses them to study the life and properties of living objects, their identification and cultivation.  **Can** apply methods of observation, classification, reproduction of biological objects in natural and laboratory conditions; use the acquired knowledge to analyze the interactions of organisms of various species with each other and with the environment.  **owns**experience in participation in the monitoring and protection of biological resources, the use of biological objects to analyze the quality of their habitat.  **Understands** the role of biological diversity as a leading factor in the sustainability of living systems and the biosphere as a whole. |

* + - 1. **Scope of discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Types of educational work*** | |  | | ***Forms of study*** | | |
| ***full-time***  ***1 semester*** | ***full-time***  ***2 semester*** | | ***Part-time***  ***1 semester*** | ***Part-time***  ***2 semester*** |
| **General labor intensity**: credits/hours | | 144/4 | 144/4 | | 144/4 | 144/4 |
| **contact work**: | | 51 | 56 | | 34 | 28 |
|  | Lecture-type classes | 17 | 28 | | 17 | 14 |
| Seminar type classes | 34 | 28 | | 17 | 14 |
| Intermediate certification: credit / credit with grade / exam \* |  |  | |  |  |
| **Independent work**(SRS) | | 39 | 52 | | 74 | 62 |
| Of which for course work (course project) | |  |  | |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time study 1 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Introduction. | 1 |  |  |  | 2 |  | 3 |
| 2. | Protozoa | 2 |  |  |  | 4 |  | 6 |
| 3. | lower multicellular animals | 2 |  |  |  | 4 |  | 6 |
| 4. | Worms | 4 |  |  |  | 6 |  | 6 |
| 5. | shellfish | 2 |  |  |  | 6 |  | 6 |
| 6. | arthropods | 4 |  |  |  | 6 |  | 6 |
| 7. | Echinoderms | 2 |  |  |  | 6 |  | 6 |

* + 1. Full-time study 2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | chordates | 4 |  |  |  | 4 |  | 10 |
| 2. | Inferior chordates. | 6 |  |  |  | 6 |  | 10 |
| 3. | Subtype Vertebrates. | 6 |  |  |  | 6 |  | 10 |
| 4. | Aquatic  vertebrates. | 6 |  |  |  | 6 |  | eleven |
| 5. | Ground  vertebrates. | 6 |  |  |  | 6 |  | eleven |

* + 1. Part-time education 1 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. | 1 |  |  |  | 1 |  | 2 |
| 2. | Protozoa | 2 |  |  |  | 2 |  | 10 |
| 3. | lower multicellular animals | 2 |  |  |  | 2 |  | 10 |
| 4. | Worms | 4 |  |  |  | 4 |  | 12 |
| 5. | shellfish | 2 |  |  |  | 2 |  | 10 |
| 6. | arthropods | 4 |  |  |  | 4 |  | 20 |
| 7. | Echinoderms | 2 |  |  |  | 2 |  | 10 |

* + 1. Part-time education 2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | chordates | 2 |  |  |  | 2 |  | 12 |
| 2. | Inferior chordates. | 4 |  |  |  | 4 |  | 12 |
| 3. | Subtype  Vertebrates. | 2 |  |  |  | 2 |  | 12 |
| 4. | Aquatic  vertebrates | 2 |  |  |  | 2 |  | 12 |
| 5. | Ground  vertebrates. | 4 |  |  |  | 4 |  | 14 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Section 1. Introduction.The subject and tasks of zoology | Subject and tasks of zoology. History of Zoology. Animal system |
|  | Protozoa | General characteristics of protozoa Type Sarcomastigophora. General characteristics and classification. Type Apicomplexes. General features of the structure of the apicomplex in connection with the parasitic way of life. type of infusoria. General characteristics of ciliates as the most differentiated and highly organized protozoa. |
|  | lower multicellular animals | Lower multicellular animals. Type intestinal. General characteristics of the type and classification. Overview of the main groups. |
|  | Worms | Type Flatworms. General characteristics and type classification. Features of the organization of free-living and parasitic flatworms. Type Roundworms. General characteristics and classification. Features of the structure of nematodes. Type Annelids. General characteristics and type classification |
|  | shellfish | Mollusk type. General characteristics and type classification. Features of the structure of the main groups of mollusks |
|  | arthropods | General characteristics and type classification. Subtype Gillbreathers. Lower and higher crustaceans. Subtype Cheliceraceae. Features of the organization of the main groups of chelicerae. Classification of chelicerates. Superclass Millipedes. Structural features. Significance in soil formation. Superclass Insects. External and internal structure of insects. Insects with complete and incomplete metamorphosis. Main squads. Type Echinoderm. General characteristics and type classification. |
|  | Echinoderms | Echinodermata (phylum Echinodermata): features of the organization of representatives of the main taxa of recent echinoderms. Anatomy of starfish. Diversity and ecology of echinoderms. |
|  | chordates | Subject and tasks of vertebrate zoology  Chordates as a type of animal kingdom.  The main features and characteristics of the type.  Development. Systematics of type up to subclasses.  direction of evolution. |
|  | Inferior chordates | Subtype Shellers. The main features of biology and structure. Simplification as a way of evolution. Systematics.  Subtype Cranial. The main features of biology and structure. Specialization, development. Systematics |
|  | Subtype  Vertebrates. | The main features of the subtype in connection with the transition to an active lifestyle.  Organization principles. Progressive evolution of vertebrates. |
|  | Aquatic  vertebrates. | Characteristics of the class of cyclostomes,  biomorphological features.  Systematics, evolution.  Diagnostic characteristics of cartilaginous and bony fishes. Specific features  structure, level of organization.  Direction of progressive changes.  Systematics, distribution, evolution.  The meaning of fish. |
|  | Ground  vertebrates | Mastering the air-terrestrial environment by vertebrates, its features.  Origin of terrestrial vertebrates.  Amphibians as the first class of terrestrial  vertebrates.  Major morphobiological rearrangements.  Signs of primacy. Systematics, distribution.  Amniotes and their features.  Diagnostic characteristic of the class Reptiles, class Birds, class Mammals. direction of evolution. Systematics, distribution, ecology. Origin and meaning. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of laboratory classes** |
| 1 | Section 1. Introduction.Protozoa | 1 Features of the structure of free-living protozoa.  Features of the structure of parasitic protozoa. |
| 2 | lower multicellular animals | Structural features of sponges.  Features of the structure of hydroid and scyphoid jellyfish. |
| 3 | Plosike worms | External and internal structure of free-living flatworms.  Features of the structure of parasitic flatworms.  Nematodes are parasites of humans, animals and agricultural plants |
| 4 | Worms | Features of the structure of polychaete worms. Structural features of oligochaete worms. |
| 5 | shellfish | Features of the structure of gastropods.  Features of the structure of bivalve molluscs. |
| 6 | Crustaceans | Class Crustaceans. Morphology and anatomy of crayfish |
| 7 | arachnids | Class Arachnids. Features of the structure of arachnids. |
| 8 | Insects | Class Insects. The external structure of insects.  Types of mouthparts, wings and limbs of insects.  Internal structure of insects.  Determination of the most important orders of insects |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Introduction. | OR, R, T, RP |
| 2. | Protozoa | OR, R, T, RP |
| 3. | lower multicellular animals | OR, R, T, RP |
| 4. | Worms | OR, R, T, RP |
| 5. | shellfish | OR, R, T, RP |
| 6. | arthropods | OR, R, T, RP |
| 7. | chordates | OR, R, T, RP |
| 8. | Inferior chordates. | OR, R, T, RP |
| 9. | Vertebrate subtype | OR, R, T, RP |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic literature

Dmitrienko, VK Zoology of invertebrates [Electronic resource] study guide. – Krasnoyarsk Siberian Federal University, 2017. – Access mode: http://www.iprbookshop.ru/84347.html

Nikitina, S. M. Zoology of invertebrates [Electronic resource]: teaching aid. - Kaliningrad: Baltic Federal University. Immanuel Kant, 2012. - Access mode: http://www.iprbookshop.ru/23779.html

Zaitsev, AI Laboratory work on the zoology of invertebrates [Electronic resource]: educational and methodological guide. - M .: Moscow City Pedagogical University, 2013. - Access mode: http://www.iprbookshop.ru/26511.html

Rodionov Yu.A. Vertebrate zoology [Electronic resource]: textbook.— M.: Russian State Agrarian Correspondence University, 2011.— Access mode: http://www.iprbookshop.ru/20660.html

Pereverzeva E.V. Laboratory work on vertebrate zoology. Part II. Birds. Mammals [Electronic resource]: textbook for the course "Zoology".— M.: Moscow City Pedagogical University, 2013.— Access mode: http://www.iprbookshop.ru/26513.html

6.2. Additional literature.

Dauda T.A., Koschaev A.G. Zoology of invertebrates. Tutorial. - M.: Lan, 2015.

Yazykova, I. M. Practicum on invertebrate zoology [Electronic resource] study guide. - Rostov-on-Don Southern Federal University, 2010. - Access mode: http://www.iprbookshop.ru/47083.html

Starkov, V. A. Zoology of invertebrates. Subkingdom Unicellular animals, or Protozoa [Electronic resource] study guide. - Orsk Orenburg State University, EBS DIA, Orsk Institute of Humanities and Technology (branch) of Orenburg State University, 2011. - Access mode: http://www.iprbookshop.ru/50094.html

* 1. Periodicals

None.

1. **Modern professional databases and information reference systems**

Windows operating system

Electronic library system "IPRbooks"<http://www.iprbookshop.ru/index.ph>

Student consultant (http://www.studentlibrary.ru)

www.avanta.ru

http//dic.academic.ru

Scientific electronic library e-library.ru

elibrary.ru//item.asp?id=17073813

http://window.edu.ru/resource/132/27132/files/m 108

http://window.edu.ru/resource/332/64332/files/0007

www.twirpx.com/file/1257434/

www.twirpx.com/file/1257433/

http://www.ido.rudn.ru

<http://www.countries.ru/>

1. **Composition of software**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base

Laboratories.

Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical exercises and lecture notes on electronic

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"Chechen State University"

Work program of the discipline

**"**BOTANY**»**

|  |  |
| --- | --- |
| Direction of training | Biology |
| Code | 06.03.01 |
| Orientation (profile) | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to apply knowledge of biological diversity and use methods of observation, identification, classification, reproduction and cultivation of living objects to solve professional problems | GPC-1.1; GPC-1.2; GPC-1.3; GPC-1.4 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPK-1 | GPC-1.1;  GPC-1.2;  GPC-1.3;  GPC-1.4 | **Knows** theoretical foundations of microbiology and virology, botany, zoology and uses them to study the life and properties of living objects, their identification and cultivation.  **Can** apply methods of observation, classification, reproduction of biological objects in natural and laboratory conditions; use the acquired knowledge to analyze the interactions of organisms of various species with each other and with the environment.  **owns**experience in participation in the monitoring and protection of biological resources, the use of biological objects to analyze the quality of their habitat.  **understands**the role of biological diversity as a leading factor in the sustainability of living systems and the biosphere as a whole. |

**3. Scope of discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| ***Types of educational work*** | |  | | ***Forms of study*** | | |
| ***full-time***  ***1 semester*** | ***full-time***  ***2 semester*** | | ***Part-time***  ***1 semester*** | ***full-time***  ***Correspondence***  ***2 semester*** |
| **General labor intensity**: credits/hours | | 144/4 | 144/4 | | 144/4 | 144/4 |
| **contact work**: | | 51 | 56 | | 34 | 28 |
|  | Lecture-type classes | 17 | 28 | | 17 | 14 |
| Seminar type classes | 34 | 28 | | 17 | 14 |
| Intermediate certification: credit / credit with grade / exam \* |  |  | |  |  |
| **Independent work**(SRS) | | 39 | 52 | | 74 | 71 |
| Of which for course work (course project) | |  |  | |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work

4Full-time study 1 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 1. Botany - as a science | 2 |  |  |  | 2 |  | 2 |
| 2. | Section 2. Plant cell | 2 |  |  |  | 4 |  | 6 |
| 3. | Section 3. Plant tissues | 4 |  |  |  | 8 |  | 7 |
| 4. | Section 4. Vegetative organs of plants | 3 |  |  |  | 8 |  | 8 |
| 5. | Section 5 Plant Propagation | 2 |  |  |  | 2 |  | 6 |
| 6. | Section 6. Systematics of lower plants | 2 |  |  |  | 10 |  | 10 |

4.1.1. Full-time study 2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 7. Angiosperms | 6 |  |  |  | 6 |  | 14 |
| 2. | Section 8. Systematics of Angiosperms. | 16 |  |  |  | 16 |  | 20 |
| 3. | Section 9. Ecology of plants and geobotany. | 6 |  |  |  | 6 |  | 18 |

* + 1. Part-time education 1 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 1. Botany and plant physiology as a science. The structure and physiology of the plant cell. | 4 |  |  |  | 4 |  | 24 |
| 2. | Section 2. Plant tissues. | 6 |  |  |  | 6 |  | 24 |
| 3. | Section 3. Vegetative organs of plants. | 7 |  |  |  | 7 |  | 26 |

4.1.2. Part-time education 2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Section 4. Morphology of vegetative organs. | 4 |  |  |  | 4 |  | 17 |
| 2. | Section 5. Morphology of generative organs of angiosperms. | 4 |  |  |  | 4 |  | 18 |
| 3. | Section 6. Propagation of plants. | 2 |  |  |  | 2 |  | 18 |
|  | Section 7. Systematics of lower plants. | 4 |  |  |  | 4 |  | 18 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Section 1  Botany - as a science | tasks of botany.  The main branches of botany.  Plant and man. |
| 2 | Section 2  plant cell | Cell - as the basic structural and functional unit of living matter.  The concept of the protoplast. Classification of organelles. Features of the structure and function.  Cell inclusions. |
| 3 | Section 3  Plant tissues | The concept of tissues. Principles of classification. meristems. Classify them according to their origin and location. Basic fabrics. Characteristics of chlorenchyma, aerenchyma, aquifers and storage parenchyma.  Integumentary tissues: epiblema, epidermis, cork. cover complexes.  Mechanical tissues: sclereids, collenchyma. Sclerenchyma - bast and wood fibers.  Conductive tissues: Structural and functional features of ascending and descending current tissues. Conductive bundles and their classification.  System of external and internal secretion in plants. |
| 4 | Section 4  Vegetative organs of plants | General regularities in the structure of vegetative organs. Root and root system. Classification. Features of the growth of the root tip zone. Primary anatomical structure. The secondary structure of the roots of dicotyledonous plants. Specialization and metamorphoses of roots. Mycorrhiza, nodules.  Escape and stem. Metamerism. Kidneys. Branching shoots. The stem is the axis of the shoot. Stem anatomy. Primary building. Features of the anatomy of the stems of cereals. Cambium and its activities. Secondary structure of stems of herbaceous plants. The structure of the stems of woody plants. Metamorphoses of the shoot as an object of crop production.  Leaf: morphology, functions. Leaf arrangement. Leaf functions. Microscopic structure of leaves of monocotyledonous, dicotyledonous and coniferous plants.  leaf metamorphoses |
| 5 | Section 5  Plant propagation | The biological meaning of reproduction. Types of reproduction. Alternation of generations and change of nuclear phases. |
| 6 | Section 6  Systematics of lower plants | Introduction to systematics.  Viruses. prenuclear organisms. bacteria. Structure, nutrition, reproduction. value in nature. Cyanea. Characteristics, nutrition, distribution and significance.  Mushrooms. General characteristics. cytological features. Classification. Lower fungi: Chytridiomycetes, Oomycetes, Zygomycetes. Higher fungi: Ascomycetes, Basidiomycetes, Deuteromycetes, Slime Mushrooms. Lichens. Features of the structure and reproduction. Role in nature, human use.  The concepts of lower and higher plants. Seaweed. General characteristics. Classification. The value of algae.  Higher spore plants. Origin and classification. Division Bryophytes. Characteristics and meaning.  Department Lycopsformes. Diversity. Characteristic. Department of Horsetails. Characteristic. Meaning.  Division Ferns. Structure and life cycle. Meaning.  seed plants. Department Gymnosperms. Origin. Classification. Features of gametophyte and sporophyte. Role in the vegetation cover of Russia. |
| 7 | Section 7  angiosperms | General characteristics and origin of Angiosperms. Theories of the origin of the flower.  Flower. Androecium. Stamen structure, microsporogenesis and pollen development.  Gynoecium. The structure of the pistil. Ovule. Megasporogenesis and development of the embryo sac.  inflorescences. Flower formula and diagram.  Bloom. Sexual types of flowers and plants. Monocarpics and polycarpics.  Pollination. Adaptations to prevent self-pollination.  Fertilization. Essence of double fertilization.  Seed development and structure.  Fetus. Development and structure. Fruit classification. Methods of dispersal of seeds and fruits. Importance of seeds and fruits. |
| 8 | Section 8  Systematics of angiosperms | Principles of construction of phylogenetic systems. Comparative characteristics of dicotyledonous and monocotyledonous plants.  Characteristics and representatives of the Buttercup, Gooseberry, Pink family.  Characteristics and representatives of the family. Legumes, Celery, Flax, Malvaceae, Grapes.  Characteristics and representatives of the family. Dodder, Broomrape, Borage, Bindweed, Lamiaceae, Solanaceae, Euphorbiaceae.  Characteristics and representatives of the family. Birch, Beech, Willow, Marevy, Shiritsevye, Hemp, Mulberry, Nettle. Cabbage, Poppy, Aster. Pumpkin.  Characteristics and representatives of the family. Liliaceae, Bluegrass, Onion. |
| 9 | Section 9  Flora and vegetation | Area. The teachings of N.I. Vavilov about the centers of origin of cultivated plants.  Flora.  Vegetation. Zoning of the vegetation cover of Russia. |
| 10 | Section 10  Plant ecology and geobotany | Ecology of plants. Concepts and tasks. Classification of environmental factors.  Light as an environmental factor. Warm. Water. Adaptation of plants to insufficient and excessive moisture. Air.  Ecological significance of the gas composition. The soil. Ecological significance of soil organic matter. Fire, its positive and negative meaning.  . biotic factors. Classification. Zoogenic and anthropogenic factors. Ecology of populations.  The concept of phytocenosis. Classification of phytocenoses. The concept of phytoindication. Agrocenoses. |
| eleven | Section 11  Physiology of the plant cell. | Cell - as the basic structural and functional unit of living matter.  The concept of the protoplast. Classification of organelles. Features of the structure and function.  Cell inclusions.  The role and place of plants in the living world. The specificity of plant metabolism in comparison with animals (autotrophy, oxygen formation, mineral nutrition and nitrogen and sulfur reduction, water exchange, experiencing unfavorable seasons).  The concept of diffusion, chemical potential, osmosis. The cell as an osmotic system. Cell permeability to salts. Passive and active entry of minerals into the cell.  The functional role of individual cell organelles. Specific role in the metabolism of organelles typical of plants (plastids, vacuole, cell wall).  Symbiotic theory of the origin of plastids and mitochondria. |
| 12 | Section 12  Water regime of plants. | **General idea of ​​water exchange.**Importance of water in plant life. The main patterns of water entry into the plant. Forms of water in the plant organism. Water balance of plants. Significance and physiological role of transpiration. Types of transpiration and mechanisms of stomatal opening. Influence of external conditions on transpiration. Daily course of transpiration. The species are hydrostable and hydrolabile.  **The flow and movement of water in the plant.**The root system as an organ of water intake. Upper and lower terminal water current motors. Guttation and weeping of plants. Root pressure, its value. Apoplast. Symplast. The speed of movement of water in different plants. clutch theory. The influence of external conditions on the flow of water through the root system. Forms of water in the soil. Atmospheric and soil moisture. Effects of lack of water on the plant. Water regime of plants of different ecological types and different life forms. Drought tolerance of plants |
| 13 | Section 13  Photosynthesis. | **The leaf as an organ of photosynthesis.**Features of the structure of the sheet. Chloroplasts and their role in photosynthesis. Leaf pigments: chlorophylls, carotenoids, phycobilins. Chemical and physical properties. Physiological role of pigments. Theory of chromatic adaptation.  **The main stages of photosynthesis.**Photophysical processes in photosynthesis.Transfer of absorbed photon energy between pigment molecules. The idea of ​​a photosynthetic unit, a light-harvesting complex, a cancer center and a photosystem. Photochemical processes in photosynthesis. Emerson effect and two photosystems. Photochemical processes of photosynthesis, Z-scheme. Photosynthetic phosphorylation, cyclic and non-cyclic. The mechanism of phosphorylation, Mitchell's theory. The formation of oxygen. Dark phase of photosynthesis. Calvin cycle (reductive pentose phosphate cycle, C3 pathway). Stages of the Calvin cycle - carboxylation, reduction, regeneration. Hatch-Slack cycle, C4 path. Anatomical structure of the leaves of C4 plants, features of chloroplasts from mesophyll cells and sheaths. CAM pathway of photosynthesis. Ways of supplying CO2 to the Calvin cycle in C3-, C4- and CAM-plants. Adaptive role of C3, C4, and CAM pathways of photosynthesis. Oxygenase function of RuBP carboxylase/oxygenase. Photorespiration (glycolate cycle) in C3 plants.  **Influence of external conditions on photosynthesis**. Light curve of photosynthesis, points of compensation and light saturation. Differences in light curves in photophilous and shade-tolerant plants, in C3- and C4-plants. Influence of CO2 concentration on photosynthesis. Carbon dioxide compensation point in C3- and C4-plants. Regulation of CO2 intake by means of stomatal apparatus. Influence of temperature, water supply and mineral nutrition on photosynthesis. Relationship between photosynthesis and respiration. Photosynthesis and plant productivity. |
| 14 | Section 14  Mineral nutrition of plants. | **Features of mineral nutrition of plants.**Theoretical and practical significance of studying the root nutrition of plants. Ash elements. Methods for studying root nutrition. Classification of elements according to their content in the plant. Interaction of ions (antagonism, synergism). The physiological role of nitrogen. Ammonia and nitrates as sources of nitrogen. Works by D.N. Pryanishnikov. Ways of assimilation of ammonia and nitrates in the plant. The role of glutamic acid and glutamine in the biosynthesis of amino acids.  The role of macro- and microelements for plants.  Plant nutrition by symbiotic organisms. Physiological bases of application of fertilizers.  Synthetic function of the root system of plants. Features of the synthesis of amino acids, amides, phytohormones and alkaloids.  **The intake and movement of substances in the plant.**  Mineral salts as the main form of plant nutrition. Passive and active intake of minerals. Ascending and descending currents of substances. Influence of factors on the absorption of substances. Hypotheses explaining the mechanism of movement of substances through the phloem. |
| 15 | Section 15  Plant respiration. | **Importance of respiration and respiratory pathways.**  The release of energy during respiration. Redox processes. Carbohydrates as the main substrate of respiration. respiratory rate. Glycolysis. Krebs cycle. glyoxylate pathway. Pentose phosphate pathway of respiration.  **The mechanism of plant respiration.**Membranes as a structural basis for bioenergetic processes. oxidative phosphorylation. Chemoosmotic theory of conjugation of oxidation and phosphorylation.  **Influence of external and internal factors on the intensity of respiration.**Methods for measuring the intensity of breathing. Influence on the process of respiration of external conditions: temperature, supply of oxygen, carbon dioxide, water, nutrient salts, injury, light. Influence of internal factors on the intensity of respiration. Ways of regulation of respiration. |
| 17 | Section 16  Plant growth and development | **Plant hormones as the main regulators of the process of growth and development.**Phytohormones. The history of the formation of ideas about the presence of phytohormonal regulation in plants. Comparison of phytohormones and animal hormones.  The history of the discovery of phytohormones, their chemical nature, physiological action and practical application. Features of phytohormonal regulation of growth and morphogenesis of various plant organs and various processes of growth and development. The movement of phytohormones throughout the plant.  Mechanism of action of phytohormones.  **Growth and development of plants.**Definition of the concepts of "growth" and "development". Quantitative patterns of growth. Stages of ontogenesis. Life span of plants and its features. Regulation of the transition of plants to the generative state. The phenomenon of vernalization. The adaptive role of vernalization. The phenomenon of photoperiodism. Groups of plants with different photoperiodic response, its adaptive value. Hormonal theory of flowering by M.Kh. Chailakhyan. The role of phytochrome in photoperiodic reactions of plants. Structure and localization of phytochrome. Specificity and mechanism of action of the phytochrome system in the regulation of various processes.  Growth frequency. dormant state in plants. Types of rest: forced and physiological (deep). Conditions for exiting dormancy. Adaptive role of dormancy, its significance for frost, heat and drought resistance of plants.  **plant movements**. Tropisms and nastia, their physiological mechanisms and adaptive role.  **Integration of physiological processes in the plant**  The production process of a plant and the integration of various functions in it: photosynthesis, respiration, growth, mineral nutrition, water regime. Donor-acceptor relations and transport of assimilators in a plant. Interaction of plant organs, correlation, root-leaf connection. The need to study the plant as an integral organism in order to develop methods for increasing its productivity and resistance to adverse environmental factors. |
| 18 | Section 17Physiology of plant resistance. Transformation and transport of substances in plants. | Understanding stress and stressors. Three phases of plant stress response. Mechanisms of resistance to damaging environmental factors. Mechanisms of plant adaptation at the cellular, organismal and population levels. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of laboratory classes** |
| 1 | Section 1. Plant cell | No. 1. Microscope device. The shape and structure of the plant cell. (Creative task - preparation of a microscopic preparation).  No. 2. The movement of the cytoplasm. Reserve nutrients. End products of metabolism. |
| 2 | Section 2. Plant tissues | No. 3. Histology. Classification of tissues - educational and integumentary tissues. (Discussion).  No. 4. Basic and mechanical fabrics. (Creative task - preparation of a microscopic preparation).  No. 5. Conductive tissues. conductive bundles. Milky and excretory tissues.  No. 6. Colloquium 1. on the topic: cytology and histology .. |
| 3 | Section 3  Vegetative organs of plants | No. 7. Organography. Macromorphology of the seedling. Types and forms of root systems. root zones. Microscopic structure of the root. Storage roots are root crops. (Discussion).  No. 8. Stem morphology. The anatomical structure of the woody stem of gymnosperms and angiosperms. The anatomical structure of the stems of herbaceous plants. Grass stalks.  No. 9. Sheet. Classification. Morphology and anatomy. (Discussion).  No. 10. Colloquium 2. on the topic: morphology and anatomy of the vegetative organs. |
| 4 | Section 4  Plant reproduction. | No. 11. The biological meaning of reproduction. Types of reproduction. Alternation of generations and change of nuclear phases. |
| 5 | Section 5. Systematics of lower plants | No. 12. Lower plants. Department of Algae.  No. 13. Lower mushrooms. High mushrooms.  No. 14. Higher spores: Mosses, club mosses, horsetails.  No. 15. Ferns. Department Gymnosperms.  No. 16. Colloquium 3. on the topic: Lower plants (Algae), Mushrooms, Higher plants (Mosses, Club mosses, Horsetails, Ferns, Gymnosperms). |
| 6 | Section 6. Generative organs of angiosperms. | No. 17. Reproductive organs. Flower and its parts. Flower formula and diagram. inflorescences.  No. 18. Seeds and fruits, structure and classification of seeds.  No. 19. Colloquium 4. on the topic: Angiosperms. Reproductive organs of plants: flower, fruit, seed. |
| 7 | Section 7. Systematics of Angiosperms. | No. 20. Principles of classification of plants. Work with the determinant of higher plants. (Solution of situational problems by group method). Herbarization, observation technique.  No. 21. Characteristics and representatives of the Buttercup, Pink, Gooseberry family.  No. 22. Characteristics and representatives of the family Legumes, Celery, Malvaceae, Flax, Grapes.  No. 23. Characteristics and representatives of the family Dodder, Broomrape, Borage, Bindweed, Nightshade, Euphorbia.  No. 24. Characteristics and representatives of the family Birch, Marevy, Beech, Willow  No. 25. Characteristics and representatives of the Cabbage, Poppy, Pumpkin family. Lamb, Nettle, Aster, Liliaceae, Bluegrass.  No. 26. Characteristics and representatives of the family Shiritsevye, Hemp, Buckwheat.  No. 27. Colloquium 5. on the topic:  Systematics of angiosperms. |
| 8 | Section 8. Ecology of plants and geobotany. | No. 28. Abiotic and biotic factors in plant life. Phytocenoses and agrophytocenoses.  No. 29. Colloquium 6. on the topic: Environmental factors. Phytocenoses. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Botany - as a science | UO, R, T, LR |
| 2. | Section 2. Plant cell |  |
| 3. | Section 3. Plant tissues |  |
| 4. | Section 4. Vegetative organs of plants |  |
| 5. | Section 5 Plant Propagation |  |
| 6. | Section 6. Systematics of lower plants |  |
| 7. | Section 7. Angiosperms |  |
| 8. | Section 8. Systematics of Angiosperms. |  |
| 9. | Section 9. Ecology of plants and geobotany. |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

Main literature

1. Andreeva I.I., Rodman L.S. Botany: studies for s / universities. – M.: Kolos, 2009. – 528 p.

2. Alekhina, I.D. Physiology of plants. [Text]: textbook / I.D. Alyokhina, Yu.V. Balnovkin, V.S. Gavrilenko, T.V. Zhigalova N.R. Melchik, A.M. Nosov, O.G. Polesskaya, E.V. Kharitonoshvil, V.V. Chub. M: Publishing House Center "Academy". - 2007. - 640 p.

3. Pilshchikova, N.V. Plant physiology with the basics of microbiology. [Text]: textbook / N.V. Pilshchikov. M: Mir Publishing House: - 2004. - 184 p.

6.2 additional literature

1. Suvorov, V.V. Botany with the basics of geobotany [Text]: textbook / V.V. Suvorov, I.N. Voronova - 3rd ed., revised. and additional - M.: ARIS, 2012. - 520 p.

2. Serebryakova, T.I. Botany with the basics of phytocenology: Anatomy and morphology of plants [Text]: textbook / T.I. Serebryakova, N.S. Voronin, A.G. Elenevsky and others. M.: Akademkniga, 2006. 543 p.

3. Timonin, A.K. Botany. higher plants. [Text]: textbook. (Volume 3 of 4). M.:, Ed. Center "Academy", 2007. - 352 p.

4. Atabekova A.I., Ustinova E.I. plant cytology. - M.: Kolos, 2007. - 246 p.

5. Erzhapova, R.S., "Morphology of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S., Alikhadzhiev M.Kh. Publishing house of ChSU, 2015. S. 94.

6. Pavlova M.E. Botany [Electronic resource]: lecture notes. Textbook / Pavlova M.E. - Electron. text data. - M .: Russian University of Peoples' Friendship, 2013. - 256 p. - Access mode: http://www.iprbookshop.ru/22163.

7. Pyatunina S.K. Botany. Systematics of plants [Electronic resource]: textbook / Pyatunina S.K., Klyuchnikova N.M. - Electron. text data.— M.: Prometheus, 2013.— 124 p.— Access mode: http://www.iprbookshop.ru/23975

8. Evert, R.F. Esau plant anatomy. Meristems, cells and tissues of plants: structure, functions and development. [Electronic resource] - Electron. Dan. - M .: Publishing house "Laboratory of knowledge", 2015. - 603 p. - Access mode: http://www.iprbookshop.ru/70790

9. Botany course of algology and mycology. [Electronic resource] - Electron. Dan. - M. : Moscow State University named after M.V. Lomonosov, 2007. - 559 p. - Access mode: http://www.iprbookshop.ru /10120

10. Erzhapova, R.S., "Morphology of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S., Alikhadzhiev M.Kh. Publishing house of ChSU, 2015. S. 94.

11. Erzhapova, R.S., "Systematics of higher plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing house of ChSU, 2015. S. 124.

12. Lecture notes on plant physiology. [Text]: textbook / V. M. Gold, N. A. Gaevsky, T. I. Golovanova, N. P. Belonog, T. B. Gorbaneva. - Krasnoyarsk, IPK SFU, 2008. 148 p.

13. Kuznetsov V.V. Plant Physiology / V.V. Kuznetsov. - M.: Higher school, 2006. - 742 p.

14. Andreev V.P. Lectures on plant physiology [Electronic resource]: textbook / Andreev V.P.— Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2012. - 299 p. - Access mode: http://www.iprbookshop.ru/20552.

15. Kabashnikova L.F. Photosynthetic apparatus and stress in plants [Electronic resource] / Kabashnikova L.F. - Electron. text data. - Minsk: Belarusian Science, 2014. - 272 p. - Access mode: http://www.iprbookshop.ru/29569.

16. Yakushkina, N. I. Plant Physiology: a textbook for universities / N. I. Yakushkina, E. Yu. Bakhtenko. - M.: Vlados, 2005. - 463 p.

17. Zitte, P. Botany: Plant Physiology / ed. V.V. Chuba. Textbook for universities: in 4 volumes: / P. Sitte, E. V. Weiler, J. V. Kaderait, A. Brezinski, K. Kerner; based on the textbook by E. Strasburger [et al.] ; per. with him. O.V.Artemieva, T.A.Vlasova, I.G.Karnaukhova, N.B.Kolesova, M.Yu.Cherednichenko. - M .: Publishing Center "Academy", 2008. - 496 p. T. 2.

18. Voskresenskaya O.L., Grosheva N.P., Sochilova E.A. Plant Physiology: Textbook. / Mar. state un-t. - Yoshkar-Ola, 2008. - 148 p.

19. Erzhapova, R.S., "Plant physiology: water regime of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing house of ChSU, 2015. S. 85.

20. Erzhapova, R.S., Plant Physiology: Plant Respiration. [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing House of ChSU, 2015. S. 90.

* 1. Periodicals

Botanical Journal of the Russian Academy of Sciences (1916—) https://ru.wikipedia.org/wiki/

Botanical Notes (ScriptaBotanica). https://en.wikipedia.org/w/index.php

News of taxonomy of higher plantshttps://ru.wikipedia.org/w/index.php

News of taxonomy of lower plantshttps://ru.wikipedia.org/w/index.php

Phytodiversity of Eastern Europe IEVB RAS[https://en.wikipedia.org/w/index.php](https://ru.wikipedia.org/w/index.php)

1. **Modern professional databases and information reference systems**

Internet resources:

1. http://en.wikipedia.org/wiki/

2. www.avanta.ru

3. http//dic.academic.ru

2. Scientific electronic library e-library.ru

3. Agricultural electronic knowledge library (SEKBiZ): http://www.cnshb.ru/akdil/default.htm

4. Nature of Russia. National portal. - http://www.priroda.ru/

5. Wildlife Conservation Center: http://biodiversity.ru/

6. Open illustrated atlas of vascular plants in Russia and neighboring countries: http: //www.plantarium.ru/

1. **Software Composition**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

1. **Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base of the laboratory:

Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

Educational and visual aids:

1. Color tables: a) “Cell structure”, b) “Plant tissues”, c) “Vegetative organs of plants”, d) “Generative organs of plants”, e) “Botanical families”, etc.

2. Herbarium (medicinal plants, botanical families, etc.).

3. Collection of seeds.

4. Models by morphology.

5. Portraits of famous prominent scientists and figures in the field of botany.

6. Microscopes and micropreparations.

7. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

Laboratory equipment: 1. Dissecting magnifier with a table.

2. Manual magnifying glass.

3. Ruler.

4. Scissors.

5. Dissecting needles.

6. Blades.

7. Spirit lamp.

8. Cover glasses.

9. Slides.

10. The flask is conical.

11. Chemical glasses.

12. Glass funnel.

13. Glass stick.

14. Petri dishes.

15. Evaporating cup.

16. Eye dropper.

17. Vials.

18. Plastic cups.

19. Test tubes.

20. Stand for test tubes.

21. Cuvettes.

22. Filter paper.

23. Cotton wool.

24. Gauze.

25. Matches.

26. Towel.

27. Reagents in accordance with the curriculum.

28. Garden set.

29. Herbarium grid.

30. Folder for herbarium

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"Chechen State University"

Work program of disciplines

**SOIL SCIENCE WITH THE BASICS OF PLANT PRODUCTION**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to apply knowledge of biological diversity and use methods of observation, identification, classification, reproduction and cultivation of living objects to solve professional problems | GPC-1.2; GPC-1.3 |

* + - 1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-1 | GPC-1.2;  GPC-1.3 | **Can**apply methods of observation, classification, reproduction of biological objects in natural and laboratory conditions; use the acquired knowledge to analyze the interactions of organisms of various species with each other and with the environment  **owns**experience in participation in the monitoring and protection of biological resources, the use of biological objects to analyze the quality of their habitat |

* + - 1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 144/4 | 144/4 |  |
| **contact work**: | | 51 | 54 |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 32 | 36 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 60 | 54 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

1. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***
   1. Distribution of hours by sections/topics and types of work

4.1.1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* |  | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction.  Soil science is the science of soil. | 1 |  | 2 |  |  |  | 3 |
| 2. | Organisms and their role in the process of soil formation and fertility. | 1 |  | 2 |  |  |  | 6 |
| 3. | Soil selection and preparation. samples for analysis | 1 |  | 2 |  |  |  | 6 |
| 4. | The influence of agricultural technology on the intensity of microbiol. processes in the soil. | 1 |  | 4 |  |  |  | 6 |
| 5. | Determination of the granulometer composition, soil structure. | 1 |  | 2 |  |  |  | 6 |
| 6. | Morphological features of soils. | 1 |  | 2 |  |  |  | 6 |
| 7. | Organic part of the soil | 1 |  | 2 |  |  |  | 6 |
| 8. | Preparation of water extract | 1 |  | 2 |  |  |  | 6 |
| 9. | The processes of transformation of organic residues in the soil. | 1 |  | 2 |  |  |  | 6 |
| 10. | Determination of soil acidity by the potentiometric method | 1 |  | 2 |  |  |  | 6 |
| eleven. | Determination of moisture capacity of soil and hygroscopic water | 1 |  | 2 |  |  |  | 6 |
| 12. | Soil structure. | 1 |  | 2 |  |  |  | 6 |
| 13. | Soil fertility.  Features of the structure and properties of chestnut soils. | 2 |  | 2 |  |  |  | 6 |
| 14. | Determination of humus in the soil according to Tyurin. | 1 |  | 2 |  |  |  | 6 |
| 15. | Determination of humus content in chernozems | 1 |  | 2 |  |  |  | 6 |
| 16. | Fundamentals of agriculture, basics of crop production. | 1 |  | 2 |  |  |  | 6 |

4.1.2. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Introduction.  Soil science is the science of soil. | 1 |  |  |  | 1 |  | 6 |
| 2. | Organisms and their role in the process of soil formation and fertility. | 1 |  |  |  | 1 |  | 6 |
| 3. | Soil selection and preparation. samples for analysis | 1 |  |  |  | 1 |  | 6 |
| 4. | The influence of agricultural technology on the intensity of microbiol. processes in the soil. | 1 |  |  |  | 1 |  | 8 |
| 5. | Definition of granulometer. composition, structure of the soil. | 1 |  |  |  | 1 |  | 8 |
| 6. | Morphological features of soils. | 1 |  |  |  | 1 |  | 8 |
| 7 | Organic part of the soil | 1 |  |  |  | 1 |  | 8 |
| 8 | Preparation of water extract | 1 |  |  |  | 1 |  | 8 |
| 9 | The processes of transformation of organic residues in the soil. | 1 |  |  |  | 1 |  | 8 |
| 10 | Introduction.  Soil science is the science of soil. | 1 |  |  |  | 1 |  | 8 |
| eleven | Organisms and their role in the process of soil formation and fertility. | 1 |  |  |  | 1 |  | 8 |
| 12 | Soil selection and preparation. samples for analysis | 1 |  |  |  | 1 |  | 8 |
| 13 | The influence of agricultural technology on the intensity of microbiol. processes in the soil. | 1 |  |  |  | 1 |  | 8 |
| 14 | Definition of granulometer. composition, structure of the soil. | 1 |  |  |  | 1 |  | 8 |
| 15 | Morphological features of soils. | 1 |  |  |  | 1 |  | 8 |

4.2. The program of the discipline, structured by topics / sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| No. p / p | Name of the topic (section) of the discipline | The content of the lecture |
|  | Introduction.  Soil science - the science of soil | Topic 1. Introduction. Soil science is the science of soil.  Soil as a component of the biosphere and terrestrial biogeocenoses. The causal significance of soil in the functioning of the biosphere and biogeocenoses. Soil science as a natural - historical science. The soil is the owner of productive capacity, the carrier of fertility, the main means of agricultural production. Importance of soil science in agriculture and forestry. Soil definition. Place and role of soil in nature. The protection and rational use of soil is an integral part of environmental protection in general and rational nature management. The relationship of soil science with related, natural, agronomic and economic sciences. Soil property - soil fertility. |
| 2 | Organisms and their role in the process of soil formation and fertility. | Numerous organisms that inhabit the soil are microorganisms (bacteria, fungi, actinomycetes, algae,) and vertebrates and invertebrates. The number of bacteria in the soil depends on its type and cultural condition. With depth, the number of bacteria decreases. Especially a lot of them are found on the surface horizon of the soil, rich in organic matter. According to the mode of nutrition, bacteria are divided into autotrophic and heterotrophic. Autotrophic bacteria absorb carbon from carbon dioxide. Heterotrophic bacteria assimilate carbon in ready-made organic compounds. Bacteria also require ash nutrients (phosphorus, potassium, sulfur, calcium, trace elements, etc.). The processes of nutrition and respiration of bacteria are carried out by various biological catalysts called enzymes,  Relationshipsmicroorganisms in the soil.  All interactions between microorganisms and microorganisms and plants can be reduced to the following main types: symbiosis, metabiosis, antagonism, parasitism. A more common type of relationship between microorganisms in the soil is metabiosis. |
| 3 | Organisms and their role in the process of soil formation and fertility. | Numerous organisms that inhabit the soil are microorganisms (bacteria, fungi, actinomycetes, algae,) and vertebrates and invertebrates. The number of bacteria in the soil depends on its type and cultural condition. With depth, the number of bacteria decreases. Especially a lot of them are found on the surface horizon of the soil, rich in organic matter. According to the mode of nutrition, bacteria are divided into autotrophic and heterotrophic. Autotrophic bacteria absorb carbon from carbon dioxide. Heterotrophic bacteria assimilate carbon in ready-made organic compounds. Bacteria also require ash nutrients (phosphorus, potassium, sulfur, calcium, trace elements, etc.). The processes of nutrition and respiration of bacteria are carried out by various biological catalysts called enzymes,  The relationship of microorganisms in the soil.  All interactions between microorganisms and microorganisms and plants can be reduced to the following main types: symbiosis, metabiosis, antagonism, parasitism. A more common type of relationship between microorganisms in the soil is metabiosis. The rapid mineralization of organic matter in the soil occurs only due to the joint activity of various groups of microorganisms. The number of microorganisms in different types of soils is different. |
| 4 | Soil selection and preparation. samples for analysis | Samples delivered to the laboratory should be air-dry immediately. The storage of raw samples is not allowed, as soil properties change under the influence of microbiological processes. Most analyzes are carried out with air-dry samples, ground and sifted through a 1 mm sieve. Aggregate analysis should be carried out on unrubbed samples (some tests, such as nitrate determination, are performed on fresh samples). In this case, the sample is scattered on paper, the roots and stony particles are removed with tweezers and, after thorough mixing, a sample is immediately taken for moisture determination and for appropriate analysis). To dry, the sample is scattered in a thin layer on a large sheet of thick paper, roots and other plant residues are removed with tweezers and, having covered the top with another sheet of paper, leave for 2-3 days. The sample drying room must be dry and protected from ammonia, acid fumes and other gases. The dried sample is divided diagonally into four parts. Two opposite parts are taken for grinding, while the other two are kept unchanged. The soil is ground in a mortar with a pestle and sifted through a sieve with holes of 1 mm.  Rubbing and sieving is repeated until only solid stony particles larger than 1 mm (soil skeleton) remain on the sieve. The soil sifted through a sieve is placed in a jar with a ground-in lid or in a box. The entire soil skeleton is wrapped in paper and placed in the same jar or box. If it is necessary to determine the amount of the skeleton, it is necessary to weigh the soil intended for grinding on technical scales, and then weigh the soil skeleton and calculate its amount as a percentage of the soil sample.  To determine humus and nitrogen, the soil is subjected to special preparation, which consists in carefully removing all roots and additional rubbing. To do this, the soil, sifted through a sieve with holes of 1 mm, is poured onto paper, leveled with a thin layer and divided into a number of squares with an area of ​​about 4x4 cm. A small amount of soil is taken from each square, making an average sample of about 5 g. The selected sample is again spread in a thin layer on a sheet of paper and large roots are carefully selected with tweezers (using a magnifying glass). Small roots are taken with a glass rod electrified with a piece of woolen cloth; for this, the stick is repeatedly carried out over a layer of soil at a height of 3-5 cm. All roots are attracted to the stick. This operation must be carried out carefully  In the process of selecting roots, the soil is mixed several times and again spread in a thin layer. The purity of the selection of roots should be checked with a magnifying glass. At the end of the selection of roots, the soil is ground in a porcelain or agate mortar and sifted through a sieve with holes of 0.25 mm. The soil left behind on the sieve is again ground in a mortar and sieved, repeating this operation until the entire sample is sifted. It is impossible to leave part of the sample unsifted, as this can distort the indicators of the humus content in the soil. The sample prepared in this way should be stored in a small paper bag or in a jar with a ground stopper.  Forest litter and peat samples, due to their high moisture capacity, contain a large amount of water and require drying for several days. For this purpose, the samples are laid out in a thin layer on a large sheet in well-ventilated rooms, stirring many times daily. After drying, the samples are ground first by grinding in porcelain mortars, then in a mill and sieved through a sieve with holes with a diameter of 2-3 mm. Then an average sample of 50-200 g is taken, crushed again and sifted through a sieve with holes with a diameter of 1 mm. Particles remaining on the sieve are again triturated and sieved until the entire sample is sieved. Ready samples are stored in the same way as soil samples. |
|  | The influence of agricultural technology on the intensity of microbiol. processes in the soil. | The content and composition of the microflora, as well as the intensity of microbiological processes, depend on the natural state of the soil and the human impact on it. The intensity of microbiological processes in different soils is different. Soil cultivation, especially plowing, has a certain effect on its water, air and thermal regimes. When favorable conditions are created in the soil, the development of microorganisms that contribute to the mobilization of nutrients is enhanced. Different methods of tillage affect the soil microflora and the mobilization of nutrients in the arable layer differently. When tilling the soil, organic matter is mineralized, which leads to the accumulation of nutrients. An essential factor determining the microbiological activity of the soil is the application of organic and mineral fertilizers. |
|  | Determination of the granulometer composition, soil structure | The mechanical composition is the relative content of mechanical elements of various diameters in the soil. The soil mass always consists of particles of various sizes - from a few micrometers to several millimeters.  Elementary particles are combined into groups or fractions: particles larger than 3 mm - stones, 3 -1 - gravel, 1 - 0.5 - coarse sand, 0.5 - 0.25 - medium sand, 0.25 - 0.05 - fine sand, 0.05 - 0.01 - coarse dust, 0.01 - 0.005 - medium dust, 0.005 - 0.001 - fine dust, 0.001 - 0.0005 - coarse silt, 0.0005 - 0.0001 - fine silt, < 0.0001 mm (<0.1 µm) - colloids.  Each fraction is characterized by a sum of physical properties that distinguish it from other fractions. For classification purposes, all particles larger than 0.01 mm are often combined into the physical sand fraction, and all particles smaller than 0.01 mm into the physical clay fraction.  The term "physical" means the presence in one or another fraction of the physical properties of sand or clay, without predetermining the chemical composition of the fraction. In addition, usually all particles smaller than 1 mm are called soil fine earth, and larger than 1 mm - soil skeleton. |
|  | Morphological features of soils. | The vertical thickness of any soil, which is called the soil profile, has a certain structure - it is divided into a number of genetically interconnected horizons. Each horizon is characterized by a set of external (morphological) features. As a collection of horizons. Of which the soil profile consists, the external features of each horizon reflect the nature of the soil-forming process, which is why different types of soils can be distinguished from each other by the totality of external features. |
|  | Organic part of the soil | The organic part of the soil consists of organic residues (roots and ground litter) and humus. The source of humus is the organic remains of higher plants, microorganisms and animals living in the soil. Roots serve as the main source of humus formation under grassy vegetation. In soils under forests, the main source of humus formation is the litter, the amount of which depends on the zone, composition, age, and density of stands, as well as on the development of grass and moss cover. The roots of woody vegetation are perennial and their participation in the formation of humus is small. The primary and main source of organic matter from which humus is formed are the remains of green plants in the form of ground litter and roots. Organic residues always contain some amount of ash elements: potassium. calcium, magnesium, silicon, phosphorus,  The transformation of organic residues into humus takes place in the soil with the participation of microorganisms, animals, air oxygen and water. The remains of green plants that enter the soil or are on its surface are decomposed by microorganisms and used by them as a source of energy and nutrition. In the process of decomposition, these remains lose their anatomical structure, and their constituent substances pass into more mobile and simpler compounds. One part of these compounds is completely mineralized by microorganisms, and the decay products are assimilated by new generations of green plants, while the other part of the decomposition products is used by heterotrophic microorganisms for the synthesis of secondary proteins, fats, carbohydrates and other substances that form the plasma of new generations of microorganisms and subsequently decompose again. And some of the intermediate decomposition products are converted into specific complex high-molecular substances - humic acids. Microscopic and macroscopic animals take an active part in the transformation of organic residues into humus, which move the entire mass of organic residues and products of their decomposition and humification with the soil, process them and throw out the unused part in the form of excrement into the soil. The role of earthworms developing in the soil is especially great. Thus. The transformation of organic residues into humus (humus formation) is a set of processes of decomposition of the initial organic residues, synthesis of secondary forms of microbial plasma and their humification. Microscopic and macroscopic animals take an active part in the transformation of organic residues into humus, which move the entire mass of organic residues and products of their decomposition and humification with the soil, process them and throw out the unused part in the form of excrement into the soil. The role of earthworms developing in the soil is especially great. Thus. The transformation of organic residues into humus (humus formation) is a set of processes of decomposition of the initial organic residues, synthesis of secondary forms of microbial plasma and their humification. Microscopic and macroscopic animals take an active part in the transformation of organic residues into humus, which move the entire mass of organic residues and products of their decomposition and humification with the soil, process them and throw out the unused part in the form of excrement into the soil. The role of earthworms developing in the soil is especially great. Thus. The transformation of organic residues into humus (humus formation) is a set of processes of decomposition of the initial organic residues, synthesis of secondary forms of microbial plasma and their humification. The role of earthworms developing in the soil is especially great. Thus. The transformation of organic residues into humus (humus formation) is a set of processes of decomposition of the initial organic residues, synthesis of secondary forms of microbial plasma and their humification. The role of earthworms developing in the soil is especially great. Thus. The transformation of organic residues into humus (humus formation) is a set of processes of decomposition of the initial organic residues, synthesis of secondary forms of microbial plasma and their humification. |
|  | Preparation of water extract | On technochemical scales, 100 g of air-dry soil, sifted through a sieve with holes of 1 mm, is weighed in a porcelain cup. The sample is carefully poured through a funnel with a wide and short tube into a glass jar with a ground stopper. 500 ml of distilled water is poured into the jar, the entire contents of the jar are shaken for 3 minutes and immediately filtered through a dense pleated filter, transferring all the soil to it (water extracts from peat and forest litter are prepared at a ratio of 1:20, i.e. take  25g of air-dry peat and 500ml of distilled water). For filtration, funnels with a diameter of 12–15 cm are used. The first cloudy portions of the filtrate are transferred back to the filter; the filtrate is collected in a flask with a capacity of 500-700 ml. During filtration, the filtration speed, color and transparency of the extract are recorded. Analysis of the water extract must be carried out immediately after the filtration is completed, since water extracts easily rot in 1-2 days after preparation. |
|  | The processes of transformation of organic residues in the soil. | On technochemical scales, take 8 g of air-dry soil in a glass with a capacity of 50 ml, add 20 ml of fresh distilled water or 20 ml of 1N. KCL solution. In peat and forest litter, a ratio of 1:25 is taken. 1 g of air-dry, carefully crushed peat is poured into 25 ml of the solution. Water should have a reaction close to neutral, KCL solution - pH about 5.6.  the contents of the cups are moved and the pH value is measured.  Before operation, the potentiometer (pH meter) must be adjusted to a series of buffer solutions with known pH values. Getting started, the electrodes are washed with distilled water, excess water is removed with filter paper. Then, taking the beaker with the test solution in the right hand, the sensor table is taken to the left side with the left hand. Substitute the glass under the electrodes (it is necessary to ensure that the electrodes do not touch the bottom and walls of the glass), bring the table to its original place and fix it with a back clamp. Install the switch  "types of work" and "measurement limits" to the corresponding pH position -  2, +14. Turn on the device in the network and warm up the device for 10-15 minutes.  Then, on the lower scale -2, +14, pH readings are made. For a more accurate pH measurement, set the “measurement limits” switch to pH +2, +8 or +6, +10 (depending on the pH of the measured solution). The galvanometer pointer should not go beyond the scale to calculate the total pH value to +2 or +6, add the value indicated by the arrow on the upper scale. Similarly, you can determine the EMF scale (millivolts). At the end of the work, the electrodes are again washed with distilled water and immersed in a glass of distilled water. |
|  | Determination of moisture capacity of soil and hygroscopic water | Topic 5. Determination of nutrients in the soil (determination of calcium and magnesium)  To determine, take with a pipette 25-50 ml of an aqueous extract (depending on the size of the precipitate) into a beaker with a capacity of 100 ml (they are determined by the Ca-complexometric method), heat until vapors appear (up to 70-800 C), add 2 ml of sodium sulfide solution to bind copper ions interfering with the determination, and 5 drops of hydroxylamine to eliminate the harmful effects of manganese ions. Then add 5 ml of ammonium chloride buffer solution for alkalization to pH 10 and 12-15 drops of indicator complexon - black chromogen. In this case, the solution turns wine-red due to the Ca and Mg complexes formed. The solution is titrated with Trilon B until the color changes from wine-red to blue-blue or blue. It should be borne in mind that complex formation during titration with Trilon b does not occur instantly, therefore, when the titration approaches the end (purple color), titrate slowly, adding Trilon B solution drop by drop and thoroughly mixing the sample after each addition. The content of Ca and Mg in the titrated solution should not exceed 0.5 mEq., i.e. titration should not exceed 10 ml of 0.05 N. or 5 ml 0.1 n. Trilon B solution. The required content of Ca and Mg in the solution can be adjusted by reducing the volume of the solution to be titrated (from 100 to 5 ml) and changing the concentration of Trilon B solution from 0.01 N.  The number of Ca2+ and Mg2+ exchange cations is calculated in milliequivalents by the formula, Wherethe amount of Trilon B solution used for  titration, ml;  - normality of Trilon B solution;  - coefficient for the conversion taken to analyze the solution for the entire volume (if 50 ml out of 250 are taken,  The amount of Mg2+ is calculated from the difference between the second (Ca2+Mg2+) and the first (Ca2+) determinations.  All water extract analysis data is recorded in a summary table. |
|  | Soil structure. | Separations (lumps, aggregates) of various sizes and shapes into which the soil breaks up - the structure of the soil. The structure has a great influence on agronomic properties and soil fertility. Cultivated soil is structural soil. The structure affects a number of agronomically important properties of the soil, which ultimately affects the yield of crops. In structural soils, in comparison with structureless soils, more favorable conditions for water, air, thermal, thermal and nutritional regimes are created. The most favorable in the agronomic sense is a lumpy-granular macrostructure with aggregate sizes from 0.25 to 10 mm. An important property of the structure is its water resistance (the ability of aggregates to withstand the eroding action of water). However, not every water-resistant structure is agronomically valuable. If water-resistant structural units have loose packing, and, consequently, high porosity, then they easily perceive water, and root hairs and microorganisms freely penetrate into their pores. This structure is the most valuable. If the structural units are densely packed, then their porosity is very low, the pores are thin, which water hardly penetrates and hairs and microorganisms do not penetrate. The water resistance of such a structure is determined by the fact that water penetrates them weakly, and they do not soak for a long time. which water hardly penetrates and hairs and microorganisms do not penetrate. The water resistance of such a structure is determined by the fact that water penetrates them weakly, and they do not soak for a long time. which water hardly penetrates and hairs and microorganisms do not penetrate. The water resistance of such a structure is determined by the fact that water penetrates them weakly, and they do not soak for a long time. |
|  | Soil fertility.  Features of the structure and properties of chestnut soils. | The ability of the soil to satisfy the need of plants for nutrients, water, to provide their root systems with sufficient air and heat for activity is called soil fertility. Fertility is an essential quality property of the soil. Soil fertility is the result of the development of a natural soil-forming process. Every soil has natural, or natural, fertility. It is due to the potential reserves of nutrients, the number of forms readily available to plants, the content of humus and its composition, the thickness of humus horizons, the mechanical composition of the soil, the intensity of microbiological processes, the characteristics of the water-air, salt and other soil regimes, its reaction, etc. Fertile soil contains a sufficient amount of nutrients readily available to plants, provides plants with moisture during their growth, has good physical properties that contribute to the development of a powerful root system and normal air exchange in the root layer, is characterized by a favorable reaction for plants and microorganisms, does not contain toxic and harmful substances. Natural fertility is closely related to growing vegetation. Plants require heat, moisture, oxygen and nutrients to grow and develop. The soil provides the plant's need for ash nutrients and nitrogen, moisture, a certain temperature regime and air oxygen for the roots to breathe. All these factors for life are equivalent for plants. characterized by a favorable reaction for plants and microorganisms, does not contain toxic and harmful substances. Natural fertility is closely related to growing vegetation. Plants require heat, moisture, oxygen and nutrients to grow and develop. The soil provides the plant's need for ash nutrients and nitrogen, moisture, a certain temperature regime and air oxygen for the roots to breathe. All these factors for life are equivalent for plants. characterized by a favorable reaction for plants and microorganisms, does not contain toxic and harmful substances. Natural fertility is closely related to growing vegetation. Plants require heat, moisture, oxygen and nutrients to grow and develop. The soil provides the plant's need for ash nutrients and nitrogen, moisture, a certain temperature regime and air oxygen for the roots to breathe. All these factors for life are equivalent for plants. |
|  | Determination of humus in the soil according to Tyurin. | From a soil sample sifted through a sieve with holes of 0.25 mm, a sample of 0.1 to 0.5 g is taken on an analytical balance, depending on the amount of humus in the soil. The sample is carefully transferred into a 100 ml conical flask and poured from a burette with 10 ml of 0.4 N. solution of K2Cr 2O7 prepared in diluted 1:1 sulfuric acid.  A small funnel is inserted into the neck of the flask, serving as a refrigerator, and placed on an Eternite stove, gas burner, or sand bath. The contents of the flask are boiled for exactly 5 minutes, avoiding strong boiling and overheating. When heated, humus oxidation begins, noticeable by small bubbles of CO2 released.  potassium dichromate is spent on the oxidation of humus according to the scheme:  2K2Cr2O7 + 8H2 SO4 = 2K2SO4 + 2Cr2(SO4)3 + 8H2O + 3O2; 3O2 + 3C (humus) = 3CO2.  Then the contents of the flask are cooled, 5-8 drops of phenylanthranilic acid are added as an indicator and titrated with 0.2 N. Mohr's salt solution FeSO4. (NH4) 2.SO4 .6HO until the dark brown color of the solution changes from violet and blue to dirty greenish. When the solution turns blue, it is necessary to titrate very carefully, adding 1 drop of Mohr's salt solution and thoroughly stirring the liquid to be titrated (0.1 N Mohr's salt solution can be used for titration). The reaction between potassium dichromate, remaining after the oxidation of humus, and Mohr's salt consists in the reduction of potassium dichromate to chromium oxide and proceeds according to the equation  К2Сr2О7+6FeSO4+7Н2SO4 =Сr2(SO4)3+К2SO4+3Fe2(SO4)3 +7Н2 О  At the same time, the ratio between K2Cr2O7 and Mohr's salt is established, for which 10 ml of 0.4N are taken with a burette. K2Cr2O7 solution into a 100 ml conical flask, the contents of the flask are titrated in the same way as described above (without boiling).  It was experimentally established that 1 ml of 0.2 n. Mohr's salt solution corresponds to such an amount of chromic acid that oxidizes 0.0010362 g of humus or 0.0006 g of carbon. Therefore, the amount of humus is calculated by the formula  *X*(a*b*)0.0010362r100K, c  where X is the amount of humus, % to dry soil;  a is the number of milliliters Mohr's salt solution in a blank determination; b – the same, during back titration after humus oxidation;  r is the correction for the normality of the Mohr's salt solution, if it is not exactly 0.2 N; 100 - conversion factor per 100g of soil; K - coefficient for conversion to dry soil (adjustment for the content of hygroscopic water); c – soil sample taken for analysis, g. |
|  | Determination of humus in the soil according to Tyurin. | From a soil sample sifted through a sieve with holes of 0.25 mm, a sample of 0.1 to 0.5 g is taken on an analytical balance, depending on the amount of humus in the soil. The sample is carefully transferred into a 100 ml conical flask and poured from a burette with 10 ml of 0.4 N. solution of K2Cr 2O7 prepared in diluted 1:1 sulfuric acid.  A small funnel is inserted into the neck of the flask, serving as a refrigerator, and placed on an Eternite stove, gas burner, or sand bath. The contents of the flask are boiled for exactly 5 minutes, avoiding strong boiling and overheating. When heated, humus oxidation begins, noticeable by small bubbles of CO2 released.  potassium dichromate is spent on the oxidation of humus according to the scheme:  2K2Cr2O7 + 8H2 SO4 = 2K2SO4 + 2Cr2(SO4)3 + 8H2O + 3O2; 3O2 + 3C (humus) = 3CO2.  Then the contents of the flask are cooled, 5-8 drops of phenylanthranilic acid are added as an indicator and titrated with 0.2 N. Mohr's salt solution FeSO4. (NH4) 2.SO4 .6HO until the dark brown color of the solution changes from violet and blue to dirty greenish. When the solution turns blue, it is necessary to titrate very carefully, adding 1 drop of Mohr's salt solution and thoroughly stirring the liquid to be titrated (0.1 N Mohr's salt solution can be used for titration). The reaction between potassium dichromate, remaining after the oxidation of humus, and Mohr's salt consists in the reduction of potassium dichromate to chromium oxide and proceeds according to the equation  К2Сr2О7+6FeSO4+7Н2SO4 =Сr2(SO4)3+К2SO4+3Fe2(SO4)3 +7Н2 О  At the same time, the ratio between K2Cr2O7 and Mohr's salt is established, for which 10 ml of 0.4N are taken with a burette. K2Cr2O7 solution into a 100 ml conical flask, the contents of the flask are titrated in the same way as described above (without boiling).  It was experimentally established that 1 ml of 0.2 n. Mohr's salt solution corresponds to such an amount of chromic acid that oxidizes 0.0010362 g of humus or 0.0006 g of carbon. Therefore, the amount of humus is calculated by the formula  X  (a b)0.0010362r 100K , s  where X is the amount of humus, % to dry soil;  a is the number of milliliters Mohr's salt solution in a blank determination; b – the same, during back titration after humus oxidation;  r is the correction for the normality of the Mohr's salt solution, if it is not exactly 0.2 N; 100 - conversion factor per 100g of soil; K - coefficient for conversion to dry soil (adjustment for the content of hygroscopic water); c – soil sample taken for analysis, g. |
|  | Fundamentals of agriculture, basics of crop production | Plants in the process of growth, development and creation of a crop require a constant, in the required amount of influx of life factors - cosmic and terrestrial. Cosmic factors include light and heat, while terrestrial factors include carbon dioxide, oxygen, water, nitrogen, phosphorus, potassium, calcium, and other ash elements. The cosmic factors of plant life are essentially not regulated in agriculture. In agriculture, a number of regularities have been formulated for the action of plant life factors in the process of creating a crop (laws of agriculture):  1. The law of equivalence and irreplaceability of plant life factors.  2. The law of the minimum (minimum, optimum, maximum).  3. The law of the combined action of plant life factors.  4. Law of return  5. Law of diminishing soil fertility.  Crop production is the study of cultivated plants and their cultivation. Scientific plant growing is based on the principles of modern biological science, which studies the development of plants, their requirements for environmental conditions. The data of many related disciplines (soil science, agrochemistry, plant physiology, agriculture, chemistry, physics, etc.) are also widely used in crop production.  The biological basis of crop production is the knowledge of:  1) characteristics of cultivated plants and their needs for environmental factors;  2) environmental conditions, use and change them in the right direction;  3) hereditary characteristics of plants and the development on their basis of appropriate agricultural technology.  The tasks of crop production are the study of the patterns of crop formation, the identification of reserves for increasing the production of field products, the development of the theory and technology for obtaining high yields of the best quality at the lowest cost of labor and funds.  Field crops in crop production differ in botanical, biological and economic characteristics, in terms of product type, cultivation features, and placement in crop rotations, in the degree of mechanization, harvesting methods and other indicators. For the convenience of studying a large number of various field crops, they are divided according to the production principle into 4 large groups - grain, technical, fodder and melons. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of laboratory classes*** |
|  | Section 1. Introduction.Subject and tasks of biology | 1. Light microscope device, temporary preparations, drawing. The structure of the cell of the epidermis of the juicy scales of the onion bulb. |
|  | Section 2. Chemical composition of living systems. The biological role of proteins, polysaccharides, lipids and ATP. Nucleic acids. Protein biosynthesis | 1. Plastids, their functions in a plant cell, chloroplasts, leukoplasts, chromoplasts.  2. The phenomenon of plasmolysis in Elodea leaf cells, reserve starch. Aleurone grains in endosperm cells of wheat grains and bean cotyledons  3.Chemical composition of the cell, metabolism and energy generation. Photosynthesis. |
|  | Section 4. The structure and functions of germ cells (gametes). Asexual reproduction. Forms and biological role. Hollow reproduction. Its forms and biological role |  |
|  | Section 5. Cell life cycle. Mitosis.Meiosis: characteristics, biological significance | Mitotic (cellular) cycle in onion root tip cells |
|  | Section 6Gametogenesis. Ontogenesis | Protein biosynthesis, determination of protein with a biuret reagent in blood serum |
|  | Section 7Laws of inheritance. Heredity. Heredity and variability | Genetic analysis. Laws of Mendel. |
|  | Section 8Plant selection. Animal breeding | Chromosomal theory of heredity, non-chromosomal theory of inheritance, mutations. |
|  | Section 9Structure and functions of the biosphere |  |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| No. p / p | Controlled sections (topics) | Name of the evaluation tool |
| 1. | Introduction.  Soil science - the science of soil | UO, R, T, LR |
| 2. | Organisms and their role in the process of soil formation and fertility. |  |
| 3. | Soil selection and preparation. samples for analysis |  |
| 4. | The influence of agricultural technology on the intensity of microbiol. processes in the soil. |  |
| 5. | Determination of the granulometer composition, soil structure. |  |
| 6. | Morphological features of soils. |  |
| 7. | Organic part of the soil |  |
| 8. | Preparation of water extract |  |
| 9. | The processes of transformation of organic residues in the soil |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.3 Main literature

Valkov, V.S. Soil science. [Text]: textbook / V.S. Valkov, K.Sh.Kazeev, S.I. Kolesnikov. M: Yurayt Publishing House. - 2012. -527 p.

Zvyagintsev, D.G. Soil biology. [Electronic resource] - Electron. Dan. - M. : Moscow State University named after M.V. Lomonosov, 2005. - 445 p. - Access mode: http://e.lanbook.com/book/10112.

6.2. additional literature

gavtsDraeva I.A., Savin I.Yu., Edelgeriev A.S-Kh., Bayrakov I.A., Borzaev R.B., Kuzmina A.A. Resource potential of the lands of the Chechen Republic for the cultivation of fruit crops. Monograph. North Caucasian Zonal Research Institute of Horticulture and Viticulture, Krasnodar-Grozny, 2011. 198 p.

Vashchenko I.M. Fundamentals of soil science, agriculture and agrochemistry [Electronic resource]: textbook / Vashchenko I.M., Mironychev K.A., Konichev V.S. - Electron. text data.— M.: Prometheus, 2013.— 174 p.— Access mode: http://www.iprbookshop.ru/26943.

Novitsky M.V. Laboratory and practical classes in soil science [Electronic resource]: textbook / Novitsky M.V., Donskikh I.N., Chernova D.V.— Electron. text data.— St. Petersburg: Prospekt Nauki, 2009.— 320 pp.— Access mode: http://www.iprbookshop.ru/35837.

Kulikov Ya.K. Soil resources [Electronic resource]: textbook / Kulikov Ya.K.— Electron. text data. - Minsk: Higher School, 2013. - 320 p. - Access mode: http://www.iprbookshop.ru/24073.

Motuzova G.V. Ecological monitoring of soils [Electronic resource]: textbook / Motuzova G.V., Bezuglova O.S.— Electron. text data. - M .: Academic Project, 2007. - 240 p. - Access mode: http://www.iprbookshop.ru/36657.

Prineva L.A. Soil fertility, its maintenance systems and anti-erosion measures in the seed garden [Electronic resource] / Prineva L.A. - Electron. text data. - M .: All-Russian Selection and Technological Institute of Horticulture and Nursery of the Russian Academy of Agricultural Sciences, 2013. - 274 p.

Trushina T.P. Ecological bases of nature management. Rostov n/a, 2007.

* 1. Periodicals

1. "Biological Diversity of the Caucasus" (Grozny, Chechen State University, 27-29 o6.

Main literature

1. Valkov, V.S. Soil science. [Text]: textbook / V.S. Valkov, K.Sh.Kazeev, S.I. Kolesnikov. M: Yurayt Publishing House. - 2012. -527 p.

2. Zvyagintsev, D.G. Soil biology. [Electronic resource] - Electron. Dan. - M. : Moscow State University named after M.V. Lomonosov, 2005. - 445 p. - Access mode: http://e.lanbook.com/book/10112.

6.2. additional literature

1. Drayeva I.A., Savin I.Yu., Edelgeriev A.S-Kh., Bayrakov I.A., Borzaev R.B., Kuzmina A.A. Resource potential of the lands of the Chechen Republic for the cultivation of fruit crops. Monograph .North Caucasian Zonal Research Institute of Horticulture and Viticulture, Krasnodar-Grozny, 2011. 198 p.

2. Vashchenko I.M. Fundamentals of soil science, agriculture and agrochemistry [Electronic resource]: textbook / Vashchenko I.M., Mironychev K.A., Konichev V.S. - Electron. text data.— M.: Prometheus, 2013.— 174 p.— Access mode: http://www.iprbookshop.ru/26943.

3. Novitsky M.V. Laboratory and practical classes in soil science [Electronic resource]: textbook / Novitsky M.V., Donskikh I.N., Chernova D.V.— Electron. text data.— St. Petersburg: Prospekt Nauki, 2009.— 320 pp.— Access mode: http://www.iprbookshop.ru/35837.

4. Kulikov Ya.K. Soil resources [Electronic resource]: textbook / Kulikov Ya.K.— Electron. text data. - Minsk: Higher School, 2013. - 320 p. - Access mode: http://www.iprbookshop.ru/24073.

5. Motuzova G.V. Ecological monitoring of soils [Electronic resource]: textbook / Motuzova G.V., Bezuglova O.S.— Electron. text data. - M .: Academic Project, 2007. - 240 p. - Access mode: http://www.iprbookshop.ru/36657.

6. Prineva L.A. Soil fertility, its maintenance systems and anti-erosion measures in the seed garden [Electronic resource] / Prineva L.A. - Electron. text data.— M.: All-Russian Selection and Technological Institute of Horticulture and Nursery of the Russian Academy of Agricultural Sciences, 2013.— 274 p. Trushina T.P. Ecological bases of nature management. Rostov n/a, 2007.October2011) Publishing House of ChSU, 2011. - 388s

2. Actual problems of general parasitology: Studies of the scientific school of academician KI Skryabin. - M.: Nauka, 2000

**7.Modern professional databases and information reference systems**

Windows operating system

Electronic library system "IPRbooks"<http://www.iprbookshop.ru/index.ph>

Student consultant (http://www.studentlibrary.ru)

EBS "Lan" - services for inclusive education (https://e.lanbook.com)

Polpred.com-Internet resources

‒ www.pubmed.com

‒ www.medline.ru

‒ www.elibrary.ru

‒ http://biblioclub.ru

‒ 19http://znanium.com/

‒ http://e.lanbook.com/

1. **Software Composition**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

1. **Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base

Laboratories.

Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY"

Work program of the discipline

**PLANT PHYSIOLOGY**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
| *Graduate Qualification* | Bachelor |

Grozny, 2022**The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to use knowledge of the principles of structural and functional organization and physiological, cytological, biochemical, biophysical methods to assess and correct the state of living objects and monitor their habitat. | OPK-2 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-2 | OPK-2.1 | Knows: the main systems of life support and homeostatic regulation of vital functions in plants and animals, methods of perception.  Able to: carry out the choice of methods adequate for solving a research problem; identify the relationship of the physiological state of the object with environmental factors.  Owns: experience in the application of experimental methods to assess the state of living objects. |

1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Types of educational work** | | **Forms of study** | | |
| **full-time** | **Part-time** | **Correspondence** |
| **General labor intensity**: credits/hours | | 144/4 | 144/4 |  |
| **contact work**: | | 51 | 34 |  |
|  | Lecture-type classes | 17 | 17 |  |
| Seminar type classes | 34 | 17 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 93 | 110 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

1. credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

**The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Section 1. Botany - as a science | 1 |  |  |  | 2 |  | 3 |
| 2. | Section 2. Plant cell | 1 |  |  |  | 2 |  | 6 |
| 3. | Section 3. Plant tissues | 1 |  |  |  | 2 |  | 6 |
| 4. | Section 4. Vegetative organs of plants | 1 |  |  |  | 2 |  | 6 |
| 5. | Section 5 Plant Propagation | 1 |  |  |  | 2 |  | 6 |
| 6. | Section 6. Systematics of lower plants | 1 |  |  |  | 2 |  | 6 |
| 7. | Section 7. Angiosperms | 1 |  |  |  | 2 |  | 6 |
| 8. | Section 8. Systematics of Angiosperms. | 1 |  |  |  | 2 |  | 6 |
| 9. | Section 9. Ecology of plants and geobotany. | 1 |  |  |  | 2 |  | 6 |
| 10. | Section 10. Physiology of the plant cell. | 1 |  |  |  | 2 |  | 6 |
| eleven. | Section 11. Water regime of plants. | 1 |  |  |  | 2 |  | 6 |
| 12. | Section 12. Photosynthesis. | 1 |  |  |  | 2 |  | 6 |
| 13. | Section 13. Mineral nutrition of plants. | 1 |  |  |  | 2 |  | 6 |
| 14. | Section 14. Plant respiration. | 1 |  |  |  | 2 |  | 6 |
| 15. | Section 15. Growth and development of plants. | 1 |  |  |  | 2 |  | 6 |
| 16. | Section 16. Physiology of plant resistance. Transformation and transport of substances in plants. | 2 |  |  |  | 4 |  | 6 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Section 1. Botany and plant physiology as a science. The structure and physiology of the plant cell | 1 |  |  |  | 1 |  | 6 |
| 2. | Section 3. Plant tissues | 1 |  |  |  | 1 |  | 8 |
| 3. | Section 4. Vegetative organs of plants | 1 |  |  |  | 1 |  | 8 |
| 4. | Section 4Morphology of vegetative organs. | 1 |  |  |  | 1 |  | 8 |
| 5. | Section 5Morphology of generative organs of angiosperms. | 1 |  |  |  | 1 |  | 8 |
| 6. | Section 6Plant propagation. | 1 |  |  |  | 1 |  | 8 |
| 7. | Section 7. Systematics of lower plants. | 1 |  |  |  | 1 |  | 8 |
| 8. | Section 8Physiology of the plant cell. | 1 |  |  |  | 1 |  | 8 |
| 9. | Section 9Water regime of plants. | 1 |  |  |  | 1 |  | 8 |
| 10. | Section 10Photosynthesis. | 1 |  |  |  | 1 |  | 8 |
| eleven. | Section 11Mineral nutrition of plants. | 1 |  |  |  | 1 |  | 8 |
| 12. | Section 12.Plant respiration. | 2 |  |  |  | 2 |  | 8 |
| 13. | Section 13.Growth and development of plants. | 2 |  |  |  | 2 |  | 8 |
| 14. | Section 14. Physiology of plant resistance. Transformation and transport of substances in plants. | 2 |  |  |  | 2 |  | 8 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | **Section 1**  **Botany - as a science** | tasks of botany.  The main branches of botany.  Plant and man. |
|  | **Section 2**  **plant cell** | Cell - as the basic structural and functional unit of living matter.  The concept of the protoplast. Classification of organelles. Features of the structure and function.  Cell inclusions. |
|  | **Section 3**  **Plant tissues** | The concept of tissues. Principles of classification. meristems. Classify them according to their origin and location. Basic fabrics. Characteristics of chlorenchyma, aerenchyma, aquifers and storage parenchyma.  Integumentary tissues: epiblema, epidermis, cork. cover complexes.  Mechanical tissues: sclereids, collenchyma. Sclerenchyma - bast and wood fibers.  Conductive tissues: Structural and functional features of ascending and descending current tissues. Conductive bundles and their classification.  System of external and internal secretion in plants. |
|  | **Section 4**  **Vegetative organs of plants** | General regularities in the structure of vegetative organs. Root and root system. Classification. Features of the growth of the root tip zone. Primary anatomical structure. The secondary structure of the roots of dicotyledonous plants. Specialization and metamorphoses of roots. Mycorrhiza, nodules.  Escape and stem. Metamerism. Kidneys. Branching shoots. The stem is the axis of the shoot. Stem anatomy. Primary building. Features of the anatomy of the stems of cereals. Cambium and its activities. Secondary structure of stems of herbaceous plants. The structure of the stems of woody plants. Metamorphoses of the shoot as an object of crop production.  Leaf: morphology, functions. Leaf arrangement. Leaf functions. Microscopic structure of leaves of monocotyledonous, dicotyledonous and coniferous plants.  leaf metamorphoses |
|  | **Section 5**  **Plant propagation** | The biological meaning of reproduction. Types of reproduction. Alternation of generations and change of nuclear phases. |
|  | **Section 6**  **Systematics of lower plants** | Introduction to systematics.  Viruses. prenuclear organisms. bacteria. Structure, nutrition, reproduction. value in nature. Cyanea. Characteristics, nutrition, distribution and significance.  Mushrooms. General characteristics. cytological features. Classification. Lower fungi: Chytridiomycetes, Oomycetes, Zygomycetes. Higher fungi: Ascomycetes, Basidiomycetes, Deuteromycetes, Slime Mushrooms. Lichens. Features of the structure and reproduction. Role in nature, human use.  The concepts of lower and higher plants. Seaweed. General characteristics. Classification. The value of algae.  Higher spore plants. Origin and classification. Division Bryophytes. Characteristics and meaning.  Department Lycopsformes. Diversity. Characteristic. Department of Horsetails. Characteristic. Meaning.  Division Ferns. Structure and life cycle. Meaning.  seed plants. Department Gymnosperms. Origin. Classification. Features of gametophyte and sporophyte. Role in the vegetation cover of Russia. |
|  | **Section 7**  **angiosperms** | General characteristics and origin of Angiosperms. Theories of the origin of the flower.  Flower. Androecium. Stamen structure, microsporogenesis and pollen development.  Gynoecium. The structure of the pistil. Ovule. Megasporogenesis and development of the embryo sac.  inflorescences. Flower formula and diagram.  Bloom. Sexual types of flowers and plants. Monocarpics and polycarpics.  Pollination. Adaptations to prevent self-pollination.  Fertilization. Essence of double fertilization.  Seed development and structure.  Fetus. Development and structure. Fruit classification. Methods of dispersal of seeds and fruits. Importance of seeds and fruits. |
|  | **Section 8**  **Systematics of angiosperms** | Principles of construction of phylogenetic systems. Comparative characteristics of dicotyledonous and monocotyledonous plants.  Characteristics and representatives of the Buttercup, Gooseberry, Pink family.  Characteristics and representatives of the family. Legumes, Celery, Flax, Malvaceae, Grapes.  Characteristics and representatives of the family. Dodder, Broomrape, Borage, Bindweed, Lamiaceae, Solanaceae, Euphorbiaceae.  Characteristics and representatives of the family. Birch, Beech, Willow, Marevy, Shiritsevye, Hemp, Mulberry, Nettle. Cabbage, Poppy, Aster. Pumpkin.  Characteristics and representatives of the family. Liliaceae, Bluegrass, Onion. |
|  | **Section 9**  **Flora and vegetation** | Area. The teachings of N.I. Vavilov about the centers of origin of cultivated plants.  Flora.  Vegetation. Zoning of the vegetation cover of Russia. |
|  | **Section 10**  **Plant ecology and geobotany** | Ecology of plants. Concepts and tasks. Classification of environmental factors.  Light as an environmental factor. Warm. Water. Adaptation of plants to insufficient and excessive moisture. Air.  Ecological significance of the gas composition. The soil. Ecological significance of soil organic matter. Fire, its positive and negative meaning.  biotic factors. Classification. Zoogenic and anthropogenic factors. Ecology of populations.  The concept of phytocenosis. Classification of phytocenoses. The concept of phytoindication. Agrocenoses. |
|  | **Section 11**  **Physiology of the plant cell.** | Cell - as the basic structural and functional unit of living matter.  The concept of the protoplast. Classification of organoids. Features of the structure and function.  Cell inclusions.  The role and place of plants in the living world. The specificity of plant metabolism in comparison with animals (autotrophy, oxygen formation, mineral nutrition and nitrogen and sulfur reduction, water exchange, experiencing unfavorable seasons).  The concept of diffusion, chemical potential, osmosis. The cell as an osmotic system. Cell permeability to salts. Passive and active entry of minerals into the cell.  The functional role of individual cell organelles. Specific role in the metabolism of organelles typical of plants (plastids, vacuole, cell wall).  Symbiotic theory of the origin of plastids and mitochondria. |
|  | **Section 12**  **Water regime of plants.** | **General idea of ​​water exchange.**Importance of water in plant life. The main patterns of water entry into the plant. Forms of water in the plant organism. Water balance of plants. Significance and physiological role of transpiration. Types of transpiration and mechanisms of stomatal opening. Influence of external conditions on transpiration. Daily course of transpiration. The species are hydrostable and hydrolabile.  **The flow and movement of water in the plant.**The root system as an organ of water intake. Upper and lower terminal water current motors. Guttation and weeping of plants. Root pressure, its value. Apoplast. Symplast. The speed of movement of water in different plants. clutch theory. The influence of external conditions on the flow of water through the root system. Forms of water in the soil. Atmospheric and soil moisture. Effects of lack of water on the plant. Water regime of plants of different ecological types and different life forms. Drought tolerance of plants. Works by N.A. Maksimov. Features of metabolism in drought-resistant plants. xeromorphic structure. Rule V.N. Zalensky. Changes in plant drought resistance in ontogeny, critical periods. Influence of water stress on physiological processes in plants. Physiological bases of irrigation. |
|  | **Section 13**  **Photosynthesis.** | **The leaf as an organ of photosynthesis.**Features of the structure of the sheet. Chloroplasts and their role in photosynthesis. Leaf pigments: chlorophylls, carotenoids, phycobilins. Chemical and physical properties. Physiological role of pigments. Theory of chromatic adaptation.  **The main stages of photosynthesis.**Photophysical processes in photosynthesis.Transfer of absorbed photon energy between pigment molecules. The idea of ​​a photosynthetic unit, a light-harvesting complex, a cancer center and a photosystem. Photochemical processes in photosynthesis. Emerson effect and two photosystems. Photochemical processes of photosynthesis, Z-scheme. Photosynthetic phosphorylation, cyclic and non-cyclic. The mechanism of phosphorylation, Mitchell's theory. The formation of oxygen. Dark phase of photosynthesis. Calvin cycle (reductive pentose phosphate cycle, C3 pathway). Stages of the Calvin cycle - carboxylation, reduction, regeneration. Hatch-Slack cycle, C4 path. Anatomical structure of the leaves of C4 plants, features of chloroplasts from mesophyll cells and sheaths. CAM pathway of photosynthesis. Ways of supplying CO2 to the Calvin cycle in C3-, C4- and CAM-plants. Adaptive role of C3, C4, and CAM pathways of photosynthesis. Oxygenase function of RuBP carboxylase/oxygenase. Photorespiration (glycolate cycle) in C3 plants.  **Influence of external conditions on photosynthesis**. Light curve of photosynthesis, points of compensation and light saturation. Differences in light curves in photophilous and shade-tolerant plants, in C3- and C4-plants. Influence of CO2 concentration on photosynthesis. Carbon dioxide compensation point in C3- and C4-plants. Regulation of CO2 intake by means of stomatal apparatus. Influence of temperature, water supply and mineral nutrition on photosynthesis. Relationship between photosynthesis and respiration. Photosynthesis and plant productivity. |
|  | **Section 14**  **Mineral nutrition of plants.** | **Features of mineral nutrition of plants.**Theoretical and practical significance of studying the root nutrition of plants. Ash elements. Methods for studying root nutrition. Classification of elements according to their content in the plant. Interaction of ions (antagonism, synergism). The physiological role of nitrogen. Ammonia and nitrates as sources of nitrogen. Works by D.N. Pryanishnikov. Ways of assimilation of ammonia and nitrates in the plant. The role of glutamic acid and glutamine in the biosynthesis of amino acids.  The role of macro- and microelements for plants.  Plant nutrition by symbiotic organisms. Physiological bases of application of fertilizers.  Synthetic function of the root system of plants. Features of the synthesis of amino acids, amides, phytohormones and alkaloids.  **The intake and movement of substances in the plant.**  Mineral salts as the main form of plant nutrition. Passive and active intake of minerals. Ascending and descending currents of substances. Influence of factors on the absorption of substances. Hypotheses explaining the mechanism of movement of substances through the phloem. |
|  | **Section 15**  **Plant respiration.** | **Importance of respiration and respiratory pathways.**  The release of energy during respiration. Redox processes. Carbohydrates as the main substrate of respiration. respiratory rate. Glycolysis. Krebs cycle. glyoxylate pathway. Pentose phosphate pathway of respiration.  **The mechanism of plant respiration.**Membranes as a structural basis for bioenergetic processes. oxidative phosphorylation. Chemoosmotic theory of conjugation of oxidation and phosphorylation.  **Influence of external and internal factors on the intensity of respiration.**Methods for measuring the intensity of breathing. Influence on the process of respiration of external conditions: temperature, supply of oxygen, carbon dioxide, water, nutrient salts, injury, light. Influence of internal factors on the intensity of respiration. Ways of regulation of respiration. |
|  | **Section 16**  **Plant growth and development** | **Plant hormones as the main regulators of the process of growth and development.**Phytohormones. The history of the formation of ideas about the presence of phytohormonal regulation in plants. Comparison of phytohormones and animal hormones.  The history of the discovery of phytohormones, their chemical nature, physiological action and practical application. Features of phytohormonal regulation of growth and morphogenesis of various plant organs and various processes of growth and development. The movement of phytohormones throughout the plant.  Mechanism of action of phytohormones.  **Growth and development of plants.**Definition of the concepts of "growth" and "development". Quantitative patterns of growth. Stages of ontogenesis. Life span of plants and its features. Regulation of the transition of plants to the generative state. The phenomenon of vernalization. The adaptive role of vernalization. The phenomenon of photoperiodism. Groups of plants with different photoperiodic response, its adaptive value. Hormonal theory of flowering by M.Kh. Chailakhyan. The role of phytochrome in photoperiodic reactions of plants. Structure and localization of phytochrome. Specificity and mechanism of action of the phytochrome system in the regulation of various processes.  Growth frequency. dormant state in plants. Types of rest: forced and physiological (deep). Conditions for exiting dormancy. Adaptive role of dormancy, its significance for frost, heat and drought resistance of plants.  **plant movements**. Tropisms and nastia, their physiological mechanisms and adaptive role.  **Integration of physiological processes in the plant**  The production process of a plant and the integration of various functions in it: photosynthesis, respiration, growth, mineral nutrition, water regime. Donor-acceptor relations and transport of assimilators in a plant. Interaction of plant organs, correlation, root-leaf connection. The need to study the plant as an integral organism in order to develop methods for increasing its productivity and resistance to adverse environmental factors. |
|  | **Section 17 Physiology of plant resistance. Transformation and transport of substances in plants.** | Understanding stress and stressors. Three phases of plant stress response. Mechanisms of resistance to damaging environmental factors. Mechanisms of plant adaptation at the cellular, organismal and population levels. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of laboratory classes*** |
|  | **Section 1**  **Botany - as a science** | No. 1.microscope device. The shape and structure of the plant cell. (Creative task - preparation of a microscopic preparation).  No. 2.Movement of the cytoplasm. Reserve nutrients. Finalmetabolic products. |
|  | **Section 2**  **plant cell** | No. 3. Histology. Classification of tissues - educational and integumentary tissues. (Discussion).  No. 4. Basic and mechanical fabrics. (Creative task - preparation of a microscopic preparation).  No. 5. Conductive tissues. conductive bundles. Milky and excretory tissues.  No. 6. Colloquium 1. on the topic: cytology and histology. |
|  | **Section 3**  **Plant tissues** | No. 7. Organography. Macromorphology of the seedling. Types and forms of root systems. root zones. Microscopic structure of the root. Storage roots are root crops. (Discussion).  No. 8.Stem morphology. The anatomical structure of the woody stem of gymnosperms and angiosperms. The anatomical structure of the stems of herbaceous plants. Grass stalks.  No. 9.Sheet. Classification. Morphology and anatomy. (Discussion).  No. 10.Colloquium 2. on the topic: morphology and anatomy of the vegetative organs. |
|  | **Section 4**  **Vegetative organs of plants** | No. 11.The biological meaning of reproduction. Types of reproduction. Alternation of generations and change of nuclear phases. |
|  | **Section 5**  **Plant propagation** | No. 12.lower plants. Department of Algae.  No. 13.Lower mushrooms. High mushrooms.  No. 14.Higher spores: Mosses, club mosses, horsetails.  No. 15.ferns. Department Gymnosperms.  No. 16.Colloquium 3. on the topic: Lower plants (Algae), Mushrooms,Higher plants (Mosses, club mosses, horsetails, ferns,Golosperms). |
|  | **Section 6**  **Systematics of lower plants** | No. 17. Reproductive organs. Flower and its parts. Flower formula and diagram. inflorescences.  No. 18. Seeds and fruits, structure and classification of seeds.  No. 19. Colloquium 4. on the topic: Angiosperms. Reproductive organs of plants: flower, fruit, seed. |
|  | **Section 7**  **angiosperms** | No. 20. Principles of classification of plants. Work with the determinant of higher plants. (Solution of situational problems by group method). Herbarization, observation technique.  No. 21. Characteristics and representatives of the Buttercup, Pink, Gooseberry family.  No. 22.Characteristics and representatives of the family Legumes, Celery, Malvaceae, Flax, Grapes.  No. 23.Characteristics and representatives of the family Dodilaceae, Broomrape, Borage, Bindweed, Nightshade, Euphorbia.  No. 24.Characteristics and representatives of the family Birch, Marevy, Beech, Willow  No. 25.Characteristics and representatives of the Cabbage, Poppy, Pumpkin family. Lamb, Nettle, Aster, Liliaceae, Bluegrass.  No. 26.Characteristics and representatives of the family Shiritsevye, Cannabis, Buckwheat.  No. 27.Colloquium 5. on the topic:  Systematics of angiosperms. |
|  | **Section 8**  **Systematics of angiosperms** | No. 28.Abiotic and biotic factors in plant life. Phytocenoses and agrophytocenoses.  No. 29.Colloquium 6. on the topic: Environmental factors. Phytocenoses. |
|  | **Section 9**  **Flora and vegetation** | No. 30. Obtaining an artificial cell "Traube". The study of the phenomenon of osmosis. The phenomenon of plasmolysis and deplasmolysis; observation of cap plasmolysis. Changes in the permeability of the cytoplasm in case of damage. Determination of potential osmotic pressure. Determination of water and osmotic potential by various methods of changing the length of plant tissue. Determination of water by Shardakov's method. Determination of water potential by refractometric method.  No. 31.Colloquium 7."physiology of the plant cell" |
|  | **Section 10**  **Plant ecology and geobotany** | No. 32.Influence of external conditions on the process of guttation. Comparison of transpiration by the chlorocobalt method. Determination of relative transpiration and transpiration intensity by weight method (using the Veska device).  Determination of the intensity of transpiration using torsion balances. Monitoring the state of stomata by infiltration. The study of stomata by the method of prints (replicas) and the determination of their size using the eyepiece of a micrometer.  Microchemical analysis of plant ash.  Serving amides and amino acids with sap.  The supply of minerals to plants.  Discovery of nitrates in plant tissues. (RT, T).  No. 33.Colloquium 8 on the topic: "The water regime of plants." |
|  | **Section 11**  **Physiology of the plant cell.** | No. 34.Extraction of pigments. Obtaining an extract of carotene.  Chlorophyll fluorescence. Study of the absorption spectra of extracts of carotene. Separation of pigments according to Kraus.  Saponification of chlorophyll and separation of carotene.  Preparation of pheophytin and restoration of the organometallic bond.  No. 35.Fast way to separate pigments. Isolation of chlorophyll, a, carotene, xanthophyll and pheophytin.  Dependence of carbon assimilation on light intensity.  Dependence of various beams of the spectrum on carbon assimilation. Influence of temperature on the process of assimilation.  The formation of starch in the light. Sachs test.  The need for CO2 for the formation of starch.  The value of chlorophyll for the formation of starch.  The formation of low molecular weight carbons, lipids, proteins during photosynthesis.  No. 36. Colloquium 9 on the topic: "Photosynthesis". |
|  | **Section 12**  **Water regime of plants.** | No. 37.Microchemical analysis of plant ash.  Serving amides and amino acids with sap.  The supply of minerals to plants.  Discovery of nitrates in plant tissues. (RT, T).  No. 38.Colloquium 10 on the topic: "Mineral nutrition of plants." |
|  | **Section 13**  **Photosynthesis.** | No. 39.Determination of the intensity of respiration of germinating seeds. Determination of the respiratory coefficient. Oxidative enzymes of respiration.  No. 40.Detection of dehydrogenases during alcoholic fermentation.  Method for determining the activity of dehydrases using vacuum infiltration (according to Pylnev). Determination of catalase activity in plant objects. (RT, T).  No. 41. Colloquium 11 on the topic: "Breathing of plants". |
|  | **Section 14**  **Mineral nutrition of plants.** | No. 42. Bookmarking and carrying out individual works within two weeks.  Final conference and reports on the results of experiments.  No. 43 Colloquium 12 on the topic: "Growth and development of plants" |
|  | **Section 15**  **Plant respiration.** | No. 44.Cryoprotective effect of carbohydrates on the cytoplasm. Accumulation of sugars in plants with a decrease in ambient temperature. Protective effect of sugar on protoplasmic proteins at negative temperatures. Determination of the temperature threshold of coagulation of the cytoplasm (according to P.A. Genkel).  Extraction of amylase from malt. Isolation of sucrose and hydrolysis. Determination of lipase activity. The transformation of reserve substances. Determination of assimilation, transient and reserve starch.  No. 45. Colloquium 13 on the topic: “Plant resistance”; "Transformation and transport of substances in plants". |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Botany - as a science | UO, R, T, LR |
| 2. | Section 2. Plant cell |  |
| 3. | Section 3. Plant tissues |  |
| 4. | Section 4. Vegetative organs of plants |  |
| 5. | Section 5 Plant Propagation |  |
| 6. | Section 6. Systematics of lower plants |  |
| 7. | Section 7. Angiosperms |  |
| 8. | Section 8. Systematics of Angiosperms. |  |
| 9. | Section 9. Ecology of plants and geobotany. |  |
| 10. | Section 10. Physiology of the plant cell. | UO, R, T, LR |
| eleven. | Section 11. Water regime of plants. |  |
| 12. | Section 12. Photosynthesis. |  |
| 13. | Section 13. Mineral nutrition of plants. |  |
| 14. | Section 14. Plant respiration. |  |
| 15. | Section 15. Growth and development of plants. |  |
| 16. | Section 16. Physiology of plant resistance. Transformation and transport of substances in plants. |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

* 1. **Main literature**

1. Andreeva I.I., Rodman L.S. Botany: studies for s / universities. – M.: Kolos, 2009. – 528 p.

2. Alekhina, I.D. Physiology of plants. [Text]: textbook / I.D. Alyokhina, Yu.V. Balnovkin, V.S. Gavrilenko, T.V. Zhigalova N.R. Melchik, A.M. Nosov, O.G. Polesskaya, E.V. Kharitonoshvil, V.V. Chub. M: Publishing House Center "Academy". - 2007. - 640 p.

3. Pilshchikova, N.V. Plant physiology with the basics of microbiology. [Text]: textbook / N.V. Pilshchikov. M: Mir Publishing House: - 2004. - 184 p.

**6.2 additional literature**

1. Suvorov, V.V. Botany with the basics of geobotany [Text]: textbook / V.V. Suvorov, I.N. Voronova - 3rd ed., revised. and additional - M.: ARIS, 2012. - 520 p.

2. Serebryakova, T.I. Botany with the basics of phytocenology: Anatomy and morphology of plants [Text]: textbook / T.I. Serebryakova, N.S. Voronin, A.G. Elenevsky and others. M.: Akademkniga, 2006. 543 p.

3. Timonin,A.K. Botany. higher plants. [Text]: textbook. (Volume 3 of 4). M.:, Ed. Center "Academy", 2007. - 352 p.

4. Atabekova A.I., Ustinova E.I. plant cytology. - M.: Kolos, 2007. - 246 p.

5. Erzhapova, R.S., "Morphology of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S., Alikhadzhiev M.Kh. Publishing house of ChSU, 2015. S. 94.

6. Pavlova M.E. Botany [Electronic resource]: lecture notes. Textbook / Pavlova M.E. - Electron. text data. - M .: Russian University of Peoples' Friendship, 2013. - 256 p. - Access mode: http://www.iprbookshop.ru/22163.

7. Pyatunina S.K. Botany. Systematics of plants [Electronic resource]: textbook / Pyatunina S.K., Klyuchnikova N.M. - Electron. text data.— M.: Prometheus, 2013.— 124 p.— Access mode:<http://www.iprbookshop.ru/23975>

8. Evert, R.F. Esau plant anatomy. Meristems, cells and tissues of plants: structure, functions and development. [Electronic resource] - Electron. Dan. - M .: Publishing house "Laboratory of knowledge", 2015. - 603 p. - Access mode:[http://www.iprbookshop.ru/70790](%20http://www.iprbookshop.ru/70790)

9. Botany course of algology and mycology. [Electronic resource] - Electron. Dan. - M. : Moscow State University named after M.V. Lomonosov, 2007. - 559 p. - Access mode:[http://www.iprbookshop.ru/10120](%20http://www.iprbookshop.ru%20/10120)

10. Erzhapova, R.S., "Morphology of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S., Alikhadzhiev M.Kh. Publishing house of ChSU, 2015. S. 94.

11. Erzhapova, R.S., "Systematics of higher plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing house of ChSU, 2015. S. 124.

12. Lecture notes on plant physiology. [Text]: textbook / V. M. Gold, N. A. Gaevsky, T. I. Golovanova, N. P. Belonog, T. B. Gorbaneva.-Krasnoyarsk, IPK SFU, 2008.148 p.

13. Kuznetsov V.V. Plant Physiology / V.V. Kuznetsov. - M.: Higher school, 2006. - 742 p.

14. Andreev V.P. Lectures on plant physiology [Electronic resource]: textbook / Andreev V.P.— Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2012.— 299 p.— Access mode:<http://www.iprbookshop.ru/20552>.

15. Kabashnikova L.F. Photosynthetic apparatus and stress in plants [Electronic resource] / Kabashnikova L.F. - Electron. text data. - Minsk: Belarusian Science, 2014. - 272 p. - Access mode: http://www.iprbookshop.ru/29569.

16. Yakushkina, N. I. Plant Physiology: a textbook for universities / N. I. Yakushkina, E. Yu. Bakhtenko. - M.: Vlados, 2005. - 463 p.

17. Zitte, P. Botany: Plant Physiology / ed. V.V. Chuba. Textbook for universities: in 4 volumes: / P. Sitte, E. V. Weiler, J. V. Kaderait, A. Brezinski, K. Kerner; based on the textbook by E. Strasburger [et al.] ; per. with him. O.V.Artemieva, T.A.Vlasova, I.G.Karnaukhova, N.B.Kolesova, M.Yu.Cherednichenko. - M .: Publishing Center "Academy", 2008. - 496 p. T. 2.

18. Voskresenskaya O.L., Grosheva N.P., Sochilova E.A. Plant Physiology: Textbook. / Mar. state un-t. - Yoshkar-Ola, 2008. - 148 p.

19. Erzhapova, R.S., "Plant physiology: water regime of plants". [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing house of ChSU, 2015. S. 85.

20. Erzhapova, R.S., Plant Physiology: Plant Respiration. [Text]: textbook / Erzhapova R.S., Erzhapova E.S. Publishing House of ChSU, 2015. S. 90.

* 1. Periodicals

Botanical Journal of the Russian Academy of Sciences (1916—) https://ru.wikipedia.org/wiki/

Botanical Notes (ScriptaBotanica). https://en.wikipedia.org/w/index.php

News of taxonomy of higher plantshttps://ru.wikipedia.org/w/index.php

News of taxonomy of lower plantshttps://ru.wikipedia.org/w/index.php

Phytodiversity of Eastern Europe IEVB RAS https://ru.wikipedia.org/w/index.php

1. **Modern professional databases and information reference systems**

Internet resources:

1. http://en.wikipedia.org/wiki/

2. www.avanta.ru

3. http//dic.academic.ru

2. Scientific electronic library e-library.ru

3. Agricultural electronic knowledge library (SEKBiZ): http://www.cnshb.ru/akdil/default.htm

4. Nature of Russia. National portal. - http://www.priroda.ru/

5. Wildlife Conservation Center: http://biodiversity.ru/

6. Open illustrated atlas of vascular plants in Russia and neighboring countries: http: //www.plantarium.ru/

1. **Software Composition**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

1. **Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base of the laboratory.

Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

Educational and visual aids:

1. Color tables: a) “Cell structure”, b) “Plant tissues”, c) “Vegetative organs of plants”, d) “Generative organs of plants”, e) “Botanical families”, etc.

2. Herbarium (medicinal plants, botanical families, etc.).

3. Collection of seeds.

4. Models by morphology.

5. Portraits of famous prominent scientists and figures in the field of botany.

6. Microscopes and micropreparations.

7. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

Laboratory equipment: 1. Dissecting magnifier with a table. 2. Manual magnifying glass. 3. Ruler. 4. Scissors. 5. Dissecting needles. 6. Blades. 7. Spirit lamp. 8. Cover glasses. 9. Slides. 10. The flask is conical. 11. Chemical glasses. 12. Glass funnel. 13. Glass stick. 14. Petri dishes. 15. Evaporating cup. 16. Eye dropper. 17. Vials. 18. Plastic cups. 19. Test tubes. 20. Stand for test tubes. 21. Cuvettes. 22. Filter paper. 23. Cotton wool. 24. Gauze. 25. Matches. 26. Towel. 27. Reagents in accordance with the curriculum. 28. Garden set. 29. Herbarium grid. 30. Herbarium folder.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"Chechen State University"

Work program of the discipline

**"ANATOMY AND PHYSIOLOGY of man"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional  skills | GPC-2.1; GPC-2.2 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPK-2  Able to apply the principles of structural and functional organization, use physiological, cytological, biochemical, biophysical methods of analysis to assess and correct the state of living objects and monitor their habitat | GPK-2.1  GPC-2.2 | **Knows**the main systems of life support and homeostatic regulation of vital functions in plants and animals, methods of perception, storage and transmission of information, is oriented in modern methodological approaches, concepts and problems of physiology, cytology, biochemistry, biophysics Knows how to choose methods that are adequate for solving a research problem; identify the relationship of the physiological state of the object with environmental factors |

1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | |
| 7 semester | 9 semester | 10 semester |
| **General labor intensity**: credits/hours | | 2/72 | 2/72 | 2/72 |
| **contact work**: | | 32 | 54 | 36 |
|  | Lecture-type classes | 16 | 18 | 18 |
| Seminar type classes | 16 | 36 | 18 |
| Intermediate certification: credit / credit with grade / exam |  |  |  |
| **Independent work**(SRS) | | 40 | 18 | 36 |
| Of which for course work (course project) | |  |  |  |

Notes:

1. credit and credit with assessment for full-time and part-time education is carried out within the framework of seminar-type classes. The curriculum does not include hours.
2. **The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

7 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Anthropogenesis | 1 |  | 1 |  |  |  | 4 |
| 2 | The structure of the human body | 2 |  | 2 |  |  |  | 6 |
| 3 | Racial science | 1 |  | 1 |  |  |  | 4 |
| 4 | Typology of temperament | 2 |  | 2 |  |  |  | 4 |
| 5 | Cognitive sphere of man | 2 |  | 2 |  |  |  | 6 |
| 6 | Adaptation | 2 |  | 2 |  |  |  | 4 |
| 7 | Growth and development | 2 |  | 2 |  |  |  | 4 |
| 8 | human genetics | 2 |  | 2 |  |  |  | 4 |
| 9 | Ontogenesis | 2 |  | 2 |  |  |  | 4 |

4.1.2 Part-time education

9 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Anthropogenesis | 4 |  | 8 |  |  |  | 2 |
| 2 | The structure of the human body | 4 |  | 8 |  |  |  | 4 |
| 3 | Racial science | 2 |  | 4 |  |  |  | 4 |
| 4 | Typology of temperament | 4 |  | 8 |  |  |  | 4 |
| 5 | Cognitive sphere of man | 4 |  | 8 |  |  |  | 4 |

10 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 6 | Adaptation | 4 |  | 4 |  |  |  | 8 |
| 7 | Growth and development | 6 |  | 6 |  |  |  | 10 |
| 8 | human genetics | 4 |  | 4 |  |  |  | 8 |
| 9 | Ontogenesis | 4 |  | 4 |  |  |  | 10 |

4.2 The program of the discipline, structured by topics / sections

4.2.1 Lecture content

|  |  |  |  |
| --- | --- | --- | --- |
| **No.**  **p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** | |
| **Subject** | **Content** |
| 1 | Anthropogenesis | The position of man in nature | Man as a biological species. Zoological systematics of man. Its place in organic nature and in relation to animals similar to it. Evidence of the unity of the origin of man and animals. Anatomical and physiological features that are similar in all representatives of the class Mammals. Examples of rudimentary and atavistic signs that testify to the relationship of man with animals. Signs of similarities and differences between humans and great apes |
| 2 | The structure of the human body | General body measurements | Total body measurements: body length, body weight, chest girth. Partial (partial) body measurements (lower limb length, neck, wrist, waist circumference) |
| Body type and constitution. Somatotype | The concept of body type and human constitution. Somatotype and its criteria. Schemes of normal body constitutions: classification according to M.V. Chernorutsky; according to V.N. Shevkunenko (1935) - on a morphological basis; according to the scheme of V.T. Shtefko and A.D. Ostrovsky (1929) modified by S.S. Darskoy (1975). Individual typology of women: leptosomal, mesosomal, megalosomal types of constitutions. Constitutions and physiological features |
| 3 | Racial science | Racial and entoterritorial distinctions | The main differences between racial and constitutional features. Racial differences associated with a particular territory (adaptive types). Race classification. Characteristics of large and small races |
| 4 | Typology of temperament | Humoral theory of temperament | The oldest description of temperament according to Hippocrates (humoral theory): sanguine, choleric, melancholic and phlegmatic type of temperament. Character, temperament, personality. temperament properties. The role of temperament in activity and profession |
| Dependence of temperament on the type of nervous system | Three parameters for characterizing the types of GNI according to I.P. Pavlov. Types of GNI according to I.P. Pavlov. Specific types of GNI according to I.P. Pavlov. Children's types of temperament. Theory of temperament V.M. Rusalova. Functional asymmetry of the human brain |
| Constitutional theory of temperament according to W. Sheldon | The connection of temperament with the innate constitution of a person. Classification of temperament types depending on the predominance in the development of one of the germ layers |
| 5 | Cognitive sphere of man | Psychophysiological features | Thinking - a brief description, physiological foundations and biological role. Human speech as a reflection of his inner world. Human emotions. The main functions and properties of attention. Human memory. Types of memory |
| 6 | Adaptation | Human adaptation | Types and levels of adaptation. General adaptation syndrome (GAS), its stages. The concept of stress. Stress and maladaptation |
| 7 | Growth and development | Features of the growth and development of the body | Biological age, its definition. Human sexual dimorphism: genetic, morphological and physiological aspects. Acceleration and retardation. Disadvantages of acceleration Hypodynamia |
| 8 | human genetics | human heredity | Methods for studying human heredity: genealogical method; cytogenetic method; biochemical method; methods of hybridization of somatic cells; modeling of hereditary diseases; population-statistical method |
| Heredity and pathology | *Chromosomal diseases, their classification. Origin mechanisms*  1. Characteristics of chromosomal diseases (Down's syndrome, Edward's syndrome, Patau's syndrome, Shereshevsky-Turner syndrome, X-chromosome trisomy, Klinefelter's syndrome.)  2. Structural abnormalities of chromosomes.  *Metabolic diseases (enzymopathies)*  1. Diseases associated with metabolic disorders (proteins, fats, carbohydrates, hormones) |
| 9 | Ontogenesis | Prenatal ontogeny | Stages of intrauterine development. Embryo formation. Organogenesis and histogenesis. Critical periods of embryogenesis |
| Postnatal ontogeny | Age periods of human life. Neonatal period. Breast period. Periods of early, first and second childhood. Teenage years. Youthful age. Mature age. Elderly and senile age. Age crises |

4.2.1 Content of practical exercises

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the practical lesson** |
| 1 | Anthropogenesis | 1. Anthropogenesis. The driving forces of anthropogenesis. Stages of human development.  2. Evidence of the origin of man from animals. Video presentation "Anthropogenesis" |
| 2 | The structure of the human body | 1. Evaluation of the harmony of the physique.  2. Determination of body weight and body fat percentage  3. Determination of body type (body constitution) |
| 3 | Racial science | 1. Races, racial classification.  2. Racial and individual features of the skull |
| 4 | Typology of temperament | 1. Determining the type of your temperament.  2. Questionnaire for the structure of temperament (OST) according to V.M. Rusalov.  3. Determining the type of GNI of students in terms of strength, balance, mobility of nervous processes.  4. Cybernetic study of the functional asymmetry of the brain |
| 5 | Cognitive sphere of man | The study of the human cognitive sphere: linear eye, observation, speed of thinking, short-term memory |
| 6 | Adaptation | 1. Multilevel personal questionnaire "Adaptiveness".  Video presentation "General Adaptation Syndrome" |
| 7 | Growth and development | 1. Evaluation of biological age and body aging index according to anthropometric data.  2. The proportions of the human body, taking into account gender characteristics |
| 8 | human genetics | 1. Genetics of sex. Inheritance of sex-linked traits (development of skills for solving genetic problems).  Video presentation "Human hereditary diseases" |
| 9 | Ontogenesis | Ontogenesis |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

* ongoing monitoring of progress;
* intermediate certification of students in the discipline.

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1 | Anthropogenesis | Cases (situations and tasks with given conditions)  Test  Practical work report |
| 2 | The structure of the human body | Practical skills |
| 3 | Racial science | Information project (report)  Practical work report |
| 4 | Typology of temperament | Cases (situations and tasks with given conditions)  Practical work report |
| 5 | Cognitive sphere of man | Test  Practical work report |
| 6 | Adaptation | Test  Practical work report |
| 7 | Growth and development | Cases (situations and tasks with given conditions)  Practical work report |
| 8 | human genetics | Information project (report)  Practical work report |
| 9 | Ontogenesis | Test  Practical work report |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current and midterm control

**Approximate typical task in a practical lesson**

Do practical work on the topic

"DETERMINATION OF BODY TYPE (BODY CONSTITUTION)"

The purpose of the work: to determine the type of physique using indices, nomograms and formulas.

Equipment: diagrams, tables, nomogram for determining the constitution of the body, stadiometer, scales, centimeter tape.

PROGRESS

1. Determine your individual body type

Most often, body type is determined using the Solovyov index, which is equal to the girth of the wrist in centimeters.

1. The measurement is made on the leading hand (right - for right-handers and left - for left-handers).

2. The circumference is measured with a centimeter tape at the narrowest part of the wrist (wrist joint).

3. The measuring tape should fit snugly around the wrist without squeezing it.

Table 1 -Determination of body type by the size of the wrist

|  |  |  |
| --- | --- | --- |
| Body type (TT) | Wrist circumference (cm) | |
| Men | Women |
| Asthenic TT (narrow bone) | < 18 | < 16 |
| Normosthenic TT (normal) | 18-20 | 16-18 |
| Hypersthenic TT (large-boned) | >20 | > 18 |

2.*Verweck index*

IV \u003d DT: (2xMT + WGC), where

DT - body length in cm;

BW – body weight in kg;

OGK - chest circumference in cm.

If the IV is 0.75-0.85, this indicates a moderate predominance of transverse dimensions over the longitudinal ones (brachymorphy), IV within 0.85-1.25 - harmonious development, IV equal to 1.25-1.35 - moderate predominance of growth in length (dolichomorphy).

3. Determine the constitution of the body by the Pignet index

To determine body type, measure height L (cm). Determine the body weight (weight) P (kg), and the circumference of the chest on exhalation T (cm).

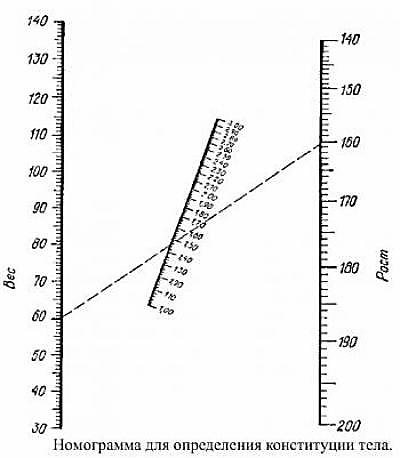
Calculate the Pinier index (PI) using the formula:

PI \u003d height - (body weight + chest circumference (ECG) on exhalation),

or IP \u003d L - (P + T)

Table 2 -Correspondence of the value of the Pignet index to the human constitution

|  |  |
| --- | --- |
| Pinier index | Constitution |
| Less than 10 | Strong (dense) physique - hypersthenic |
| 10 - 25 | Normal physique - normosthenic |
| 26 - 35 | Weak physique - asthenic |
| Over 35 | Very weak physique - pronounced asthenic |

4. Determine the constitution of the body according to the nomogram (Fig. 1)

Rice. 1**-**Nomogram to determine the constitution of the body

To a large extent, the somatotype is genetically determined. However, under the influence of various factors, primarily an increase in motor activity and normalization of nutrition, some change in the somatotype can be achieved.

There are many ways to determine the constitution of the body. One of the simplest is the definition of a nomogram. The accuracy of this method is approximate, but it gives some idea of ​​the physique. It is necessary to connect the dots corresponding to height and weight with a ruler. The number at the point of intersection of this line with the average scale will be an indicator of the constitution.

The harmonious ratio of adipose and muscle tissue corresponds to values ​​from 1.30 to 1.50, the predominance of adipose tissue - from 1.50 to 2.05, muscle - from 1.00 to 1.30.

Registration of the protocol

1. Complete table 3.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Body weight, kg | Body length, cm | OGK on exhalation | IV | wrist circumference | Pinier index | Nomogram |
|  |  |  |  |  |  |  |
| Type of constitution | | |  |  |  |  |

Table 3 -Results of own research

2. Draw appropriate conclusions about the type of your constitution.

Control questions

1. The concept of the human constitution.
2. Basic body types. A brief description of.

**An exemplary set of tests for current control**

|  |  |
| --- | --- |
| № r / d | Exemplary test tasks for sections of the discipline |
| 5 | Cognitive sphere of man |
| 1. The psychology of cognitive processes studies  +: memory  -: capabilities  -: character  -: motivation |
| 2. Memory is  -: processes associated with the passage of impulses through a certain group of neurons, causing electrical and mechanical changes in the places of their contact and leaving behind a physical trace  -: processes of storing information due to chemical changes  -: the processes of formation of connections between different representations and are determined not so much by the content of the memorized material, but by what a person does with it  +: processes of memorization, preservation and reproduction by a person of his experience |
| 3. The development of abstract thinking in humans is possible due to  -: first alarm system  +: second signal system  -: third alarm system  -: fourth signal system |
| 4. Voluntary attention is such attention  -: which comes after the involuntary, but qualitatively differs from it  +: which develops as a result of training and education  -: which arises without the intention of a person to see or hear something, without a pre-set goal, without effort of will  -: which is characterized by activity, purposeful concentration of consciousness, the maintenance of the level of which is associated with certain volitional efforts |
| 6 | Adaptation |
| 1. Features of the long-term stage of adaptation are  +: functioning of a new functional system, the formation of structural changes in a new functional system  -: mobilization of all functional systems, formation of a new specific functional system, erasure of old functional systems  -: mobilization of all functional systems, formation of a new specific functional system, formation of structural changes in a new functional system |
| 2. Standard non-specific adaptive responses  +: training, activation, stress  -: training, activation, adaptation  -: activation, stress, adaptation |
| 3. Under the action of stress factors, the secretion of hormones increases  -: intermedin and oxytocin  -: somatotropic and thyrotropic  - parathyroid hormone and thyrocalcitonin  +: adrenocorticotropic and glucocorticoids |
| 4. The stressor is  +: stimulus causing stress response  -: reaction, various brain structures to irritation  - defense mechanisms of the body  -: the ratio of the divisions of the autonomic nervous system |
| 10 | Ontogenesis |
| 1. Name an example of developmental disorders associated with the absence of an organ anlage  - microcephaly  -: encephaly  -: dwarfism  +: anencephaly |
| 2. What signs temporarily return in a normal human fetus  +: gill slits  - cloaca  -: the toe is shorter than the others and is located at an angle to them  -: chord |
| 3. The most informative at preschool age (4-6 years) are the following indicators of biological development  +: change in body proportions  -: annual increase in body length  -: the degree of development of secondary sexual characteristics  -: adaptation |
| 4. First of all, in the process of ontogenesis, the analyzer department matures  -: teenage  -: conductive  -: cortical  +: receptor |

**Approximate set of cases (situations and tasks with given conditions)**

|  |  |
| --- | --- |
| № r / d | Approximate situational tasks for sections of the discipline |
| 1 | Anthropogenesis |
| 1. This representative of the original genus of the hominid line was first discovered in North India in 1932. They were tetrapods, but with transient elements of bipedality, carried out object-tool activity, monogamy is characteristic, body weight did not exceed 12-16 kg.  1) What is the name of this representative?  2) Indicate the time of its existence on Earth?  Answer:  1) Ramapitek.  2) Its habitat on Earth dates back to the Miocene (about 12 million years ago) |
| 2. This monkey from the Hominid family lives in tropical Africa, in the basins of the Congo and Niger rivers. The body length of an adult is about 150 centimeters, weight is 50 kilograms, sexual demorphism in body size is weakly expressed. Genetic studies reveal a 96-98% similarity with the human genetic base.  1) Name the type of monkey.  2) What other primates belong to the Hominid family?  Answer:  1) Common chimpanzee.  2) Hominids also include gorillas and orangutans |
| 3. Travel back 200 thousand years to the territory of Western Europe.  1) What types of people of the genus Homo coexisted at the same time?  2) For how long?  Answer:  1) Neanderthals and Cro-Magnons.  2) From 5 to 30 thousand years |
| 4. On the test, the student determined the position of HOMO SAPIENS in animal taxonomy as a family.  1) What is his mistake?  2) To what family does a reasonable person belong? |
| 2 | Typology of temperament |
| 1. Which of the six situations related to educational activities will be more unfavorable for students with a weak nervous system (melancholic) and with an inert nervous system (phlegmatic).  1) Long hard work in the classroom and at home.  2) The educational material is delivered at a high pace.  3) The teacher asks an unexpected question and demands a quick answer.  4) Work in a noisy, turbulent environment.  5) Work with a hot-tempered, unrestrained teacher.  6) The teacher offers tasks that are diverse in content and methods of solution.  Answer: for melancholic situations 1,4,5 are more unfavorable; for phlegmatic people - 2,3,6 |
| 2. The literature describes cases when people who were forced to hide their serious illness from close relatives developed a nervous breakdown. What predominant type of nervous system can be assumed in these people?  Answer: when a person is forced to suppress any emotions in himself, this causes an overstrain of the inhibition process. The most vulnerable in this situation are people of two types of the nervous system - melancholic, who have a weakness of the main nervous processes and choleric, characterized by a relative weakness of the inhibition process. |
| 3. In the clinic, patients are waiting for their turn at the doctor's office. A nurse invites a patient, a participant in hostilities, to the doctor's office without a queue.  Patient A., quickly jumping up from his seat, begins to loudly, sharply and even rudely resent the actions of the nurse, causing a conflict situation.  Patient B., slowly approaching patient A., begins to calm him down, asks him to sit down, insistently offering to resolve the conflict.  Patient B. responds relatively easily to this situation, while perceiving everything that happens with a smile and actively communicating with other patients who are waiting for a doctor's appointment, he explains the legitimacy of the nurse's actions.  Patient G., feeling the awkwardness of this situation, is embarrassed, does not communicate with any of the other people, is hard pressed by the need for a longer stay in the clinic, there are tears in his eyes. Determine the temperament type of each patient.  Answer:   |  |  |  | | --- | --- | --- | | Patient | Type  temperament | Psychological features  temperament types | | Patient A. | choleric | Unbalanced, excitable, active, enterprising, but quickly exhausted in the process of work, abrupt, quick-tempered, creates conflict situations in the team. | | Patient B. | phlegmatic person | Slow, calm, unhurried, prone to order, to the familiar environment, in relations with people is even, moderately sociable. | | Patient V. | sanguine | Inquisitive, agile, sociable, friendly, quickly forgets insults, relatively easily experiences failures. | | Patient G. | melancholic | Sensitive, withdrawn, easily tiring, avoids communication with new people, suffers from a sense of his own inferiority. | |

|  |  |
| --- | --- |
| 3 | Growth and development |
| 1. The child (boy) was born on January 28, 2016.  1) Determine the age of the child on September 29, 2018 according to the rules adopted in age anthropology.  2) What age group does the child of this age belong to?  Answer:  1) Anthropologically, the child is 3 years old (2 years, 8 months, 1 day).  2) According to age periodization, this is early childhood |
| 2. A 1-year-old child has four milk teeth: two upper and two lower medial incisors.  1) Determine the variant of the child's development?  2) How many teeth must there be in order to recognize a developmental variant as banal?  Answer:  1) The variant of the development of the child is retarded, since the number of existing milk teeth is less than that provided for by age norms.  2) To recognize a developmental variant as banal, 8 teeth are needed |
| 3. Anthropometric parameters were determined for a 45-year-old man: body length 176 cm, waist circumference 98 cm, buttocks circumference 96 cm, body weight 89 kg.  1) Does the biological age correspond to the calendar age?  2) Which of the listed parameters make the greatest contribution to the processes of premature aging?  Answer:  1) The biological age of a man is ahead of the calendar and is 66 years old.  2) The greatest contribution to the processes of premature aging is made by the ratio of waist to buttocks |

**Approximate topics of reports**

Section 3

1. Origin of human races.
2. Skull and human races.
3. How different constitutions are represented in the most diverse populations of the globe.
4. The role of miscegenation and isolation within racially homogeneous groups.
5. Connections of the human constitution with race.
6. Connections of a person's race with inclinations to certain diseases.
7. The ability to adapt to different environmental conditions in representatives of different races.
8. Evidence of the unity of races. Criticism of racism.
9. The current state of the concept of race. Modern division into races.
10. fossil races.

Section 8. Human Genetics

1. Methods for studying human heredity.
2. Chromosomal theory of heredity.
3. Genetic factors influencing variations in the structure and development of the human body.
4. Investigation of twinning phenomena.
5. The study of the heredity of normal human traits.
6. Stability of the type in time.
7. Human genetics, its significance for medicine.
8. Genetic engineering and bioinformatics.
9. Human gene diseases.
10. Chromosomal diseases.

Section 9. General information about a person

1. Fabrics, their origin in individual and historical development.
2. Unity and diversity of cell types.
3. Physiological and pathological features of the visual analyzer.
4. Skin of various parts of the face and body.
5. Features of blood circulation in individual organs and systems.
6. Lymphatic system of the body and internal organs.
7. Modern methods of studying the activity of the heart.
8. Comparative anatomy of the respiratory system.
9. Comparative anatomy of the digestive system.
10. Influence on human morphology of nutrition, climate, soil and water composition.

**Approximate list of practical skills**

|  |  |
| --- | --- |
| № r / d | Section of discipline |
| 2 | The structure of the human body |
| Practicing the skills of assessing the structure and proportions of the body:   1. Assessment of body harmony. 2. Determination of body weight. 3. Determination of body fat percentage. 4. Determination of body type (body constitution).   Used equipment:   1. stadiometer, 2. scales, 3. tape measure, 4. caliper,   schemes, tables, nomogram for determining the constitution of the body |

5.3 Methodological materials definingprocedures for assessing knowledge, skills and (or) experience

**Practical lessons**

Practical classes allow you to combine theoretical knowledge and practical skills of students in the process of research activities.

Practical classes are held in a specialized classroom, equipped with educational and visual materials in the form of sets of demonstration and handouts: maps, tables, charts, regulations and equipped with the following equipment (projector; interactive whiteboard; computer, etc.).

The work should be carried out in groups, which forms a sense of collectivism and sociability. In the course of the practical work, thematic video material is also shown.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Theoretical study of the material | GPC-3.4 |
| 2 | Task execution technique |
| 3 | Ability to analyze and discuss assignment results and formulate conclusions |
| 4 | The correctness of the calculation of the results and the execution of the protocol |

*"Passed"*exhibited when all items are completed, not less than 70%.

*"Not counted"*exhibited in the absence or incorrectly executed protocol of a laboratory lesson, the student's inability to explain the results.

Students who have not attended laboratory classes work them out individually, one of the forms can be writing an essay on a missed topic.

**Test tasks**

The test is a tool for assessing students' learning, consisting of a system of test tasks, a standardized procedure for conducting, processing and analyzing the results. The teacher must determine for students the initial data for preparing for testing: name the sections (topics, questions) for which there will be tasks in the test form and theoretical sources for preparation. Preparation involves the study of lecture material, the preparation of auxiliary schemes in workbooks for visual structuring of the material in order to simplify its memorization. Pay attention to the basic terminology, classification, distinctive features, the presence of appropriate links between individual processes. Testing time, usually at least 40 minutes.

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Correct answer to the question | GPC-3.1 |

The grade "excellent" is given if 90-100% of the tasks are correctly completed.

The grade "good" is given if 70-89% of the tasks are correctly completed.

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed.

An "unsatisfactory" grade is given if less than 50% of the tasks are correctly completed.

**Cases (situations and tasks with given conditions)**

A situational task is a type of educational task that simulates situations that may arise in real life. The solution of situational problems is carried out in order to check the level of skills (possessions) of the student in solving a practical situational problem. The condition of the problem is announced to the student, the solution of which he sets out orally.

An effective interactive way to solve problems is to compare the results of solving one task by two or more small groups of students.

The main actions of students in working with a situational task are:

* preparation for the lesson;
* acquaintance with the criteria for assessing a situational task;
* clarification of the essence of the task and clarification of the algorithm for solving a situational problem;
* development of options for decision-making, selection of decision criteria, evaluation and forecast of options being sorted out;
* presentation of a solution to a situational problem (written or oral);
* receiving an assessment and its comprehension.

To successfully master the techniques for solving situational problems, three stages can be distinguished. At the first stage, it is necessary to familiarize students with the methodology for solving problems using printed publications on the methodology for solving problems, materials contained in databases, video lectures, and computer simulators. At this stage, the student is offered typical tasks, the solution of which allows him to work out the stereotypical techniques used in solving problems, to realize the connection between the theoretical knowledge gained and the specific problems that they can be aimed at solving.

For self-control at this stage, it is reasonable to use informal tests that not only state the correctness of the answer, but also provide detailed explanations if the wrong answer is chosen; in this case, tests perform not only a controlling, but also a learning function. To answer questions that arise, consultations are held with the teacher leading the course.

At the second stage, tasks of a creative nature are considered. In this case, the role of the teacher increases. Such classes not only form creative thinking, but also develop the skills of a business discussion of the problem, provide an opportunity to master the language of professional communication.

At the third stage, control work is performed to test the skills of solving situational problems.

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Possession of theoretical knowledge in a particular section and special terminology | GPC-3.1  GPC-3.4 |
| Response reasoning |
| Use of additional material |

Grade "excellent" - the problem is solved correctly and framed according to the proposed rules. Complete answers to all questions of the problem are given.

Rating "good" - the problem is solved correctly, but contains minor errors in the evaluation of indicators (no more than 30%) and design. Answers to all questions are incomplete.

Grade "satisfactory" - the problem is solved correctly, but contains errors in the evaluation of indicators (no more than 50%) and design. Not all questions of the problem have been answered.

Rating "unsatisfactory" - the problem is solved incorrectly. Contains errors in the assessment of indicators (more than 50%). Incorrect answers were given to the questions of the problem.

**Information project (report)**

The report is a small informational work devoted to one narrow topic. It can be done both in writing and orally. The report is intended to inform the audience. The performance usually lasts 5-10 minutes. Volume 5-6 pages. Structure of the report: Title page; Table of contents; Introduction; Main part; Conclusion; List of used literature (bibliography).

The preparation of the report is aimed at developing and consolidating the students' skills of independent deep, creative and comprehensive analysis of scientific, methodological and other literature on topical issues of the discipline; to develop skills and abilities to correctly and convincingly present the material, clearly formulate theoretical generalizations, conclusions and practical recommendations.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Compliance of the content of the report with the stated topic | GPC-3.1 |
| 2 | Completeness of disclosure of the topic |
| 3 | Target orientation and clarity of construction |
| 4 | Free presentation of material |
| 5 | List of used literature |
| 6 | Ability to answer questions about the text of the report |
| 7 | Contact with the audience |
| 8 | Presentation |
| 9 | Complied with the rules of speech |

Rated "excellent"- the educational material is mastered by the student in full, he easily navigates the material, fully and reasonably answers additional questions, presents the material logically sequentially, draws independent conclusions, conclusions, demonstrates his horizons, uses material from additional sources, Internet resources. The message is exploratory in nature. Speech is characterized by emotional expressiveness, clear diction, stylistic and orthoepic literacy. Uses visual material (presentation).

Evaluation "good" - according to its characteristics, the student's message corresponds to the characteristics of an excellent answer, but the student may experience some difficulties in answering additional questions, make some errors in speech. There is no research component in the message.

Grade "satisfactory" - the student experienced difficulties in the selection of material, its structuring. I used mainly educational literature, did not use additional sources of information. Unable to answer additional questions on the topic of the message. The material is presented inconsistently, does not establish logical connections, and finds it difficult to formulate conclusions. Makes stylistic and spelling mistakes.

Grade "unsatisfactory" - the message is not prepared by the student or prepared according to one source of information, or does not correspond to the topic.

**Practical skills**

Practical skills. Practical skill is the use of theoretical and practical knowledge in practice, i.e. turning knowledge into skills.

Skill is the ability of a student to correctly perform a procedure or manipulation on their own.

For effective assimilation and implementation of practical skills, consistent step-by-step training is required, which consists of:

* explaining the need to perform the skill;
* performance by the teacher of the skill with an explanation;
* independent step by step implementation of the skill by each student;
* the teacher's observation of the performance of the skill;
* discussion of completed skills.

For practical skills training, the following conditions must be created:

* the student must know in what situation this skill needs to be applied - the following must be presented: the purpose, indications, necessary equipment and the implementation of the stages of each specific practical skill;
* it is better to start learning the skill with demonstration materials: showing video material, slides, photographs, drawings;
* each student should have a step-by-step instruction (description) of the skill being performed;
* it is necessary to provide an opportunity and conditions for independent performance of the skill;
* To achieve competence in performing a skill, the student must repeatedly perform this skill and pass it to the teacher.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Instruments and equipment | UK-6.4  PC-1.3 |
| 2 | Demonstration of research methodology |
| 3 | Conducted measurements |
| 4 | Research results |

Evaluation "excellent" - the student correctly names the research method, correctly names the device, correctly demonstrates the research / measurement methodology, correctly evaluates the result.

Evaluation "good" - the student correctly names the research method, correctly names the device, makes single errors in demonstrating the research methodology / measurement and evaluating its results.

The “satisfactory” rating is that the student incorrectly names the research method, but at the same time gives the correct name of the device. Makes multiple errors in demonstrating research/measurement methodology and evaluating its results.” -

Grade "unsatisfactory" - the student incorrectly names the research method, gives the wrong name of the device. Cannot demonstrate the test/measurement technique and evaluate the result.

1. **List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Main literature

1. Belyakova G.A. Dictionary of biological terms [Electronic resource]: Textbook / G.A. Belyakova - M.: Publishing House of Moscow State University, 2013. - 288 p. – ISBN 978-5-211-06470-6 – Access mode:<http://www.studentlibrary.ru/book/ISBN9785211064706.html>
2. Verkhoshentseva Yu.P. Biology with the basics of ecology [Electronic resource]: textbook / Verkhoshentseva Yu.P.— Electron. text data. - Orenburg: Orenburg State University, EBS DIA, 2013. - 146 p. - Access mode:<http://www.iprbookshop.ru/30101>
3. Tulyakova O.V. Biology [Electronic resource]: textbook / Tulyakova O.V.— Electron. text data. - Saratov: Higher education, 2014. - 448 p. - Access mode:<http://www.iprbookshop.ru/21902>.
4. Chebyshev N.V. Biology. Guide to laboratory studies [Electronic resource]: textbook. allowance / ed. N.V. Chebyshev. - 2nd ed., Rev. and additional - M.: GEOTAR-Media, 2015. - 384 p. – ISBN 978-5-9704-3411-6 – Access mode:<http://www.rosmedlib.ru/book/ISBN9785970434116.html>

6.2 Further reading

1. Aleksandrova L.A. Special questions of human biology [Electronic resource]: textbook / L.A. Alexandrova, I.A. Mikhailova, V.V. Thomson. — Electron. text data. - St. Petersburg. : ITMO University, 2009. - 99 p. — 2227-8397. - Access mode:<http://www.iprbookshop.ru/68144.html>
2. Andreev V.P. Biological Dictionary [Electronic resource] / Andreev V.P., Pavlovich S.A., Pavlovich N.V.— Electron. text data. - Minsk: Higher School, 2011. - 336 p. - Access mode:<http://www.iprbookshop.ru/20061>
3. Korochkin L.I. Biology of individual development. Genetic aspect [Electronic resource]: textbook / L.I. Korochkin. — Electron. text data. - M .: Moscow State University named after M.V. Lomonosov, 2002. - 264 p. — 5-211-04480-0. - Access mode:<http://www.iprbookshop.ru/13054.html>
4. Rodionova O.M. Lectures on the disciplines "Ecological Physiology" and "Human Biology". Part 1 [Electronic resource]: textbook / Rodionova O.M., Glebov V.V. - Electron. text data. - M .: Russian University of Peoples' Friendship, 2012. - 244 p. - Access mode:<http://www.iprbookshop.ru/22191>
5. Sych V.F. General biology [Electronic resource]: textbook / VF Sych. — Electron. text data. - M .: Academic Project, Culture, 2007. - 336 p. — 978-5-8291-0916-5. - Access mode:<http://www.iprbookshop.ru/36438.html>
6. Tulyakova O.V. Biology with the basics of ecology [Electronic resource]: textbook / Tulyakova O.V.— Electron. text data. - Kirov: Vyatka State University for the Humanities, 2011. - 373 p. - Access mode:<http://www.iprbookshop.ru/21900>
7. Chebyshev N.V. Biology [Electronic resource] / Chebyshev N.V., Grineva G.G. - M.: GEOTAR-Media, 2010. - 416 p. - ISBN 978-5-9704-0553-6 - Access mode:<http://www.studentlibrary.ru/book/ISBN9785970405536.html>

6.3 Periodicals

1. JOURNAL "BULLETIN OF EXPERIMENTAL BIOLOGY AND MEDICINE". Publishing house: RAMS (Moscow). HAC. Publishes short experimental papers on topical issues of biology and medicine. For more than 20 years, it has been completely translated into English. 12 issues per year. The journal contains the planned work of scientific research institutions in the form of brief original reports on topical issues in the field of biology and medicine, containing new significant scientific results. Priority articles are published first.

Journal website:<http://www.iramn.ru/journal/bbm_cont.htm>

2. JOURNAL OF GENERAL BIOLOGY. Publishing House: Federal State Unitary Enterprise "Academic Scientific Publishing, Production, Printing and Book Distribution Center of the Russian Academy of Sciences" Publishing House "Nauka". Moscow. Founded in 1940. 6 issues per year. Publishes materials on issues of interest to a wide range of biologists.

Journal website:<http://elementy.ru/genbio>

3. PROBLEMS OF MODERN BIOLOGY. Publishing house: Limited liability company "Publishing house "Sputnik +". Year of foundation: 2011. 4 issues per year. Moscow.

4. SUCCESS IN MODERN BIOLOGY. Publishing House: Federal State Unitary Enterprise "Academic Scientific Publishing, Production, Printing and Book Distribution Center of the Russian Academy of Sciences" Publishing House "Nauka". Year of foundation: 1936. 6 issues. Moscow. HAC.

Journal website:<http://www.maik.ru/cgi-bin/list.pl?page=uspbio>

**7. Modern professional databases and information reference systems**

Internet resources

* Electronic library system "IPRbooks"<http://www.iprbookshop.ru/>
* EBS "Student Advisor"<http://www.studentlibrary.ru/>
* <http://obi.img.ras.ru/humbio/default.htm>
* Site about human biology

**8. Composition of the software**

Windows7 Professional OS OPEN agreement 93592430ZZE1605 License 63588548 (perpetual);

MS Office Standard 2010 Russian Agreement OPEN 93592432ZZE1605 License 63588550 (perpetual);

Kaspersky Endpoint Security for Business Standard, License # 2304-000451-57227148.

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;
* rooms for independent work with Internet access.

Technical training aids

For lectures, a specialized auditorium equipped with the following equipment is used:

* Epson video projector, stulus, console;
* interactive board;
* computer / laptop;
* educational audio and video, animations and presentations;
* a package of applied training programs;
* electronic library of the course;
* demonstration tables.

For laboratory classes, specially equipped

laboratory: "Human Physiology", equipped with presentation equipment (Epson video projector, stulus, remote control, screen, computer / laptop) based on BHF.

Devices and equipment for educational purposes

1. Scales with height meter electronic WB-3000 TANITA.
2. Tonometer AUTOMATIC OMRON MHZ.
3. Scales with stadiometer RGT-160 mechanical floor.
4. Height meter electronic REP.
5. Scales medical VMEN-150 NPV-150 kg, floor, electronic, remote control (from batteries).
6. Dynamometer DMER-120-0.5 electronic manual.
7. Pulse oximeter YUTASOKSI-200.
8. Microscopes.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"Chechen State University"

Work program of the discipline

**"CYTOLOGY AND HISTOLOGY"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional  skills | GPC-2.1;  GPC-2.3 |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-2  Able to apply the principles of structural and functional organization, use physiological, cytological, biochemical, biophysical methods of analysis to assess and correct the state of living objects and monitor their habitat | OPK-2.1  Knows the main systems of life support and homeostatic regulation of vital functions in plants and animals and humans, methods of perception, storage and transmission of information, is oriented in modern methodological approaches, concepts and problems of physiology, cytology, biochemistry, biophysics | **Know:**  - the importance of cytology and histology for biology, the main stages in the development of cytology and histology as a science, its main methods;  - the main regularities of the structural organization of cells, tissues and organs;  - morphofunctional features of epithelial, connective, muscle and nervous tissues;  - participation of tissues in the main biological processes (protective, trophic, secretory, plastic, etc.) based on microscopy data;  - histological functional features of tissue elements and their participation in biological processes;  - features of the device of various microscopes and micromanipulator;  - about methods of cytology and histology;  - the main methods of preparation of cytological and histological preparations and methods for their staining; |
| GPC-2.3  Has experience in applying experimental methods to assess the state of living objects | **Own:**  - the main methods and methods of microscopy by means of light microscopy;  - methods for studying preparations in cytology under a microscope, in atlases and on electron micrographs;  - skills in describing cytological preparations;  - the ability to determine the phases of mitosis on micropreparations;  - methods for studying histological preparations under a microscope, in atlases and on electron micrographs;  - skills in describing histological specimens |

1. **Scope of discipline**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | | |
| ***full-time*** | | ***Part-time*** | |
| 2 semester | 3 semester | 2 semester | 3 semester |
| **General labor intensity**: credits/hours | | 3/108 | 4/144 | 3/108 | 4/144 |
| **contact work**: | | 42 | 34 | 28 | 34 |
|  | Lecture-type classes | 14 | 17 | 14 | 17 |
| Seminar type classes | 28 | 17 | 14 | 17 |
| Intermediate certification: credit / credit with grade / exam |  | 54 |  | 36 |
| **Independent work**(SRS) | | 66 | 56 | 80 | 74 |
| Of which for course work (course project) | |  |  |  |  |

Notes:

1. credit and credit with assessment for full-time and part-time education is carried out within the framework of seminar-type classes. The curriculum does not include hours.
2. **The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

**Module 1Cytology**

2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Introduction | 1 |  |  |  |  |  | 6 |
| 2 | General characteristics of the cell | 2 |  |  |  |  |  | 8 |
| 3 | Structural and functional characteristics of the cytoplasm | 1 |  |  |  |  |  | 6 |
| 4 | Membrane cell organelles | 2 |  |  |  |  |  | 8 |
| 5 | Non-membrane organelles | 2 |  |  |  |  |  | 8 |
| 6 | Core | 2 |  |  |  |  |  | 8 |
| 7 | cell cycle | 2 |  |  |  |  |  | 6 |
| 8 | cell division | 1 |  |  |  |  |  | 6 |
| 9 | Cell response to external influences | 1 |  |  |  |  |  | 6 |

**Module 2.Histology**

3 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Subject of histology | 2 |  |  |  |  |  | 10 |
| 2 | epithelial tissues | 3 |  |  |  |  |  | 12 |
| 3 | Tissues of the internal environment | 4 |  |  |  |  |  | 12 |
| 4 | Muscle | 4 |  |  |  |  |  | 10 |
| 5 | nervous tissue | 4 |  |  |  |  |  | 12 |

4.1.2 Part-time education

**Module 1Cytology**

2 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Introduction | 1 |  |  |  | 2 |  | 10 |
| 2 | General characteristics of the cell | 2 |  |  |  | 2 |  | 8 |
| 3 | Structural and functional characteristics of the cytoplasm | 1 |  |  |  | 2 |  | 10 |
| 4 | Membrane cell organelles | 2 |  |  |  | 4 |  | 8 |
| 5 | Non-membrane organelles | 2 |  |  |  |  |  | 8 |
| 6 | Core | 2 |  |  |  | 2 |  | 8 |
| 7 | cell cycle | 2 |  |  |  | 2 |  | 8 |
| 8 | cell division | 1 |  |  |  |  |  | 10 |
| 9 | Cell response to external influences | 1 |  |  |  |  |  | 10 |

**Module 2.Histology**

3 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Subject of histology | 2 |  |  |  |  |  | 14 |
| 2 | epithelial tissues | 3 |  |  |  | 4 |  | 14 |
| 3 | Tissues of the internal environment | 4 |  |  |  | 6 |  | 16 |
| 4 | Muscle | 4 |  |  |  | 3 |  | 14 |
| 5 | nervous tissue | 4 |  |  |  | 4 |  | 16 |

4.2 The program of the discipline, structured by topics / sections

4.2.1 Lecture content

**Module 1Cytology**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Introduction | Topic 1. The subject of cytology. The subject of cytology, its goals and objectives. The development of cytology. The formation of the cell theory, its main provisions and their proof |
| Topic 2. Methods for the study of cytology  Light and electron microscopy. Intravital observations of cells. Cell culture outside the body. The study of fixed cells. Principles of staining of cellular structures. Brief description of other methods of cell research |
| 2 | General characteristics of the cell | Topic 3. General characteristics of the cell  General characteristics of the cell, the size and shape of the cells. The main components of the cell (nucleus, cell membrane, cytoplasm), their brief description. Features and differences in the structure of prokaryotic and eukaryotic cells. Main Differences Between Animal and Plant Cells |
| 3 | Structural and functional characteristics of the cytoplasm | Topic 4. General characteristics of the cytoplasm  General chemical composition of the cytoplasm. Hyaloplasm (cytoplasm matrix), its structure and functions. Cell organelles, their classification and brief characteristics. Inclusions in a cage: types of inclusions and their brief description |
| Topic 5. Plasma membrane  General characteristics of membranes: lipoprotein membranes, their molecular organization. Plasma membrane, structure and chemical composition. Functions of the plasmalemma. Receptor role of the plasma membrane. Transport function of the plasma membrane. Passive and active transport of substances across the membrane |
| 4 | Membrane cell organelles | Topic 6. Structural and functional characteristics of single-membrane cell organelles. Granular endoplasmic reticulum  Structural characteristic. Role in the synthesis of protein excreted from the cell. Protein synthesis on ribosomes associated with membranes of the endoplasmic reticulum. Smooth endoplasmic reticulum. Structural characteristic. Connection of the smooth endoplasmic reticulum with the synthesis of polysaccharides, fats, steroids and other molecules. The role of the smooth endoplasmic reticulum in the deactivation of various chemical agents. Connection with the function of conducting excitation in muscle tissue. Gold's apparatus (lamellar complex): general characteristics, localization in the cell, microscopic structure. Functions of the Golgi apparatus: segregation, accumulation; maturation, sorting and excretion of secrets and other substances in the cell. Lysosomes. The structure of lysosomes, their chemical characteristics, types of lysosomes. The functional significance of lysosomes, their origin. |
| Topic 7. Double-membrane organelles  Mitochondria. The structure of mitochondria: membranes, cristae, matrix. The role of mitochondria in the synthesis and accumulation of ATP. Ways of ATP synthesis in the cell: anaerobic glycolysis and oxidative phosphorylation. Structure of cristae, localization of oxidative phosphorylation units in them. Plastids, their structure and functions |
| 5 | Non-membrane organelles | Topic 8. Centrioles  Centrioles, ultrastructure, replication, participation in cell division. Basal body, structure and functions. Structure of cilia and flagella in eukaryotic cells. mechanism of their movement. The structure of bacterial flagella |
| Topic 9. Cytoskeleton  Microtubules, structure and chemical composition. Tubulins, their properties and role in the formation of microtubules. The role of microtubules in the formation of the cell division spindle. The role of the spindle in chromosome segregation during mitosis. Framework role of cytoplasmic microtubules. Microfilaments, structure and chemistry. Properties of actin microfilaments. Microfilaments in muscle and non-muscle cells. Intermediate filaments, structure and functions |
| Topic 10. Ribosomes  The structure of the ribosome. The chemical composition of the ribosome. Ribosome functions |
| 6 | Core | Topic 11. General characteristics of the core  The role of the nucleus in the life of the cell and its importance in the transfer of information from DNA to protein. The main functions of the nucleus: storage, implementation (transcription), reduplication and redistribution of genetic material. Interphase nucleus, the main elements of its structure: chromatin (chromosomes), nucleolus, nuclear juice (karyoplasm), nuclear envelope, nuclear protein matrix |
| Topic 12. Chromatin  Chromatin, its chemical characteristics. Diffuse and condensed chromatin, euchromatin and heterochromatin, their functional significance. Chromatin ultrastructure, structure of elementary chromatin fibrils. Nucleosomes: structure, role in the functioning of chromatin. Nucleomeric fibril. Loop domains of chromatin. Histones and non-histone proteins: their role in DNA compaction. The nucleus is in the process of reduplication and redistribution of genetic material. Two states of the main nuclear structures - chromosomes. Behavior of chromatin - chromosomes - during mitosis |
| Topic 13. Nucleolus  The nucleolus is an organelle for the synthesis of cellular ribosomes. The number of nucleoli in the nucleus, their chromosomal origin. Chemistry of the nucleolus, RNA of the nucleolus. Structure and chemistry of ribosomes. Ribosomal RNA precursors. Ribosome synthesis pathways. nucleolus DNA. Structure and ultrastructure of the nucleolus. The fate of the nucleolus in mitosis and its relationship with mitotic chromosomes |
| Topic 14. Nuclear shell. Nuclear envelope, its structure and functional significance. The structure of nuclear pores. Communication of the nuclear envelope with cytoplasmic structures and chromosomes. Nuclear cytoplasmic transport |
| Topic 15. Skeletal structures of the nucleus  Nuclear protein matrix, lamina; their structure and functional significance |
| 7 | cell cycle | Topic 16. Cell cycle  Cell cycle of a cell: presynthetic, synthetic and postsynthetic phases and mitosis. The significance of these phases in the life of cells |
| 8 | cell division | Topic 17. Mitosis  Mitosis in animal and plant cells. Stages of mitosis, their duration and characteristics. mechanism of chromosome movement. The fate of cell organelles during cell division |
| Topic 18. Meiosis  Meiosis, stages of meiosis. Chromosome conjugation, crossing over, reduction in the number of chromosomes. The biological meaning of meiosis. Differences Between Mitosis and Meiosis |
| 9 | Cell response to external influences | Topic 19. Cell response to external influences Morphological changes in the cell under various influences on the cell. Cell death: necrosis and apoptosis |

**Module 2. Histology**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Subject "Histology" | Topic 1. Histology, its goals and objectives. Histological methods. The place of histology among biological disciplines and its relationship with other sciences. Methods of histological research. Definition of the concept of "fabric". General principles of tissue organization. Morphological and functional classification of tissues |
| 2 | epithelial tissues | Topic 2. Integumentary epithelium. General characteristics of the epithelium. Principles of morphofunctional organization of the epithelial layer. Features of the structure of epithelial cells. basement membrane. Morphological, functional, histogenetic classification of epithelium. Structural and functional characteristics of certain types of epithelial tissues (cubic, bordered, ciliated, keratinized stratified epithelium).  Topic 3. Glandular epithelium. General characteristics of the secretory epithelium. Classification of glands. Features of the morphofunctional organization of exocrine and endocrine glands. Secretion types |
| 3 | Tissues of the internal environment | Topic 4. General characteristics of the tissues of the internal environment. Classification of tissues of the internal environment. Their general characteristics, features of origin, structure and function.  Topic 5. Blood. Blood and lymph. Their composition, functions. Plasma and formed elements of blood and lymph. Blood cells: erythrocytes, leukocytes, platelets, their structural and functional characteristics. Ultrastructure and cytochemical characteristics of blood cells. Leukocyte formula, its clinical significance and changes in various conditions of the body.  Topic 6. Hematopoiesis. Hematopoiesis (hematopoiesis). General characteristics and regulation. Hematopoietic organs. Embryonic and postembryonic hematopoiesis. Stem and semi-stem blood cells. Development of myeloid and lymphoid cells.  Topic 7. Actually connective tissues. Basically connective tissue. Areas of distribution, varieties, functions, development. Intercellular substance: origin, structure, chemical composition, functional significance. Morphofunctional characteristics and origin of loose connective tissue cells. Fibroblasts and fibrocytes, mast cells, pericytes, histiocytes, plasma and fat cells. Blood and loose connective tissue as a single system. Dense connective tissue of collagen (tendons, fascia, dermis) and elastic (ligaments, elastic membranes) type. Their structure, function and development.  Topic 8. Connective tissues with special properties. Reticular, adipose, pigment and mucous tissues, their structure, localization and functions.  Topic 9. Skeletal tissues. General characteristics. Tissues of the internal environment with a supporting function (skeletal tissues). General patterns of morphofunctional organization and sources of origin.  Topic 10. Cartilaginous tissue. Cells and intercellular substance of cartilage, their origin, types, structure. Perchondrium, structure, functions and development. Features of cartilage growth: appositional and interstitial growth. Morphofunctional characteristics of various types of cartilage tissue.  Topic 11. Bone tissue. Coarse fibrous and lamellar bone tissue. Bone tissue cells, their structure, function, sources of origin. Features of the structural and functional organization and chemical composition of the intercellular substance. Osteon is the structural and functional unit of lamellar bone. Periosteum, its structure, functions, development. The structure of the bone as an organ. Bone development from mesenchyme. Restructuring of coarse fibrous bone into lamellar. Development of bone in place of cartilage. Bone growth in length and thickness |
| 4 | Muscle | Topic 10. Skeletal muscle tissue. Classification, morphofunctional characteristics and histogenesis of various types of muscle tissue: smooth, cardiac and somatic striated. Muscle fiber is a structural and functional unit of striated muscle tissue. The structure of the myofibril. Sarcomere. Molecular mechanisms of muscle contraction. The structure of the muscle as an organ.  Topic 11. Cardiac muscle tissue. Cardiac muscle tissue: structural and functional characteristics.  Topic 12. Smooth muscle tissue. Smooth muscle tissue: structural and functional characteristics |
| 5 | nervous tissue | Topic 13. Neurons. Morphofunctional characteristics of the nervous tissue. Morphological, functional and cytochemical classification of neurons. Light-optical and electron-microscopic structure of nerve cells. Pericaryon: the structure of the nucleus and cytoplasm. Outgrowths of nerve cells: dendrites and axons. The structure of pulpy and non-pulmonic nerve fibers, their functional features. Contacts between neurons are synapses. Reflex arc. Nerve endings: afferent and efferent. neuromuscular synapse.  Topic 14. Neuroglia. Neuroglia, its types, structure and functions. Macroglia and microglia. The relationship between neurons and glia. Histogenesis of nervous tissue |

4.2.1 Content of the lab

**Module 1Cytology**

|  |  |  |  |
| --- | --- | --- | --- |
| **No. p / p** | **№ r / d** | **Name of the topic (section) of the discipline** | **The content of the laboratory lesson** |
| 1 | 1 | Introduction | Principles of working with a light microscope |
| 2 | 2 | General characteristics of the cell | General cell morphology. Non-cellular structures |
| 3 | 3 | Structural and functional characteristics of the cytoplasm | Inclusions in a cage |
| 4 | 4 | Membrane cell organelles | Morphology of cell organelles |
| 5 | 6 | Core | Nuclear morphology |
| 6 | 7 | cell cycle | Cell cycle. Mitosis |

**Module 2. Histology**

|  |  |  |  |
| --- | --- | --- | --- |
| **No. p / p** | **№ r / d** | **Name of the topic (section) of the discipline** | **The content of the laboratory lesson** |
| 1 | 2 | epithelial tissues | Study of the morphology of epithelial tissues |
| 2 | 3 | Tissues of the internal environment | Study of the morphology of blood and connective tissues |
| 3 | Study of the morphology of cartilage and bone tissues |
| 4 | 4 | Muscle | The study of the morphology of muscle tissues |
| 5 | 5 | nervous tissue | Study of the morphology of nervous tissue |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

* ongoing monitoring of progress;
* intermediate certification of students in the discipline.

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

**Module 1Cytology**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1 | Introduction | Information project (report)  Lab report |
| 2 | General characteristics of the cell | Test  Tasks for self-study (work with the album)  Lab report |
| 3 | Structural and functional characteristics of the cytoplasm | Cases (situations and tasks with given conditions)  Lab report |
| 4 | Membrane cell organelles | Cases (situations and tasks with given conditions)  Tasks for self-study (work with the album)  Lab report |
| 5 | Non-membrane organelles | Cases (situations and tasks with given conditions) |
| 6 | Core | Cases (situations and tasks with given conditions)  Tasks for self-study (work with the album)  Lab report |
| 7 | cell cycle | Test  Lab report |
| 8 | cell division | Cases (situations and tasks with given conditions)  Lab report |
| 9 | Cell response to external influences | Information project (report) |

**Module 2. Histology**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1 | Subject of histology | Research project (abstract) |
| 2 | epithelial tissues | Cases (situations and tasks with given conditions)  Tasks for self-study (work with the album)  Lab report |
| 3 | Tissues of the internal environment | Test  Tasks for self-study (work with the album)  Lab report |
| 4 | Muscle | Cases (situations and tasks with given conditions)  Tasks for self-study (work with the album)  Lab report |
| 5 | nervous tissue | Test  Tasks for self-study (work with the album)  Lab report |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

**Module 1. Cytology**

**An exemplary typical task in a laboratory lesson**

Approximate laboratory work on the topic:

General cell morphology. Non-cellular structures

The purpose of the work: Acquaintance with the general morphology of the cell. Introduction to supercellular structures.

In this practical lesson, students get acquainted with the general morphology (shape, size, cell types, morphology of fixed and living cells, the ability of cell structures and cell structures to stain differently with dyes, etc.) of a cell, including plant, animal and prokaryotic cells . In addition, students get acquainted with various microscopic structures of the body - non-cellular structures (symplasts, collagen fibers).

Finished preparations:

Specimen No. 1. Cross section of axolotl liver. Stained with hematoxylin and eosin.Roldugina et al., 2004, p. 16, fig. 5.

At low magnification, a group of polygonal cells is visible. At high magnification, nuclei are clearly visible in the cell, stained with hematoxylin in purple. The cytoplasm of cells is stained predominantly inpink color, although it also contains weakly basophilic (pale purple) grains. The plasmalemma of the cell has a submicroscopic thickness, but its location - the border of the cytoplasm - is clearly visible. The ultrastructure of the plasma membrane is revealed only under an electron microscope.

Draw one or two cells and label: 1) nucleus, 2) cytoplasm, 3) plasma membrane.

Specimen No. 2. Frog blood smear. coloring byRomanovsky. Roldugina et al., 2004, p. 52, fig. 25.

Most of the cells in the frog smear are erythrocytes. Erythrocytes are oval in shape, have a cytoplasm stained inpink, and contain an oval nucleus, colored dark blue. Among leukocytes, cells with a dark purple, round nucleus and a small rim of cytoplasm (lymphocytes), cells with a lobed nucleus and granular cytoplasm (neutrophils and eosinophils) and cells with a bean-shaped nucleus and grayish-bluish cytoplasm (monocytes) can be found. Frog platelets are also oval and contain an oval nucleus. The platelet cytoplasm is stained light purple, and the nuclei are stained dark purple.

Draw and label: 1) erythrocyte, 2) neutrophil. Designate these cells: 1) nucleus, 2) cytoplasm, 3) plasmalemma.

Preparation No. 3. Striated muscle tissue. Section of the tongue of a rabbit. Stained with iron hematoxylin.Roldugina et al., 2004, p. 90, fig. 44.

Most cells have one nucleus, but there are cases when the cytoplasm contains many nuclei. This education is calledsymplastom. A symplast is a non-cellular structure. An example of a symplast is a striated muscle fiber, the bundles of which form, for example, the muscles of the tongue. Under low magnification, it is necessary to find longitudinally cut muscle fibers, large formations with many nuclei located on the periphery of the fibers. The cytoplasm and nuclei of the muscle fiber are colored blue.

Draw one muscle fiber and designate in it: 1) nuclei, 2) cytoplasm, 3) plasmolemma (muscle fiber border), 4) transversestriation due to the presence of myofibrils in the cell.

living objects

Preparation No. 4. Cells of the squamous epithelium of the human oral cavity. Chentsov, 1988, p. 37, fig. 12.

In order to prepare the drug, it is enough to hold a sterile glass spatula with light pressure over the palate or gums. At the same time, at the tip of the spatula in a drop of saliva will bedesquamated cells of the epithelium lining the oral cavity. Then place this drop on a glass slide and spread it in a thin layer over the surface of the glass slide. Epithelial cells are best viewed with a phase-contrast or dark-field microscope, but a conventional light microscope (bright-field method) with a highly closed aperture can also be used. Slightly close the aperture of the microscope should always be considered when viewing living objects.

Draw one or two epithelial cells and label them: 1) nucleus, 2) cytoplasm, 3) plasmalemma.

Preparation No. 5. Skin cells of onion bulb scales. Chentsov, 1988, p. 32, fig. 9.

To prepare this preparation, it is necessary to cut the onion and take the thin skin between the fleshy scales. Put small pieces of fabric indrop of water on a glass slide and cover with a coverslip. The aperture of the microscope during the study of the preparation must be somewhat closed. A cell wall characteristic of plant cells, strands of cytoplasm, a nucleus with 1-2 nucleoli and fine-grained chromatin will be visible.

Draw one or two plant cells and label them: 1) nucleus, 2) cytoplasm, 3) cell wall.

**An exemplary set of tests for current control**

|  |  |
| --- | --- |
| № r / d | Exemplary test tasks for sections of the discipline |
| 2 | General characteristics of the cell |
| 1. Differences between the genetic material of prokaryotes and the genetic material of eukaryotes. Everything is true, except  -: circular shape of the DNA molecule  +: DNA is separated from the cytoplasm  -: DNA is not associated with histone and non-histone proteins  -no nucleoli |
| 2. What is the structure plan of the universal biological membrane  -two layers of proteins with a layer of lipids in between  +: bimolecular layer of lipids, including proteins  -two layers of lipids, and between them a layer of proteins  -groups of proteins alternate with groups of lipids |
| 3. What is the function of the Golgi complex  +: formation of complex chemical compounds (glycoproteins, lipoproteins)  -: protein synthesis  -: spindle formation  - formation of hyaloplasm |
| 4. Differences between a plant cell and an animal cell. Everything is true, except  - the presence of starch in the cell  +: the presence of the Golgi Apparatus in the cell  - the presence of a cell wall  - presence of plastids |
| 5. Common to prokaryotes and eukaryotes is everything except  +: Presence of a core  -: Presence of a plasma membrane  - Metabolic ability  -: Presence of ribosomes |
| 7 | cell cycle |
| 1. Mitosis is  -direct cell division  +: indirect cell division  - only division of the cytoplasm  - nucleolus division |
| 2. In what phase of mitosis do chromosomes diverge towards the poles  - prophase  -: telophase  -: metaphase  +: anaphase |
| 3. In what phase of the cell cycle is DNA synthesized  - in telophase  +: in interphase  -: in anaphase  - in metaphase |
| 4. For meiosis, all statements are true except  - Needed for sexual reproduction  - there is no interphase before the second division of meiosis  - Meiosis produces haploid cells  +: meiosis is one of the periods of interphase |
| 5. In meiosis, the reduction in the number of chromosomes occurs in  +: anaphase 1  -: metaphase 1  -: anaphase 2  -: metaphase 2 |

**Approximate set of cases (situations and tasks with given conditions)**

|  |  |
| --- | --- |
| № r / d | Approximate situational tasks for sections of the discipline |
| 3 | Structural and functional characteristics of the cytoplasm |
| 1. As a result of experimental exposure, transport processes were blocked in cells. What organelles were damaged in the experiment?  Answer. Plasma membrane, cytoskeletal elements (microtubules, microfilaments, microtrabeculae), centrioles, ER |
| 2. Under a high magnification of the microscope, a group of cells was found in the field of view, which, after mitosis, retain communication with each other in the form of the thinnest cytoplasmic bridges. What are these clusters of cells called? In what organs can they be found?  Answer. Microvilli increase the absorptive surface of the cell |
| 4 | Membrane cell organelles |
| 1. On the electron diffraction pattern of the myosymplast, stringy cavity formations are visible, limited by two membranes, the inner of which forms protrusions into the inside of the cavities. Identify these structures. What functions do they perform?  Answer. These are mitochondria, which in their matrix contain the enzyme of the tricarboxylic acid cycle, involved in the oxidative phosphorylation of ADP, its conversion into ATP - the main intracellular energy equivalent |
| 2. On the electron diffraction pattern in the cytoplasm of the pancreocyte, cavity membrane formations in the form of tubules and cisterns are visible, on the surface of which numerous granular structures are found. What organelle of general importance can we talk about? What are the grains on its surface and what is their function?  Answer. About granular EPS, on the surface of which ribosomes are localized in the form of grains, participating in protein biosynthesis |
| 5 | Non-membrane organelles |
| 1. During the experiment, the animal was injected with colchicine, which destroys microtubules. What cellular processes will be affected by this substance? What tissues are most affected?  Answer. Destruction of microtubules, for example, by colchicine, disrupts the transport of substances in the axons of nerve cells, leads to blockade of secretion and other violations of the transport of substances. Special proteins are associated with cytoplasmic microtubules, which are involved in the mechanical transfer of individual intracellular components: microvacuoles, ribosomes, mitochondria, and other organelles. |
| 2. Under an electron microscope in the cytoplasm of the glandulocyte of the parotid salivary gland, numerous little bodies up to 20-25 nm in size were detected, in which, during a cytochemical study, a sharply positive reaction to proteins and RNA was found. What are these structural formations? What kinds of them do you know? What functions do they perform?  Answer. These are ribosomes. They can be free in the cytoplasm (polysomes) and fixed on the EPS membranes. The first synthesize proteins for their own needs, and the second - "for export" |
| 6 | Core |
| 1. In a cytological study in the nucleus of a differentiated cell, the predominance of heterochromatin over euchromatin was noted. What does this picture show?  Answer. The predominance of euchromatin over heterochromatin in the cell nucleus indicates an increased transcriptional activity of the cell. |
| 2. Using a micromanipulator, the amoeba was surgically divided into two fragments: nucleated and non-nuclear. What is the further fate of these fragments and what is it connected with?  Answer. The nucleated fragment will restore the cell. Nuclear-free - will die. The nucleus regulates all processes, including cell repair |
| 8 | cell division |
| 1. As a result of mitosis, two daughter cells arose. One of them enters the stage of the cell cycle, the second, as a result of differentiation, loses the ability to reproduce. What is the ultimate fate of the first and second cells?  Answer. The first one will separate, the second one can function for a long time and then die. For some cells, it is possible to return them to the mitotic cycle. |
| 2. A mitotically dividing somatic diploid cell was exposed to a drug that very quickly destroys the spindle of division, as a result of which the normal course of mitosis was disrupted. At what stage is the normal course of mitosis interrupted? How many nuclei are formed as a result of such mitotic division? What set of chromosomes will contain the resulting nucleus (or nuclei)?  Answer. At the anaphase stage. One core. Tetraploid set |

**Approximate topics of reports**

Section 1.The subject of cytology. Cytology research methods

1. Formation of the cell theory.
2. Light microscopy.
3. Cell culture.
4. stem cells.
5. Quantitative methods of cytology.
6. Modern methods of cytology research.
7. Immunofluorescent microscopy and its possibilities in the study of cellular functions.
8. Using light microscopy techniques to study cells.
9. Using electron microscopy methods to study cells.
10. Method of fractionation of cellular structures.
11. Possibilities of immunofluorescence in the study of various cell structures.
12. Research of tinctorial properties of cellular components.

Section 8. Cell division

1. Cell division: a description of the main processes.
2. division of the cell nucleus. Types of nuclear fission.
3. Mitosis, its stages, types and significance.
4. Reproductive function and biological significance of meiosis.
5. Methods of cell engineering.
6. The role of the nucleus in the life of the cell.
7. Modern views on the molecular mechanisms of chromosome segregation.
8. Centrioles in the early development of mice: an immunofluorescent study.
9. Centrioles in the early development of mice: an electron microscopic study.
10. The centrosome in the early development of mice: an immunofluorescent study.
11. The centrosome in the early development of mice: an electron microscopic study.

Section 9. Cell response to external influences

1. Changes in cellular structures in response to external influences. Common features in cell responses
2. Adaptive and maladaptive changes.
3. Malignant cell transformation.
4. Cell response to damaging effects.
5. The effect of cold on the tubulin cytoskeleton.
6. Effect of changes in the concentration of magnesium ions on the structure of chromatin.
7. Influence of changes in the concentration of calcium ions on the structure of chromatin.
8. Cell response to hypotension.
9. cellular response to hypertension.
10. Apoptosis.

**Tasks for self-study (work with the album)**

Sample list of tasks for self-study

|  |  |
| --- | --- |
| section number | Practical task |
| 2 | Make two separate comparison tables for prokaryotic and eukaryotic, plant and animal cells in an album or workbook. Note the similarities and differences |
| 4 | Sketch the diagrams of intercellular contacts from the textbook. Sign and study them. |
| 4 | Draw in the album a diagram of protein synthesis on the ribosomes of the granular endoplasmic reticulum. Study it. Write captions for the drawing |
| 4 | Draw electron micrographs of the lysosome and peroxisome in the album. Write captions for pictures and study them. |
| 4 | Draw a diagram of the structure of the Golgi Apparatus and label all its parts. |
| 6 | Draw a diagram of the structure of a chromosome in an album using an electron micrograph. Write captions for pictures and study them. |
| 8 | Make a comparison table of mitosis and meiosis in an album or in a workbook. Note the similarities and differences. |
| 8 | Draw a diagram of meiosis and study it. Make all necessary markings |

**Module 2. Histology**

**An exemplary typical task in a laboratory lesson**

Approximate laboratory work on the topic:

COVERING EPITHELIUM

*Finished preparations:*

Preparation No. 1. Single-layer squamous epithelium (mesothelium). Total drug. Silver nitrate impregnation and hematoxylin staining. Kuznetsov et al., 2006, p. 56, fig. 80.

The peritoneum is stretched on a glass slide, top view. At low magnification under a microscope, one layer of polygonal epithelial cells with sharply defined boundaries is revealed. Cells, as in all integumentary epithelium, are tightly adjacent to each other. Each epithelial cell usually contains one rounded nucleus.

Under high magnification, find a section of the mesothelium, draw it and designate: 1) the boundaries between adjacent epithelial cells, 2) nuclei.

Preparation No. 2. Multi-row ciliated epithelium of the trachea. Section of the trachea. Stained with hematoxylin and eosin. Kuznetsov et al., 2006, p. 59, fig. 83 c.

At low magnification, find the epithelium lining the inner surface of the trachea. At high magnification of the microscope, several rows of nuclei stand out in the epithelium (cell boundaries are not visible): the lower row of nuclei, adjacent to the basement membrane, belongs to basal cells (or short intercalated cells); nuclei lying at a higher level are the nuclei of long intercalated cells; the topmost row of nuclei belongs to ciliated (ciliated) cells. Cilia are clearly visible on the apical surface of the ciliated cells with a slightly lowered condenser. Between the ciliated cells are goblet cells (exocrinocytes). They differ in lighter cytoplasm. Their nuclei lie in the "stem of the glass", near the basement membrane.

Draw a section of the ciliated epithelium and designate: 1) basement membrane, 2) basal epitheliocyte (or short intercalated cell), 3) high intercalated epithelial cell, 4) ciliated cell, 5) goblet cell, 6) cilia.

Preparation No. 3. Stratified squamous non-keratinized epithelium of the cornea of ​​the eye. Stained with hematoxylin and eosin. Kuznetsov et al., p. 61, fig. 85 b.

At low magnification, find a stratified epithelium on the outer surface of the cornea. At high magnification, the basement membrane is clearly visible. It has one layer of low prismatic cells - the basal layer. The nuclei of the cells of the basal layer are oval in shape, with a long axis located vertically. The basal layer is followed by several layers of irregularly shaped cells with cytoplasmic outgrowths - a layer of spiny cells. Spiny cell nuclei are rounded. Outside, there are several layers of cells that form the surface layer of flat cells. Their nuclei are flattened and lie parallel to the surface of the epithelium.

Draw and label: 1) basement membrane, 2) basal layer of cells, 3) spiny layer of cells, 4) superficial layer of flat cells.

*Living objects:*

Preparation No. 4. Frog epidermis.

In the vessel where the frogs live, grayish films are often found. This is the superficial layer of the stratified squamous epithelium of the frog skin. Carefully spread a small piece of thin film in a drop of water on a glass slide and cover with a coverslip. It is necessary to consider the cytoplasm and nuclei of epithelial cells. Pay attention to the arrangement of cells in the form of a layer, characteristic of the epithelium, and the absence of intercellular substance between them.

Specimen No. 5. Ciliated epithelium of the palate of a frog.

In a frog, cut out a small section of the mucous membrane covering the palate and place it in a drop of saline on a glass slide, covered with a coverslip. The preparation should be viewed with a slightly darkened field of view of the microscope. With a strong magnification, flickering is visible along the edge of the epithelium, depending on the movement of a mass of thin cilia extending from the epithelial cells covering the palate. At first, individual cilia are not visible, but after a while their movement slows down, and they become noticeable. The movement of each individual cilium consists of flexion and extension. With a careful study of the preparation, one can also see the cells from which the cilia depart; they are elongated prisms arranged in a layer in one layer. The boundaries of cells and nuclei are not clearly visible. If you cut out the entire palate or trachea,

*Electronic micrographs:*

1. Ultramicroscopic structure of the cilium. Kuznetsov et al., 2006, p. 16, fig. 20. Study electron micrograph.

2. Electron micrograph of microvilli (brush border). Kuznetsov et al., 2006, p. 15, fig. 17. Study electron microphotography.

*Control questions*

1. Define the concept of "tissue" and explain the principles on which the classification of the main four groups of tissues is based.

2. Give a general description of the epithelial tissue. Name the main morphological features characteristic of epithelial tissues.

3. What is the basis for the division of epithelial tissues into integumentary and secretory epithelium?

4. How do single-layer integumentary epithelium differ from multilayer ones?

5. What are the distinctive morphological features of mesothelium? How does it differ in structure, for example, from the single-layer prismatic epithelium of the renal tubules?

6. Name all layers of cells of keratinized stratified epithelium and describe their morphological features.

7. What is the structure and function of the basement membrane?

**An exemplary set of tests for current control**

|  |  |
| --- | --- |
| № r / d | Exemplary test tasks for sections of the discipline |
| 3 | Tissues of the internal environment |
| 1. Chemical composition of the amorphous substance of hyaline cartilage tissue  +: 70-80% water, 10-15% organic, 4-7% mineral  -: 6-20% water, 10-20% organic component, 60-70% mineral component  -: 60% water, 30% organic component, 10% mineral component  -: 50% water, 40% organic component, 10% mineral component |
| 2. The main features of dense connective tissues. Everything is true, except:  +: the predominance of the main substance  - uniformity of cells  -: predominance of fibers  -: predominance of one cell type (fibrocyte) |
| 3. Signs of tissues of the internal environment. Everything is true, except  +: lack of intercellular substance  -: variety of cell types  -: presence of intercellular substance  - ability to regenerate |
| 4. Blood cells mainly carry out their protective functions in the composition  - Loose fibrous connective tissue  - dense irregular connective tissue  +: epithelial tissue  - densely structured connective tissue |
| 5. Which organs contain reticular tissue  - tendons  +: organs of hematopoiesis and immunogenesis  - skeletal muscles  -: blood vessels |
| 5 | nervous tissue |
| 1. Tigroid in the cytoplasm of a neuron is  -: lysosomes  - Dictyosomes of the Golgi complex  - smooth endoplasmic reticulum  +: granular endoplasmic reticulum |
| 2. Dimensions of human neurons  +: 4-130 µm  -: 1-3 microns  -: 200-300 nm  -: more than 200 microns |
| 3. What sign is characteristic of the nervous tissue  -: contractility  +: excitability  -: striation  -: mediator synthesis |
| 4. What is present in an unmyelinated nerve fiber  - myelin sheath  -: only one axle cylinder  +: multiple axle cylinders  -: internodal segments |
| 5. What structural elements of the nervous tissue are involved in the formation of the nerve fiber?  +: oligodendroglia cells  - microglial cells  - fibrous astrocytes  - plasma astrocytes |

**Approximate set of cases (situations and tasks with given conditions)**

|  |  |
| --- | --- |
| № r / d | Approximate situational tasks for sections of the discipline |
| 2 | epithelial tissues |
| 1. One of the functions of the intestine, lined with epithelium, is absorption. What type of epithelium is adequate for this function?  Answer: single-layer prismatic (cylindrical) bordered epithelium |
| 2. The skin on the palmar surface of the hand and scalp is covered with stratified keratinized epithelium. What differences in the structure of this epithelium should be expected and why? Find them in preparations.  Answer: the presence of a shiny layer in the epidermis of the skin of the palms and feet, a smaller number of layers in each similar layer of the epidermis in thin and thick skin |
| 3. In the transitional epithelium of the bladder, depending on the functional state of the organ, the thickness of the layers may change. Determine on the preparation whether the organ is stretched or shortened.  Answer: in the stretched state of the organ, the cells of the surface layer of the transitional epithelium lining the organ will be stretched; in the unstretched state of the organ, the superficial cells are dome-shaped. To ensure this function, in the apical part of the cells of the surface layer there is a reserve of membranes in the form of numerous invaginations of the plasmolemma and in the form of a wall of special membrane vesicles. |
| 4. The preparation of the gland is treated with Schiff-iodic acid; as a result, a crimson-colored secret was revealed in the cells. What chemical components does the secretion of this gland contain?  Answer: The PAS reaction is aimed at detecting polysaccharides in goblet cells (containing glycoproteins in the mucous secretion) (goblet glands are often located as part of the integumentary epithelium ‒> endoepithelial unicellular glands) |
| 5. In the preparation of the gland, it can be seen that its secretory section consists of several layers of cells, in which, as the distance from the basement membrane increases, secretion accumulates, the nuclei shrink, and cells are destroyed. What type of secretion is typical for this gland?  Answer: this gland is characterized by a holocrine type of secretion, for example: sebaceous glands (simple branched alveolar glands; cells - sebocytes; excretory ducts open into the hair funnel - the place where the hair exits to the surface of the skin; glands are located in the dermis of all skin areas, except for the palms and soles ) |
| 4 | Muscle |
| 1. Determine the type of tissue: a) a layer of cells, each of which is surrounded by a basement membrane, b) a layer of cells lying on the basement membrane.  Answer: the first is smooth muscle tissue of blood vessels and internal organs, the second is striated muscle tissue (skeletal) |
| 2. Two electron micrographs are given: one shows cells closely adjacent to each other and interconnected by desmosomes, the other shows cells closely adjacent to each other, separated by a basement membrane, but interconnected by nexuses. Determine the tissue affiliation of the cells presented in the electron micrographs.  Answer: on the first micrograph - striated cardiac muscle tissue (cardiomyocytes), on the second micrograph - smooth muscle tissue (smooth myocytes) |
| 3. When staining the preparation of muscle tissue with iron hematoxylin, transverse striation was revealed. What additional morphological features can be used to identify cardiac muscle tissue?  Answer: by intercalated discs (points of contact of neighboring cardiomyocytes) |
| 4. One electron micrograph of a section of a striated muscle fiber shows the following picture: thin myofilaments go into the A-disk so much that I-disks are barely detected in sarcomeres; in another photograph, fairly wide I-discs are seen in the sarcomeres. Explain the functional state of the muscle fibers in both photographs.  Answer: the first micrograph is the maximum contraction of the sarcomere (muscle fiber), in the second case, the muscle fiber is at rest (relaxed), provided that the distance between the telophragms is 2.3 microns, or overstretched if the distance is greater than the named value. (I-half-disk at rest is 0.4 µm) |
| 5. Electron micrographs of transversely cut muscle fibers show areas where 6 thin ones are located around one thick myofilament. In the region of which disk of myofibrils was the cut?  Answer: in the area of ​​\u200b\u200bthe A-disk (anisotropic), where thin and thick fibers mutually overlap, forming a hexagonal structure on the cut |

**Approximate essay topics**

Section 1. Subject "Histology"

1. Brief outline of the development of histology.
2. Histology as a science, the subject of study of histology.
3. A cell is a structural unit of tissues.
4. Fabrics: concept, characteristics. Classification of tissues.
5. Histochemical methods for studying tissues and their possibilities.
6. Methods of microscopy of histological preparations.
7. Quantitative methods of histology.
8. Immunofluorescent microscopy and its possibilities in the study of tissue functions.
9. Culture of tissues and organs.
10. Formation of ideas about the stem cell.

**Tasks for self-study (work with the album)**

Sample list of tasks for self-study

|  |  |
| --- | --- |
| No.  section | Practical task for self-training |
|
| 2 | Examine the preparations under a microscope, draw and label the drawings:  cuboidal epithelium of the thyroid gland.  Exocrine glands of the pancreas.  Roundworm intestine (brush border and basement membrane).  Axolotl intestinal goblet cells |
| 2 | Examine preparations under a light microscope:  Desmosomes in stratified epithelium.  Silkworm chitin.  Ascaris cuticle.  Ciliated epithelium (trachea of ​​the intestine, hepatic passages of the cochlea, etc.).  Mucous glands of the leg of a mollusc.  Cancer antennal glands |
| 2 | Sketch in the album and sign the symbols:  Electron micrograph of a microvillus (brush border).  Electron micrograph of a flickering apparatus |
| 2 | Examine the preparations under a microscope, draw and label the drawings:  Accumulation of trypan blue in histiocytes.  Mast cells.  Fat cells.  plasma cells.  bull neck ligament |
| 2 | Examine the preparations under a microscope, draw and label the drawings:  The striated musculature of a crab.  Obliquely striated muscle cells of roundworm.  Leech muscle cells |
| 3 | Sketch in the album and sign the symbols:  Electron micrograph of platelets.  Electron micrographs of macrophages, adipose, mast and plasma cells |
| 4 | Examine the preparations under a microscope, draw and label the drawings:  Purkinje cells of the cerebellum.  Pyramidal cells of the cerebral cortex |
| 5 | Sketch in the album and sign the symbols:  Electron micrograph of myelin and non-myelin fibers.  Electron micrograph of motor plaque |

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Laboratory studies**

To perform laboratory work, the following is carried out: preparation of the workplace, setting up a light microscope, selection of training materials on the relevant topic of the practical lesson, as well as preparation of teaching aids and atlases for practical classes.

In the course of laboratory work, the student sketches in the album cells, tissues and structures of the intercellular substance on preparations, visible under a light microscope, as well as from an atlas, from electron micrographs. When performing laboratory work, the student must monitor the proportionality of cellular structures, the correct observance of the coloring of tissue cells, cellular structures and structures of the intercellular substance and correctly apply symbols (signatures) on the drawings.

References: Kuznetsov S.L., Mushkambarov N.N. "Histology, Cytology and Embryology" (M., 2005); "Atlas of histology, cytology and embryology" S.L. Kuznetsova, N.N. Mushkambarova, V.L. Goryachkina (M., 2006.). It should be noted that the specified textbook and atlas of Kuznetsov et al. are editions based on original color photographs (rather than drawings) of preparations. This atlas also contains electron micrographs of the structures under study, which can be recommended for study during practical classes and in self-study.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Theoretical study of the material | GPC-2.2  GPC-2.3 |
| 2 | Technique for completing the task, including mastering the skills of working with various laboratory instruments and devices |
| 3 | Ability to analyze and discuss assignment results and formulate conclusions |
| 4 | The correctness of the calculation of the results and the execution of the protocol |

*"Passed"*exhibited when all items are completed, not less than 70%.

*"Not counted"*exhibited in the absence or incorrectly executed protocol of a laboratory lesson, the student's inability to explain the results.

Students who have not attended laboratory classes work them out individually, one of the forms can be writing an essay on a missed topic.

**Test tasks**

The test is a tool for assessing students' learning, consisting of a system of test tasks, a standardized procedure for conducting, processing and analyzing the results. The teacher must determine for students the initial data for preparing for testing: name the sections (topics, questions) for which there will be tasks in the test form and theoretical sources for preparation. Preparation involves the study of lecture material, the preparation of auxiliary schemes in workbooks for visual structuring of the material in order to simplify its memorization. Pay attention to the basic terminology, classification, distinctive features, the presence of appropriate links between individual processes. Testing time, usually at least 40 minutes.

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Correct answer to the question | OPK-2.1 |

The grade "excellent" is given if 90-100% of the tasks are correctly completed.

The grade "good" is given if 70-89% of the tasks are correctly completed.

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed.

An "unsatisfactory" grade is given if less than 50% of the tasks are correctly completed.

**Cases (situations and tasks with given conditions)**

A situational task is a type of educational task that simulates situations that may arise in real life. The solution of situational problems is carried out in order to check the level of skills (possessions) of the student in solving a practical situational problem.

The condition of the problem is announced to the student, the solution of which he states orally or in writing.

An effective interactive way to solve problems is to compare the results of solving one task by two or more small groups of students.

The main actions of students in working with a situational task are:

* preparation for the lesson;
* acquaintance with the criteria for assessing a situational task;
* clarification of the essence of the task and clarification of the algorithm for solving a situational problem;
* development of options for decision-making, selection of decision criteria, evaluation and forecast of options being sorted out;
* presentation of a solution to a situational problem (written or oral);
* receiving an assessment and its comprehension.

To successfully master the techniques for solving situational problems, three stages can be distinguished. At the first stage, it is necessary to familiarize students with the methodology for solving problems using printed publications on the methodology for solving problems, materials contained in databases, video lectures, and computer simulators. At this stage, the student is offered typical tasks, the solution of which allows him to work out the stereotypical techniques used in solving problems, to realize the connection between the theoretical knowledge gained and the specific problems that they can be aimed at solving.

For self-control at this stage, it is reasonable to use informal tests that not only state the correctness of the answer, but also provide detailed explanations if the wrong answer is chosen; in this case, tests perform not only a controlling, but also a learning function. To answer questions that arise, consultations are held with the teacher leading the course.

At the second stage, tasks of a creative nature are considered. In this case, the role of the teacher increases. Such classes not only form creative thinking, but also develop the skills of a business discussion of the problem, provide an opportunity to master the language of professional communication.

At the third stage, control work is performed to test the skills of solving situational problems..

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Possession of theoretical knowledge in a particular section and special terminology | GPK-2.1  GPC-2.2 |
| Response reasoning |
| Use of additional material |

Evaluation "excellent": the answer to the question of the problem is given correctly. The explanation of the course of its solution is detailed, consistent, competent, with theoretical justifications (including from the lecture course), with the necessary schematic images, with correct and fluent use of terminology; answers to additional questions are correct, clear.

Rating "good": the answer to the question of the problem is given correctly. The explanation of the course of its solution is detailed, but not logical enough, with single errors in details, some difficulties in theoretical justification (including from lecture material) and in schematic images, with single errors in the use of terms; answers to additional questions are correct, but not clear enough.

Grade "satisfactory": the answer to the question of the problem is given correctly. The explanation of the course of its solution is not complete enough, inconsistent, with errors, weak theoretical justification (including lecture material), with significant difficulties and errors in schematic representations, in the use of terms; answers to additional questions are not clear enough, with errors in details.

Rating "unsatisfactory": the answer to the question of the problem is given incorrectly. The explanation of the course of its solution is given incomplete, inconsistent, with gross errors, without theoretical justification (including lecture material); answers to additional questions are incorrect (missing).

**Information project (report with presentation)**

Report - a type of independent research work, where the author reveals the essence of the problem under study; gives different points of view, as well as his own views on it. The report combines three qualities of a researcher: the ability to conduct research, the ability to present the results to the audience and to answer questions in a qualified manner. The performance usually lasts 10-15 minutes. Structure of the report: Title page; Table of contents; Introduction; Main part; Conclusion; List of used literature (bibliography).

The general structure of the text of the report may be as follows:

1. The formulation of the research topic (and it should be not only relevant, but also original, interesting in content).
2. The relevance of the study (what is interesting about the direction of research, what is its importance, what scientists worked in this area, what issues in this topic were given insufficient attention, why this topic was chosen by students).
3. The purpose of the work (in general terms, corresponds to the formulation of the research topic and can clarify it).
4. Research objectives (specify the purpose of the work).
5. Hypothesis (scientifically based assumption about the possible results of research work).
6. Research methodology (detailed description of all activities related to obtaining results).
7. Research results. A brief summary of new information that the researcher has obtained in the course of observation or experiment. When presenting the results, it is desirable to give a clear and laconic interpretation of the new facts. It is useful to cite the main quantitative indicators and demonstrate them on the graphs and diagrams used in the report process.
8. Research findings. Inferences formulated in a generalized, concise form. They briefly characterize the main results obtained and the trends identified. It is advisable to number the conclusions: usually there are no more than 4 or 5.

Having learned how to make a report correctly, a master's student lays the foundation for his professional success.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Correspondence of the content of the work with the topic | GPK-2.1 |
| 2 | Independence of work performance, depth of study of the material, use of recommended and reference literature |
| 3 | Exploratory nature |
| 4 | Logic and consistency of presentation |
| 5 | Validity and evidence of conclusions |
| 6 | Literacy of presentation and quality of work design |
| 7 | Use of visual material |

Rating "excellent" - the message is of an exploratory nature. Speech is characterized by emotional expressiveness, clear diction, stylistic and orthoepic literacy. Uses visual material (presentation). The student easily navigates the material, fully and reasonably answers additional questions, presents the material logically sequentially, draws independent conclusions, conclusions, demonstrates his horizons, uses material from additional sources, Internet resources.

Evaluation "good" - according to its characteristics, the student's message corresponds to the characteristics of an excellent answer, but the student may experience some difficulties in answering additional questions, make some errors in speech. There is no research component in the message.

Grade "satisfactory" - the student experienced difficulties in the selection of material, its structuring. I used mainly educational literature, did not use additional sources of information. Unable to answer additional questions on the topic of the message. The material is presented inconsistently, does not establish logical connections, and finds it difficult to formulate conclusions. Makes stylistic and spelling mistakes.

Grade "unsatisfactory" - the message is not prepared by the student or prepared according to one source of information, or does not correspond to the topic.

**Research project (abstract)**

The purpose of the abstracting carried out by the student is to acquire valuable skills of independent literature search, processing, note-taking and analysis of sources, building the logic of presentation of the material, competent design of scientific work (links, footnotes, quotations, figures, tables, etc.).

According to the rules for the design of this type of written work, the abstract must have a title page, plan or table of contents.

Writing an abstract work should begin with a presentation of the topic plan, which usually includes 3-4 points. The plan should be logically stated, sections of the plan in the text must be highlighted. The plan must necessarily include an introduction, main body and conclusion. The introduction formulates the relevance, purpose and objectives of the abstract; the main part deals with the theoretical problems of the topic and the practice of implementation in modern conditions; in conclusion, the main results are summarized, conclusions and suggestions are made. The abstract ends with a list of references.

The tasks of the student when writing an abstract are as follows:

* logically and to the point state the issues of the plan;
* clearly form thoughts, consistently and clearly present the material, use terms and concepts correctly;
* show the ability to apply theoretical knowledge in practice;
* show knowledge of the material recommended on the topic;
* use the necessary statistical material to substantiate.
* The abstract must be formatted in accordance with the requirements for student text documents, at least 12-18 pages of typewritten text, including the title page (A4 format, Time New Roman computer text, font size 14, spacing 1.5) The abstract must include: Title sheet, Contents, Introduction, Literature review, Conclusion, References. The work must be signed and dated, pages numbered.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Ability to justify the relevance, purpose and objectives of the work | GPK-2.1 |
| 2 | Correspondence of the presented material to the topic of the abstract |
| 3 | Ability to work with literature. Number of sources (1 source per 1 page of text). Completeness of the scientific review (availability of sources for the last 5 years), Literacy of citation, availability of references. |
| 4 | Completeness and consistency of the disclosure of the topic |
| 5 | Availability of conclusions |
| 6 | Text design culture |
| 7 | Completeness of answers to questions |

Grade "excellent" - all the requirements for writing and defending the abstract are met: the problem and its relevance are identified, a brief analysis of various points of view on the problem under consideration is made and one's own position is logically stated, conclusions are formulated, the topic is fully disclosed, the volume is maintained, the requirements for external design are met , correct answers to additional questions are given.

Grade "good" - the basic requirements for the abstract and its defense are met, but there are some shortcomings. In particular, there are inaccuracies in the presentation of the material; there is no logical sequence in judgments; the volume of the abstract is not maintained; there are omissions in the design; incomplete answers were given to additional questions during the defense.

Grade "satisfactory" - there are significant deviations from the requirements for referencing. In particular, the topic is covered only partially; Factual errors were made in the content of the abstract or when answering additional questions; no output during protection.

Grade "unsatisfactory" - the topic of the abstract is not disclosed, a significant misunderstanding of the problem is revealed.

**Tasks for self-study (work with the album)**

*General provisions*

1. Working album on cytology andhistologyis the main final reporting educational document, reflecting the success (completeness and quality) of the student's mastering the material of laboratory classes in cytology.

2. The workbook contains educational drawings of cytological andhistologicaldrugs. electronic microphotographs, diagrams and tables made by the student during laboratory classes and as independent tasks.

3. Starting laboratory classes in cytology and histology, the teacher teaches the student how to properly maintain a workbook, and the student learns these rules and strictly follows them in the course of subsequent educational work.

4. During the semester, the teacher controls the correctness of the workbook.

5. At the end of each semester, the teacher evaluates the content and design of the workbook in accordance with the accepted BRS, which is recorded in the workbook signed by the teacher and in the study journal of the group.

6. The assessment for the workbook, along with the results of assessing the practical knowledge of the structure of plant and animal cells and their organelles, tissues and organs (“diagnostics” of preparations), electron micrographs, test control and other forms of educational work, as an important integral part, is included in the general score-rating assessment of the student's activity (for full-time students) for the semester.

*Rules for maintaining and designing a working album*

1. For a working album on cytology and histology, a standard A4 drawing album is used. Making drawings on separate sheets is not allowed, since it contributes to the violation of the correct order of their arrangement, which makes it difficult for the student to use the album, and for the teacher to control and final assessment of the album.

2. On the cover of the album, the full name of the student and the number of the study group are indicated.

3. At the beginning of each educational topic on the album page, its name is indicated.

4. On each page of the album, the full name of the student and the number of the study group should be indicated with a pen in the upper right corner.

5. On one page of the album, 1-2 educational drawings are made (depending on their size and in accordance with the recommendations of the teacher and guidelines for laboratory classes).

6. All drawings are made in a strict sequence of material passage. Rearranging drawings within the educational topic, and even more so, changing the order of topics or mixing drawings from different topics is not allowed.

7. When performing a drawing (diagram, table) as an independent task, a place is left in advance for it in the album at the end of the corresponding topic.

8. Incorrectly executed drawings (diagrams, tables) are replaced by new ones. New pages are sewn (pasted) into the appropriate place in the album.

9. Extensive corrections, strikethroughs and whitewashing of parts of the figure and text are unacceptable.

*Rules for the design of drawings*

1. The album must contain a complete set of drawings in accordance with the current work program. Each figure must be numbered in accordance with the available list.

2. Drawings of cytological and histological preparations are made with colored pencils (not felt-tip pens or pens). Drawings of electron micrographs are made with a simple pencil.

3. When sketching the preparation, one should be guided by the rules set forth in the guidelines. Particular attention is paid to the correctness of the image of morphological structures, the exact transfer of the proportions of objects, their color (on electron micrographs - their electron density) and relative position.

4. Work with cytological and histological preparations, as well as with electronic microphotographs, should be based on the assimilation of theoretical material on the topic under study in preparation for a practical lesson. The drawings in the workbook should reflect the student's understanding of the principles of the structure of the depicted cells, the meaning of the structural details marked on them and the knowledge of the terminology used.

5. The drawings in the album should be based on original morphological materials - cytological and histological preparations, electron micrographs. Mechanical copying of samples from the atlas is undesirable because it does not reflect the student's own work.

*Rules for the design of text material*

1. The text material accompanying the figures includes the title, symbols and (if necessary) additional information.

2. The title of each figure indicates: its full name (in accordance with the guidelines for laboratory exercises), the method of coloring. Under the figure or to the right of it, a list of symbols is given in the form of a column.

3. All designations are given in full in the order and wording given in the guidelines.

4. Inscriptions, signatures and designations are made with a pen, large and legible. Abbreviations not provided for in the guidelines are not allowed. Arrows indicating structural details should be clearly visible.

5. Cytological and histological preparations, electronic microphotographs studied in a laboratory lesson, but not intended for sketching, are marked with an entry in the album in the order corresponding to the sequence of their study. As for the figure, the full name of the drug (electron micrograph), the method of staining are indicated.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | The quality of maintaining an album on cytology | GPK-2.1 |
| 2 | Literacy of drawings, detailing |
| 3 | The presence of captions and designations to the figures |
| 4 | Teacher Visa |

Rating "excellent" - a complete set of drawings with maximum detail, captions and symbols; All drawings are certified by the teacher.

Rating "good" - the absence of single drawings; all drawings are made correctly, all the main signatures and designations are present; All drawings are certified by the teacher.

Rating "satisfactory" - inaccurate maintenance of the album; absence of more than 10% of drawings; poor quality of drawings, incorrect or incomplete signatures and designations; All drawings are certified by the teacher.

Rating "unsatisfactory" - no album; sloppy album management; absence of more than 20% of drawings; low quality of drawings, lack of signatures and designations.

1. **List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Main literature

1. Arkhipova T.V. Guide to practical classes in cytology [Electronic resource]: a manual for bachelors in the direction of training "Pedagogical education and biology" / T.V. Arkhipova, V.S. Konichev, N.S. Stvolinskaya. — Electron. text data. — M.: Prometheus, 2016. — 56 p. — 978-5-9907123-1-7. - Access mode:<http://www.iprbookshop.ru/58198.html>
2. Barsukov V.Yu. Histology [Electronic resource]: textbook / V.Yu. Barsukov. - 2nd ed. — Electron. text data. - Saratov: Scientific book, 2019. - 161 p. — 978-5-9758-1722-8. - Access mode:<http://www.iprbookshop.ru/80979.html>
3. Zimatkin S.M. Histology [Electronic resource]: textbook / S.M. Zimatkin. — Electron. text data. - Minsk: Republican Institute of Vocational Education (RIPO), 2014. - 348 p. — 978-985-503-352-4. - Access mode:<http://www.iprbookshop.ru/67625.html>
4. Popova I.A. Fundamentals of Cytology [Electronic resource]: study guide / I.A. Popov. — Electron. text data. - Saratov: IP Ar Media, 2019. - 122 p. — 978-5-4497-0167-1. - Access mode:<http://www.iprbookshop.ru/86203.html>

Sokolov V.I. Cytology, histology and embryology [Electronic resource] / V.I. Sokolov, E.I. Chumasov, V.S. Ivanov. — Electron. text data. - St. Petersburg: Kvadro, 2016. - 400 p. — 978-5-906371-15-5. - Access mode:<http://www.iprbookshop.ru/60212.html>

6.2 Further reading

1. Barsukov V.Yu. Histology [Electronic resource]: textbook / Barsukov V.Yu.— Electron. text data. - Saratov: Scientific book, 2012. - 161 p. - Access mode:<http://www.iprbookshop.ru/8194>. - EBS "IPRbooks", by password
2. Danilov R.K. Guide to histology. Volume 1 [Electronic resource] / R.K. Danilov. — Electron. text data. - St. Petersburg: SpetsLit, 2011. - 832 p. — 978-5-299-00435-9. - Access mode:<http://www.iprbookshop.ru/45720.htm>l
3. Danilov R.K. Guide to histology. Volume 2 [Electronic resource] / Danilov R.K. - Electron. text data. - St. Petersburg: SpecLit, 2011. - 512 p. - Access mode:<http://www.iprbookshop.ru/45721>. - EBS "IPRbooks", by password
4. Eremina I.Z. Abstract of lectures on general histology [Electronic resource]: Danilov R.K. Guide to histology. Volume 1 [Electronic resource] / Danilov R.K. - Electron. text data. - St. Petersburg: SpetsLit, 2011. - 832 p. - Access mode:<http://www.iprbookshop.ru/45720>. - EBS "IPRbooks", by password
5. Eremina I.Z. Lecture notes on general histology [Electronic resource]: textbook / Eremina I.Z., Lebedeva T.I., Savrova O.B.— Electron. text data. - M .: Russian University of Peoples' Friendship, 2013. - 136 p. - Access mode:<http://www.iprbookshop.ru/22184>. - EBS "IPRbooks", by password
6. Zhuravleva S.A. Histology [Electronic resource]: workshop. Textbook / Zhuravleva S.A. - Electron. text data. - Minsk: Higher School, 2013. - 320 p. - Access mode:<http://www.iprbookshop.ru/24054>. - EBS "IPRbooks", by password
7. Zimatkin S.M. Histology, cytology and embryology [Electronic resource]: textbook / Zimatkin S.M. — Electron. text data. - Minsk: Higher School, 2013. - 229 p. - Access mode:<http://www.iprbookshop.ru/20210>.- EBS "IPRbooks", by password.
8. Lima de Faria A. Praise for the "stupidity" of the chromosome. Confession of a recalcitrant molecule [Electronic resource] / Lima de Faria A. - Electron. text data. — M.: BINOM. Knowledge Laboratory, 2015. - 313 p. - Access mode:<http://www.iprbookshop.ru/12253>. - EBS "IPRbooks", by password.
9. Nurtazin S.T. General histology [Electronic resource]: textbook / S.T. Nurtazin. — Electron. text data. - Almaty: Kazakh National University. al-Farabi, 2010. - 242 p. — 9965-29-457-7. - Access mode:<http://www.iprbookshop.ru/57551.html>
10. Guide to practical exercises in histology. Private histology [Electronic resource] / A.A. Stadnikov [i dr.]. — Electron. text data. - Orenburg: Orenburg State Medical Academy, 2010. - 200 p. - Access mode:<http://www.iprbookshop.ru/21862>. - EBS "IPRbooks", by password
11. Samusev R.P. General and private histology [Electronic resource]: lecture notes / Samusev R.P., Kapitonova M.Yu.— Electron. text data. - M .: Mir and Education, Onyx, 2010. - 336 p. - Access mode:<http://www.iprbookshop.ru/14569>. - EBS "IPRbooks", by password
12. Stvolinskaya N.S. Cytology [Electronic resource]: textbook / Stvolinskaya N.S. — Electron. text data. — M.: Prometheus, 2012. — 238 p. - Access mode:<http://www.iprbookshop.ru/18637>. —EBS "IPRbooks", by password
13. Cytology [Electronic resource]: textbook / G.N. Solovyov [i dr.]. — Electron. text data. - Orenburg: Orenburg State Medical Academy, 2012. - 288 p. - Access mode:<http://www.iprbookshop.ru/33274>.- EBS "IPRbooks", by password.

6.3 Periodicals

1. The results of biological research are published in a number of domestic biological and medical journals

"CYTOLOGY" (since 1959),

"ARCHIVE OF ANATOMY, HISTOLOGY AND EMBRYOLOGY" (since 1916)

1. JOURNAL OF ANATOMY AND HISTOPATOLOGY. Quarterly scientific and educational journal. Russia, 394036, Voronezh, st. Student, d. 10, VGMA them. N. N. Burdenko. The journal publishes previously unpublished theoretical and experimental works in the field of human anatomy, functional anatomy, cell biology, cytology, histology and pathological anatomy. The editorial board accepts original articles, short communications, methodical articles, literary reviews, discussion articles, reviews of scientific and educational publications, materials of scientific congresses, congresses, symposiums, brief reports on scientific events, letters to the editor.

<http://www.janhist.ru/editors.htm>

**7. Modern professional databases and information reference systems**

The Internet carries a huge potential for educational services (e-mail, search engines, electronic conferences) and is becoming an integral part of modern education.

The use of Internet resources when studying new material makes the lesson more interesting, increases the student's motivation to gain knowledge.

* Electronic library system "IPRbooks"[http://www.iprbookshop.ru/](http://www.iprbookshop.ru/index.ph)
* <http://www.iqlib.ru>**-**Electronic library of educational and scientific publications.
* <http://www.cir.ru>– University information system of Russia.
* <http://www.diss.rsl.ru>– Electronic Library of Dissertations of the Russian State Library. Includes full-text dissertation databases.
* educational sites of Russian and foreign universities;
* an interactive tutorial on the Internet - "Do you know histology?";
* educational audio and video materials, for example, from YouTube, etc.
* <http://www.twirpx.com/files/biology/gistology/>

The section "Histology" on the site "All for the student" contains a large amount of educational literature on histology.

* <http://meduniver.com/Medical/Book/19.html>

Section "Books on histology" on the site "Meduniver".

* <http://www.neuropat.dote.hu/histol.htm>
* A large selection of foreign sites on histology. Almost every one of them has excellent photographs taken with electron and conventional microscopes.

**8. Composition of the software**

Windows7 Professional OS OPEN agreement 93592430ZZE1605 License 63588548 (perpetual);

MS Office Standard 2010 Russian Agreement OPEN 93592432ZZE1605 License 63588550 (perpetual);

Kaspersky Endpoint Security for Business Standard, License # 2304-000451-57227148.

Bioinformatics For lectures, a specialized auditorium equipped with the following equipment is used:

* Epson multimedia projector, stulus, remote control;
* computer / laptop;
* interactive board;
* educational audio and video, animations and presentations;
* a package of applied training programs (text editors, graphic editors);
* electronic library of the course;
* demonstration tables.

For laboratory classes, a specially equipped laboratory is used, which has laboratory equipment, instruments and tools for practical work in cytology and histology:

* light microscope (used for microscopic examination of cells);
* training preparations in general cytology and histology - used in laboratory classes to study the morphology of cells and cellular structures under a light microscope;
* educational atlases - used to study the microscopic structure of cells, cell organelles, tissues and intercellular substance under a light microscope and the ultrastructure of cells and cell organelles using electron micrographs;
* slides and coverslips - used for the preparation of temporary cytological and histological preparations;
* dissecting set (scissors, tweezers, scalpel, histological needles, etc.)
* used in the preparation of temporary (live) preparations, prints and total preparations;
* cytological and histological stains - used to contrast cells and cellular structures.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY"

FACULTY OF BIOLOGY AND CHEMISTRY

Department of Cell Biology, Morphology and Microbiology

Work program of the discipline

"Genetics and Evolution"

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | "Microbiology" |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional skills | GPC-3.1;  GPC-3.2;  GPC-3.3 |

* + - 1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GPC-3.1 | Knows the basics of evolutionary theory, analyzes modern trends in the study of evolutionary processes, history of development, principles and methodological approaches of general genetics, molecular genetics, population genetics, epigenetics | **Know:**fundamentals of evolutionary theory, analyzes modern trends in the study of evolutionary processes, history of development, principles and methodological approaches of general genetics, molecular genetics, population genetics, epigenetics |
| GPC-3.2 | Able to use in professional activities modern ideas about the manifestation of heredity and variability at all levels of the organization of the living; use in professional activities ideas about the genetic foundations of evolutionary processes, genomics, proteomics, developmental genetics | **Be able to:**use in professional activities modern ideas about the manifestation of heredity and variability at all levels of the organization of the living; use in professional activities ideas about the genetic foundations of evolutionary processes, genomics, proteomics, developmental genetics |
| GPC-3.3 | Proficient in basic methods of genetic analysis | **Own:**main methods of genetic analysis |

* + - 1. **Scope of discipline**

|  |  |  |  |
| --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | |
| ***Full-time (4 semester)*** | ***Part-time (6 semester)*** |
| **General labor intensity**: credits/hours | | 3/108 | 3/108 |
| **contact work**: | | 54 | 45 |
|  | Lecture-type classes | 18 | 15 |
| Seminar type classes | 36 | thirty |
| Intermediate certification: credit / credit with grade / exam \* |  |  |
| **Independent work**(SRS) | | 54 | 63 |
| Of which for course work (course project) | |  |  |

\* - highlight in bold italics

|  |  |  |  |
| --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | |
| ***Full-time (5 semester)*** | ***Part-time (7 semester)*** |
| **General labor intensity**: credits/hours | | 2/72 | 2/72 |
| **contact work**: | | 32 | thirty |
|  | Lecture-type classes | 16 | 15 |
| Seminar type classes | 16 | 15 |
| Intermediate certification: credit / credit with grade / exam \* |  |  |
| **Independent work**(SRS) | | 40 | 42 |
| Of which for course work (course project) | |  |  |
| ***Types of educational work*** | | ***Forms of study*** | |
| ***Full-time (6 semester)*** | ***Part-time (8 semester)*** |
| **General labor intensity**: credits/hours | | 4/144 | 4/144 |
| **contact work**: | | 45 | 45 |
|  | Lecture-type classes | 15 | 15 |
| Seminar type classes | thirty | thirty |
| Intermediate certification: credit / credit with grade / exam \* | 54 | 36 |
| **Independent work**(SRS) | | 45 | 63 |
| Of which for course work (course project) | |  |  |

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | **Types of educational work (in hours)** | | | | |
| **contact work**  **Lecture-type classes** | **contact work** | | | **Independent work** |
| **Lecture-type classes** | **Seminar type classes** | PZ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | INTRODUCTIONSubject and methodology of genetics. | eleven | 2 | 4 |  | 5 |
| **2** | Material bases of heredity. | 13 | 4 | 4 |  | 5 |
| **3** | DNA replication. | 16 | 2 | 4 |  | 10 |
| **4** | DNA recombination. | 28 | 2 | 6 |  | 20 |
| **5** | Structure and function of the gene. Recombinant DNA method. | 6 | 2 | 4 |  |  |
| 6 | Expression of genetic material. | 21 | 2 | 4 |  | 15 |
| **7** | Regulation of gene expression. | 6 | 2 | 4 |  |  |
| **8** | Recombinant DNA method. | 7 | 3 | 4 |  | 10 |
|  | Total |  | 18 | 34 |  | 54 |
| **Sections of the discipline studied in\_5\_semester** | | | | | | |
| **9** | Cytological bases of heredity and variability. | 8 | 2 | 4 |  | 2 |
| **10** | The patterns of inheritance of traits established by G. Mendel. | 10 | 4 | 4 |  | 2 |
| **eleven** | Chromosomal theory of heredity. | 8 | 2 | 4 |  | 2 |
| **12** | Sexual differentiation and life cycle. | 10 | 2 | 4 |  | 4 |
| **13** | Gene mapping. | 8 | 2 | 4 |  | 2 |
| **14** | mutational variability. | 10 | 4 | 4 |  | 2 |
|  | Total |  | 16 | 16 |  | 40 |
|  | **Sections of the discipline studied in\_6\_semester** | | | | | |
| **18** | modification variability. | eleven | 2 | 4 |  | 5 |
|  | ontogenetic variability. | 8 | 1 | 2 |  | 5 |
|  | Fundamentals of Genomics and Proteomics | 6 | 2 | 4 |  |  |
|  | modification variability. | eleven | 2 | 4 |  | 5 |
|  | Fundamentals of population genetics. | 7 | 2 |  |  | 5 |
| **19** | Theories of evolution as the basis of the modern evolutionary approach to the study of biological processes.Speciation. | 13 | 2 | 6 |  | 5 |
| **20** | Fundamentals of ecological genetics. | 14 | 1 | 8 |  | 5 |
| **21** | Genetic toxicology | 7 | 1 | 6 |  |  |
| **22** | Genetic bases of selection | 7 | 1 | 6 |  | 5 |
| **23** | Genetic foundations of biotechnology. | 5 | 1 | 4 |  | 5 |
|  | Total |  | 15 | thirty |  | 45 |

* + 1. Part-time education

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | **Types of educational work (in hours)** | | | | |
| **contact work**  **Lecture-type classes** | **contact work** | | | **Independent work** |
| **Lecture-type classes** | **Seminar type classes** | PZ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | INTRODUCTIONSubject and methodology of genetics. | eleven | 2 | 4 |  | 5 |
| **2** | Material bases of heredity. | 13 | 4 | 4 |  | 5 |
| **3** | DNA replication. | 16 | 2 | 4 |  | 10 |
| **4** | DNA recombination. | 28 | 2 | 6 |  | 20 |
| **5** | Structure and function of the gene. Recombinant DNA method. | 6 | 2 | 4 |  |  |
| 6 | Expression of genetic material. | 21 | 2 | 4 |  | 15 |
| **7** | Regulation of gene expression. | 6 | 2 | 4 |  |  |
| **8** | Recombinant DNA method. | 7 | 3 | 4 |  | 10 |
|  | Total |  | 18 | 34 |  | 54 |
| **Sections of the discipline studied in\_7\_semester** | | | | | | |
| **9** | Cytological bases of heredity and variability. | 8 | 2 | 4 |  | 2 |
| **10** | The patterns of inheritance of traits established by G. Mendel. | 10 | 4 | 4 |  | 2 |
| **eleven** | Chromosomal theory of heredity. | 8 | 2 | 4 |  | 2 |
| **12** | Sexual differentiation and life cycle. | 10 | 2 | 4 |  | 4 |
| **13** | Gene mapping. | 8 | 2 | 4 |  | 2 |
| **14** | mutational variability. | 10 | 4 | 4 |  | 2 |
|  | Total |  | 16 | 16 |  | 40 |
|  | **Sections of the discipline studied in\_8\_semester** | | | | | |
| **18** | modification variability. | eleven | 2 | 4 |  | 5 |
|  | ontogenetic variability. | 8 | 1 | 2 |  | 5 |
|  | Fundamentals of Genomics and Proteomics | 6 | 2 | 4 |  |  |
|  | modification variability. | eleven | 2 | 4 |  | 5 |
|  | Fundamentals of population genetics. | 7 | 2 |  |  | 5 |
| **19** | Theories of evolution as the basis of the modern evolutionary approach to the study of biological processes.Speciation. | 13 | 2 | 6 |  | 5 |
| **20** | Fundamentals of ecological genetics. | 14 | 1 | 8 |  | 5 |
| **21** | Genetic toxicology | 7 | 1 | 6 |  |  |
| **22** | Genetic bases of selection | 7 | 1 | 6 |  | 5 |
| **23** | Genetic foundations of biotechnology. | 5 | 1 | 4 |  | 5 |
|  | Total |  | 15 | thirty |  | 45 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| section number | Section name | Section content |
| 1 | 2 | 3 |
| 1 | INTRODUCTIONSubject and methodology of genetics. | Subject and methodology of genetics (2 hours)  The subject of genetics: heredity and variability as fundamental properties of the living. DNA is the molecular basis of hereditary information. traits and genes. Ideas about modifications. The place of genetics in biology and the system of natural sciences.  The main stages of the historical development of genetics. Stages of formation of genetics. prehistoric times. Representations of ancient philosophers. 1600-1850 Charles Darwin and evolution. Works by F. Galton, A. Weisman. The main stages in the development of genetics in the XX century. Chromosomal theory T. X. Morgan. Works by G. Beadle and E. Tatum. Development of molecular genetics.  Features of the development of domestic genetics. Prominent domestic geneticists: Yu. A. Filipchenko, N. K. Koltsov, N. P. Dubinin, V. N. Timofeev-Resovsky, I. A. Rapoport, A. S. Serebrovsky, D. K. Belyaev, N. I. Vavilov  Methods for the study of genetics. Method of hybridological analysis. Cytogenetic, biochemical, physical and physico-chemical methods. Methods of mathematical modeling. Molecular genetic methods of analysis. Research methods in population genetics.  Model objects of fundamental genetics.  The main sections of fundamental genetics: molecular genetics, radiation genetics, cytogenetics, evolutionary genetics, population genetics, genetics of individual development, behavioral genetics, ecological genetics, mathematical genetics.  Application of genetics in breeding, medicine, rational use of natural resources, protection of the human environment and other living beings. |
| 2 | Material bases of heredity. | Analysis of the composition and structure of DNA. The first studies of the genetic material. Works by Friedrich Miescher (1868). Evidence for the role of DNA in heredity. Experiments Fr. Griffiths (1927-1928). and O. Avery and his collaborators (1944) on transformation. Hershey-Chase experiment (1952). Transfection experiments. Direct and indirect evidence for the importance of DNA in eukaryotes. The structure of the DNA molecule. Chargaff's rule and DNA species specificity coefficient. X-Ray Structural Analysis R. Franklin. Model of J. Watson and F. Crick (1953) as a basis for replication, mutagenesis and gene specificity. Alternative forms of DNA. RNA structure. Hydrogen bonds and analysis of the structure of nucleic acids. Nucleic acid electrophoresis. |
| 3 | DNA replication. | Semi-conservative mode of replication. Meselson-Stal experiment (1958). DNA replication in microorganisms. DNA polymerase I (A. Kornberg 1957). DNA polymerases ΙΙ and ΙΙΙ. replication in vitro. Spiral unwinding. Replication initiation Concept of replicon (F.Jacob and J.Mono) and replisome (B.Alberts). Leading and lagging strands of DNA. Fragments of the Okazaki. Checking and correcting errors during replication.  DNA synthesis in eukaryotes. Comparison of DNA replication in pro- and eukaryotes. Different accuracy of replication. |
| 4 | DNA recombination. | Types of recombination. General or homologous recombination.  Crossover models by R. Holliday, Harold L.K. Whitehouse (1964) The role of single-double strand breaks in DNA. Chi-form formation. Postmeiotic cleavage and pms genes. Proteins recA, recB, recC, recD in DNA recombination. χ site value.  Gene conversion. The phenomenon of conversion in yeast (K. Lindrengen) and neurospores (M. Mitchell). Conversion characterization: molecular accuracy, site conversion, correlation of conversion and reciprocal recombination. The ratio of conversion and coconversion and reciprocal recombination in short sections. Resolution of the "high negative interference" paradox. Copy-by-selection hypothesis explaining reciprocal recombination products in bacteriophages.  Site-specific recombination in bacteriophage. The structure of the phage genome and its cyclization in the cell. Sticky ends. Infectious cycle and lysogeny. The role of plasmids in recombination. The structure of the att site in the genomes of bacteria and phages. Recombination - integration and excision. The concept of a prophage. Similar processes during inversions in the μ bacteriophage genome and 2 μm yeast plasmid, variations in flagellar antigens in Salmonellatyphimurium, etc. Site-specific recombination of immunoglobulin genes. |
| 5 | Structure and function of the gene. Recombinant DNA method. | gene theory. Formation of ideas about the gene (VL Johannsens). T. Morgan's gene theory. criteria for allelism. Stepwise allelism in Drosophila (A.S. Serebrovsky). Pseudoallelism. Dubinin effect. One gene-one protein hypothesis (A. Garrod, 1902 and W. Batson, 1909). Comparison of genetic and molecular proportionality of a gene (S. Benzer). Cis-trans test. Modern ideas about the criteria of allelism. One gene, one enzyme. Experiments by J. Beadle and E. Tatum with Neurospora mutants (1933). One gene, one polypeptide. Fine structure of the gene in bacteriophages. Overlapping deletion method for intragene mapping. |
| 6 | Expression of genetic material. | Genetic code. Collinearity of the structures of the gene and the protein it encodes. Characteristics of the genetic code. Experimental determination of the properties of the genetic code (Fr. Crick). Use of the mutation system rII of phage T4. Mutagenesis under the influence of proflavin. Interaction of insertions and deletions of base pairs. Deciphering the genetic code (M. Nirenberg and J. Mattei, S. Ochoa., G. Koran 1960-1964). Code degeneracy and the rocking hypothesis (Fr. Crick, 1966). Universality and quasi-universality of the code.  Transcription. RNA polymerase. Promoters, DNA template binding and σ-subunit. Transcription initiation and mRNA elongation. mRNA lifetime, structure. Transcription in eukaryotes. Heterogeneous nuclear RNAs and their processing: caps and tails. Introns, exons and discontinuous genes. Overlapping bacteriophage genes. splicing mechanism. Editing.  Broadcast. Components required for translation. Ribosome structure. tRNA structure. The role of tRNA and the rules for the interaction of codons and anticodons. Translation initiation and termination signals. Broadcast initiation. Creation of an initiating complex. elongation of the polypeptide chain. Translation termination. Polysomes. Genetic control of transcription and translation. |
| 7 | Regulation of gene expression. | Regulation of gene expression in prokaryotes. Review Adaptive and constitutive enzymes. Inducible regulation system of lactose metabolism in E. coli.: operon theory (F. Jacob and J. Mano, 1946). Components of the system of negative regulation of expression: promoter, operator, etc. Structural genes. Regulator gene. repressors and effectors. Genetic validation of the operon model Cap protein: positive control of the lac operon. Role of cyclic AMP Repressible system of S.typhimurium His-operon. Repressible tryptophan system in E. coli. Attenuation. Regulation of gene expression in eukaryotes: regulatory elements, transcription factors and eukaryotic genes. Regulation at the level of chromatin structure. promoters  Enhancers and Silencers. DNA-binding domains of eukaryotic transcription factors. Assembly of the transcription complex. Definition of mRNA life. Regulation of expression of stable mRNAs at the level of translation. Interference. Regulation of gene expression by steroid hormones. |
| 8 | Recombinant DNA method. | Short review. Creation of recombinant DNA molecules. restriction enzymes. Vectors. Cloning in E. coli bacterial cells. Cloning of DNA in eukaryotic cells. Cloning without host cells: PCR method. DNA libraries are collections of cloned sequences. genomic libraries. cDNA libraries. Extraction of cloned genes from libraries. Samples for identification of cloned sequences. Search in the library for specific clones. Identification of adjacent genes: the "chromosome walk" method. Characterization of cloned sequences. Restriction codes. Blotting (blot hybridization) of nucleic acids. DNA sequencing - completion of clone characterization. |
| 9 | Cytological bases of heredity and variability. | A cell is a structural and functional unit of heredity. The nucleus as the control center of the cell's vital activity. The concept of totipotency and determination. Euchromatin. Heterochromatin. Nucleosomes. Compaction of chromatin. Morphology and ultrastructure of chromosomes. metaphase chromosome. satellite chromosomes. specialized chromosomes. Giant chromosomes of Diptera. Chromosomes of the "lampbrush" type. The concept of karyotype.  Cell cycle. Interphase. Mitosis. The biological significance of mitosis.  Meiosis and its meaning. Genetic control of meiosis. Comparative characteristics of the mechanisms of meiosis and mitosis and their significance in the implementation of the fundamental properties of living organisms: heredity and variability. Gametogenesis. |
| 10 | The patterns of inheritance of traits established by G. Mendel. | Monohybrid cross. Principles of hybridological analysis. Laws of Mendel. The law of uniformity of hybrids of the first generation. splitting law. Factorial hypothesis of Mendel. Modern terminology. Basic genetic concepts and terms. Gamete purity rule.  Interaction of allelic genes. Possible functions of alleles. Allele designation. Multiple allelism. Complete dominance. incomplete dominance. Analyzing cross. Codominance.  Polyhybrid cross. The law of independent inheritance of traits. Trihybrid cross. Branching method.  Mechanisms underlying Mendel's laws. Laws of inheritance and action of genes. Genes and homologous chromosomes. The concept of combinative variability.  Probability and genetic events. Data evaluation: chi-square test.  Necessary and sufficient conditions for the implementation of Mendel's laws.  Phenotype expression. Pleiotropy. modifier genes. lethal genes. expressiveness and penetrance. Manifestation of gene expression. genetic antisipation. Genomic imprinting. reaction rate.  Interaction of non-allelic genes. Complementarity. Epistasis. Polymerism. Possible mechanisms of gene interaction. Inheritance of quantitative traits. multifactorial hypothesis. Analysis of polygenic traits. Average value. Dispersion. Standard deviation. Standard error of the mean. Analysis of quantitative traits on the example of the weight of the fetus in a tomato. Heritability. artificial selection. Twin method in humans. Analysis of gene complementation. Mapping of loci of quantitative traits. |
| eleven | Chromosomal theory of heredity. Sexual differentiation and life cycle.  Gene mapping. | Evidence for the chromosome theory of heredity. Hypothesis by W. Setton and Boveri (1902). Parallelism in the behavior of chromosomes and alleles during meiosis and fertilization.  Works by T. Morgan and Bridges. (1911-1918) Inheritance of sex-linked traits. Criss-cross inheritance. Chromosomal sex determination in Drosophila. X-linked inheritance. Y-linked inheritance. Hollandic inheritance. Experiments by C. Bridges (1916). Nondisjunction of chromosomes in meiosis and mitosis. Superfemales and supermales. Intersexes. Bridges' theory of gene balance. Gynandromorphs and mosaics. Sex determination in C. elegans. Chromosomal sex determination in humans. Klinefelter and Turner syndrome. Syndrome 47, XXX. Syndrome 47,XYY. Y-chromosome and male type of development. X-chromosome and dose compensation. Barr bodies. Hypothesis Lyon. Sex determination in reptiles. Sex-limited and sex-dependent inheritance of traits.  Linkage of genes on the example of analyzing crossing. Full clutch and incomplete (partial) clutch. Gender dependence. Non-recombinant (parental) and recombinant classes. The emergence of recombinant classes as a result of crossing over. Crossing over. Crossover mechanisms. |
| 12 | Sexual differentiation and life cycle. | Life cycles as the basis for the recombination of genetic material. Types of life cycles.  higher eukaryotes. Animals. Early studies of X-, Y-chromosomes. Fertilization in different objects. Plants. Sporophyte and gametophyte. Macrosporogenesis. Microsporogenesis. Macro-microgametogenesis. lower plants. Isogamy on the example of the life cycle of Chlamidomonas. Mechanism of sex determination in corn (Zeamays). Double fertilization.  Aberrant types of sexual reproduction. Male sterility as an example of non-chromosomal heredity. Amphimixis and apomixis. Parthenogenesis (haploid and diploid), gynogenesis, androgenesis.  lower eukaryotes. Features in lower eukaryotes. Types of mating and types of incompatibility in fungi on the example of S. cerevisiae, N. crassa, etc. Anisogamy and isogamy in fungi. Cytogamy and karyogamy. Heterokaryons. Tetrad analysis. Types of notebooks. Mapping functions in terad analysis. |
| 13 | Gene mapping. | Gene mapping. Sturtevant's work on gene mapping. genetic maps. Single and multiple crossovers. Gene mapping in Drosophila. Gene mapping in maize. Determining the sequence of genes. Accuracy of genetic mapping. Interference. Positive (chiasmatic) interference. The concept of coincidence. Accounting for multiple exchanges in the construction of genetic maps. Somatic cell hybridization and gene mapping in humans. Linkage and gene mapping in haploid organisms. Gene mapping in relation to the centromere. Collinearity of genetic and cytological maps. |
|  | Gene mapping in bacteria and bacteriophages. Types of genetic recombination in prokaryotes. E. coli conjugation (J. Lederberg and E. Tatum). Characteristics of the sexual process in bacteria. Bacteria F+ and F- - type. Recombination in crosses F+x F-: analysis of the results: haploidy of cross products, infectivity of the F-factor, transfer polarity, transfer direction. F' elements and merozygotes. Hfr factor. Rec proteins and recombination in bacteria. Plasmids and episomes. Mapping of genes by recombination frequencies and transfer time during conjugation. Ring chromosome. conjugation and replication. |
| 14 | mutational variability. | Types of variability: hereditary, non-hereditary. Combination variability. mutational variability. ontogenetic variability. Conditionality of classification of types of variability. Their importance in evolution and ensuring the adaptive variability of species.  Mutation theory Korzhinsky - de Vries. The problem of defining the concept of mutation. Different approaches to the classification of mutations. Spontaneous and induced mutations. Works by G.A. Nadson and G.S. Filippov, G. J. Miller. The hit principle (K. Zimmer, M. Delbryuk, N.V. Timofeev-Resovsky) and the physiological hypothesis of the mutation process - mutations and reparation (M.E. Lobashev). Chemical mutagenesis (M.N. Meissel, V.V. Sakharov, M.E. Lobashev, I.A. Rapoport, S. Auerbakh). detection of mutagenicity. Mutation accounting methods. Genetic control of the mutation process: mutator genes and antimutators. The law of homological series of variability N.I. Vavilov. adaptive mutagenesis. Mutations as replication, repair and recombination errors. |
|  |  | Molecular basis of mutations. Gene (point) mutations: transitions, transversions, frameshifts (frameshifts): insertions (nucleotide insertions and excisions (nucleotide dropouts). Biochemical consequences of gene mutations. Face mutations (slight change in the characteristics of the final product). Null alleles. Emergence of new gene products Missense mutations, nonsense mutations, seimsense mutations Back mutations (reversions, intragenic and intergenic suppressions) Intragenetic rearrangements.. Tautomeric shifts. Base analogs. |
|  |  | DNA repair. Double-stranded structure of DNA as a basis for stability. Types of DNA damage and repair. Cell cycle checkpoints. "Licensing" a single replication. Coordinated response to damage to a cell and its genetic material. Significance of oxidative stress and signal transduction pathway. Apoptosis in mammals. Guard of the genome protein p53.  Photoreactivation repair in prokaryotes. Excisional repair in pro- and eukaryotes. Pigmented xeroderma and nucleotide excision repair. Repair of replication errors. |
|  |  | Chromosomal rearrangements. Cytological methods for detecting chromosomal rearrangements: metaphase, anaphase, pachytonic. intrachromosomal mutations. Deletions and deficiencies. Syndrome of "cat's cry" in humans. Duplications. Gene redundancy and rRNA amplification. Bar mutations in Drosophilla. Unequal crossing over. The significance of duplications in evolution. Inversions: paracentric and pericentric. Multiple inversions. Crossing over with inversions. Consequences of inversion in the process of gametogenesis. Interchromosomal aberrations. Translocations: intrachromosomal and interchromosomal. Conjugation and variants of divergence of chromosomes in meiosis. Compatible and incompatible translocations. Robertsonian translocations. Translocation in humans: familial Down syndrome. Sites of chromosome fragility in humans. Transpositions. Migratory elements and their role in transposition. |
|  |  | Genomic mutations. Variation in the karyotype. polyploidy and aneuploidy. Nondisjunction of chromosomes is the cause of aneuploidy. Nullisomy. Monosomy. Polysomy. Down Syndrome. Viability of aneuploids in humans. Genetic analysis of aneuploids.  Polyploidy and its origin. Autopolyploidy. Methods of polyploidization. |
| 15 | modification variability. | Modifications are non-inherited changes. Theories of J.B. Lamarck and C. Darwin. Definite and indeterminate variability. The teachings of V.L. Johannsen about clean lines and evidence of the inefficiency of the selection of modifications. Modifications as an expression of the reaction norm. Types of modifications: adaptive modifications, morphoses, phenocopies and phenotypic suppression. long term modifications. modification mechanisms. Stress and "non-specific" adaptations. Heat shock and SOS repair. Random fluctuations in gene expression: manifestation |
| 16 | ontogenetic variability. | Basic concepts of developmental genetics. Differentiation and determination. Totipotency of somatic cells. Nuclear transplantation at early stages of embryogenesis (G. Driesch). Nuclear transfer into enucleated amphibian eggs (J. Gurdon). An overview of the development of Drosophila. Genetic analysis of embryogenesis. Zygotic genes and segment formation. Gap genes. Pair-rule genes. Segment polarity genes. homeotic mutants. Homeoboxes. Homeodomains. Genetic control of the spatial organization of the embryo. The problem of an elementary trait in ontogeny. Epigenetic inheritance and variability. Arabidopsis flower development: the role of homeotic genes. Intercellular  interactions in the development of C. elegans.  Rearrangements of genes in ontogeny. Differentiation of immunoglobulins in mammals. Transformation of mating types in the homothallic yeast S. cerevisiae. Trypanosome surface antigens. |
| 17 | Fundamentals of Genomics and Proteomics | Genome analysis. Determination of the nucleotide sequence of genes. Annotation of the decoded sequence. Classification of genes.  Anatomy of genes of prokaryotes. eubacteria genomes. Archaeal genomes.  Anatomy of eukaryotic genes. Organization of eukaryotic DNA. DNA repeats and satellite DNA. DNA sequences of centromeric and telomeric regions of chromosomes. Medium-length DNA repeats: VNTR and dinucleotide repeats. Short and long scattered DNA repeats: SINE and LINE. Multiple copies of genes of medium length. The coding part of the eukaryotic genome. Organization of the C. elegans genome: unexpected results. Organization of genomes in higher plants. Organization of the human genome: The Human Genome Project. Chromosomal organization of the human genome.  The evolution of the genome. The smallest genome required for life. organism-specific genes. Origin and evolution of the eukaryotic genome. Genomic duplications. Gene duplications. Comparative genomics: multigene families. Family of globin genes. Family of immunoglobulin genes. Family of histone genes. Proteomics. Methods of proteomics. bacterial proteome. Architecture of the nuclear pore complex. |
| 18 | Fundamentals of population genetics. | Definition of populations. Population genetic characteristics: population gene pool, genotype frequencies and allele frequencies. Calculation of allele frequencies. Hardy-Weinberg law. Consequences of the Hardy-Weinberg law. Balance tests. Extension of the H.-W. Application of the Hardy-Weinberg law: calculation of heterozygous frequencies. Genetic heterogeneity of populations. Factors that change the frequency of alleles in populations: natural selection, mutation process, gene flow, life waves and gene drift, inbreeding, isolation. |
| 19 | Theories of evolution as the basis of the modern evolutionary approach to the study of biological processes.Speciation. | Evolutionary history: models of speciation. Macro and microevolution The ratio of macro-and microevolution. Population as a unit of the evolutionary process. Genetic heterogeneity and polymorphism of populations. Estimates of genetic variability. Genetic variability of populations according to morphological and physiological characteristics. Variation in nucleotide sequences. Differences between genetic heterogeneity and polymorphism. Classification of types of polymorphism. The concept of a broad adaptive norm and the genetic load of populations. Types of genetic cargo. Chromosomal polymorphism: adaptive role of inversion polymorphism, advantage of heterokaryotypes, polymorphism in Robertsonian translocations, polymorphism in B-chromosomes, sex chromosomes. Biochemical polymorphism of populations: levels of protein polymorphism in populations, clinal variability.  Sources of genetic variability The role of mutations and recombinations. Genetic control of mutagenesis, mutator genes. Physiological hypothesis of the mutation process. "Fashion" for mutation. Insertional mutagenesis: unstable genetic loci, MDH. hybrid dysgenesis. Changes in the localization of retrotransposons associated with the direction of selection.  Regulatory mechanisms in populations Representation of the integrity of the population structure. Development under the influence of selection of optimal values ​​of general population parameters: abundance, sex and age composition, composition of the genetic load, ratio of frequencies of pheno- and genotypic classes. Adaptive differentiation of population structure. Genetic mechanisms for protecting the adaptive norm. The concept of genetic homeostasis of a population. The evolution of dominance. Leading patterns of progressive evolution |
| Speciation. Real-time speciation. Minimum genetic differences required for speciation. The rate of speciation. Phylogeny reconstruction. Construction of evolutionary trees. Use of phylogeny data. HIV transmission. Neanderthals and modern humans. Origin of mitochondria. Comparative molecular biology of the gene. Diversity of genes: "simple" and "complex", autonomous and assembled into operons, overlapping and non-overlapping, continuous and mosaic. Comparison of pro- and eukaryotes. The main directions in the evolution of the gene: autonomization, oligomerization, the appearance of a mosaic structure. Overlapping genes and parasitic specialization. Evolution of regulatory systems. Possible role of transposons. The appearance of chromatin, mitosis, meiosis. |
| Molecular bases of evolution. Molecular bases of evolution. Substitutions of nucleotides and amino acids in the evolution of homologous genes and proteins. Synonymous evolution. Covarions (W. Fitch, E. Margoliash). The concept of neutral evolution (M. Kimura, J. King, T. Jukes) or how new genes do not arise. Molecular Clock of Evolution (E. Zuckerkandl and L. Pauling). Evolution by duplication and divergence of copies, or how new genes arise (S.Ono). Pseudogenes. Modular principle of molecular evolution. |
|  |  | ECOLOGICAL GENETICS. |
| 20 | Fundamentals of ecological genetics. Genetic toxicology | Introduction to ecological genetics. Ecology and "environmentology". Ecological genetics - mutual influence of ecological relations and genetic processes. Food chains and food webs. Genetic control of synecological relationships. Elementary ecological-genetic models. Sterol metabolism in the plant (fungi) - arthropod system and plant protection. Relations between Agrobacterium tumefaciens and higher plants. Nitrogen fixation: legume-rhizobium symbiosis.  Synecology and biological factors of variability. Viruses and exogenous DNA, toxins of microorganisms, stress. Tissue transplantation and immunological stress.  Autecology and genetic control of resistance of organisms to environmental factors. Anomalies of the repair systems in humans. Hereditary sensitivity to harmful production factors. Pharmacogenetics. |
|  |  | Genetic toxicology. Natural and anthropogenic mutagens and genetically active environmental factors: physical, chemical, biological. Principle of universality of biological organization and relative specificity of mutagens. Characteristics of test systems and test systems in genetic toxicology. Microorganisms, plants and animals as test systems. Objects and effects taken into account: chromosome aberrations in plant and animal cells, dominant and recessive lethalities in Drosophila, mitotic crossing over and conversion in yeast, mutagenesis in bacteria, etc. Ames test. Activation of promutagens by the metabolic systems of the body in vivo and in vitro. The problem of high sensitivity, throughput of tests and the possibility of extrapolation to a person. Genetic testing and medicine. Phenotypic manifestation of primary (pre-mutational) changes. Pathways of mutagenesis and antimutagenesis. Mutagenesis and carcinogenesis. Reducing the genetic risk. Genetic monitoring of natural populations and protection of the gene pool. |
|  |  | GENETICS AND SELECTION. |
| 21 | Genetic bases of selection | The subject of selection, its goals and objectives. Selection principles c. use of biological resources: fishing, hunting and forestry. Variety, breed, strain. Models of breeds and varieties. The teachings of N.I. Vavilov about the source material (about the original varietal, species and generic potential) and its development. The concept of centers of origin of cultivated plants (botanical and geographical bases of selection). The law of homological series and its practical significance. Importance of source material and use of the world's genetic resources. The teachings of N.I. Vavilov about the role of the environment in the identification of varietal characteristics and its development. genetic collections. Breeding for adaptability to industrial technology. Qualitative and quantitative features. Heritability. Types of selection: against a provocative background, mass, individual, sib-selection. Types of crosses in breeding: inbreeding and inbreeding, outbreeding. Inbreeding depression and heterosis. Mechanisms of heterosis and the problem of fixation. Double interline hybrids of corn, using CMO. synthetic populations. The value of genetic methods in plant and animal breeding  and microorganisms. Cloning. Induced mutagenesis and its significance. Heterosis. distant hybridization. somatic hybridization. haploidy and polyploidy. signal markers. Promising methods of selection. |
| 22 | Genetic foundations of biotechnology. | Subject and tasks of biotechnology. The structure of modern biotechnology. Genetic engineering: achievements and prospects. Methods of genetic engineering. Transplantation of animal embryos. General status of transgenic crops in the world. Risks associated with the introduction of transgenic plants into the environment. The "problem" of genetically modified agricultural plants. Control of the introduction of GMOs into agricultural systems. Cell engineering: achievements and prospects. Methods of cell engineering. Cultures of somatic cells and plant tissues. |

* + 1. **The content of practical classes**

|  |  |  |
| --- | --- | --- |
| *Sections studied in 4 (full-time) / 6 (full-time) semester* | | |
| No. p / p | Name of the topic (section) of the discipline | The content of the practical lesson |
|  | Isolation of deoxynucleoprotein from spleen/liver tissue. | Isolation of deoxynucleoprotein from spleen/liver tissue. Qualitative DNA test. |
| 2. | Isolation of chromosomal DNA | Isolation of chromosomal DNA from lymphocytes |
| 3 | Determination of DNA concentration | Determination of DNA concentration in plasma by fluorescence spectrophotometry |
| 4 | Determination of the total content of nucleic acids | Determination of the total content of nucleic acids in biological material by phosphorus |
| 5 | Characteristics of the structural organization of extracellular and chromosomal DNA | Characterization of the structural organization of extracellular and chromosomal DNA in agarose gel |
| 6 | Observations of chromosomal dynamics | Observations of chromosomal dynamics and gene expression using the FISH method |
| 7 | Isolation of plasmid DNA | Isolation of plasmid DNA from bacteria. |
| 8 | Isolation of mRNA. | Isolation of mRNA from human blood lymphocytes. |
| 9 | Study of gene polymorphism by PCR. | Study of gene polymorphism by PCR. Setting up PCR with electrophoretic detection. |
| 10 | Electrophoresis in agarose gel. | Agarose gel electrophoresis of previously amplified DNA. |
| eleven | Gel filtration of nucleic acids. | Gel filtration of nucleic acids. |
| 12 | Isolation outside nuclear DNA | Isolation of DNA from cell organelles |
| 13 | PCR method | Real-time PCR method |
| *Sections studied in 5 (full-time) / 7 (full-time) semester* | | |
| 1 | Cytological bases of heredity and variability | Core structure. Morphofunctional characteristics of chromatin. The structure and types of chromosomes. Chromosome change during mitosis. |
| 2 | Meiosis as the basis of combinative variability. | phases of meiosis. Prophase I. Conjugation. Crossing over. Random and independent divergence of chromosomes in meiosis. |
| 3 | Types of interaction of allelic genes. | Complete dominance. Analyzing cross. intermediate inheritance. lethal genes. |
| 4 | The law of independent inheritance of traits. | Solving genetic problems on the independent interaction of genes |
| 5 | Types of interaction of non-allelic genes. Complementarity. Epistasis. | Solution of genetic problems: types of interaction of non-allelic genes. Complementarity. Epistasis. |
| 6 | Polymerism. Quantitative signs. | Solution of genetic problems: polymerization. Quantitative signs. |
| 7 | Determination of sex chromatin in buccal epithelial cells. | Types of sex determination. life cycles. Inheritance of sex-linked traits. |
| 8 | Linkage of genes. | Partial and complete linkage of genes. coincidence coefficient. |
| 9 | Gene mapping. | Construction of genetic maps. Cytological maps. |
| 10 | Linkage of genes | Solving genetic problems: linkage of genes |
| *Sections studied in 6 (full-time) / 8 (full-time) semester* | | |
| 1 | mutational variability. | Chromosomal mutations. Anaphase and metaphase analysis of chromosome aberrations. |
| 2 | Genomic variability. | Polyploidy. Aneuploidy. polytene chromosomes. |
| 3 | modification variability. | reaction rate. Statistical methods for studying modification variability |
|  | Chromosomal theory of heredity. | Variability |
|  | Hardy-Weinberg law.. | Estimation of migratory flows of alleles |
|  | micronucleus test. | Evaluation of the mutagenic effect of environmental factors. |
|  | Familiarity with some test systems | (crepiscapillaris, soybean, Tradescantia clone 02) |
|  | Analysis of wild flora plants growing in oil-contaminated areas. | Objects of study: chamomile, horse sorrel, plantain, dandelion |
|  | Analysis of the occurrence of somatic mutations | Analysis on T31 soybean leaves used as a test system |
|  | Kariological | Analysis of the buccal epithelium. |
|  | Assessment of the mutagenicity of the medium | Analysis using the Allium test |
|  | Gene polymorphism analysis | AnalysisPCR method |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | INTRODUCTIONSubject and methodology of genetics. | *oral questioning* |
| 2. | Material bases of heredity. | *oral questioning* |
| 3. | DNA replication. | *oral questioning* |
| 4. | DNA recombination. | *oral questioning* |
| 5. | Structure and function of the gene. Recombinant DNA method. | *oral questioning* |
| 6. | Expression of genetic material. | *oral questioning* |
|  | Regulation of gene expression. | *oral questioning* |
|  | Recombinant DNA method. | *oral questioning* |
|  |  | *oral questioning* |
|  | Cytological bases of heredity and variability. | *oral questioning* |
|  | The patterns of inheritance of traits established by G. Mendel. | *oral questioning* |
|  | Chromosomal theory of heredity. | *oral questioning* |
|  | Sexual differentiation and life cycle. | *oral questioning* |
|  | Gene mapping. | *oral questioning* |
|  | mutational variability. | *oral questioning* |
|  | modification variability. | *oral questioning* |
|  | ontogenetic variability. | *oral questioning* |
|  | Fundamentals of Genomics and Proteomics | *oral questioning* |
|  |  | *oral questioning* |
|  | Fundamentals of population genetics. | *oral questioning* |
|  | Theories of evolution as the basis of the modern evolutionary approach to the study of biological processes.Speciation. | *oral questioning* |
|  | Fundamentals of ecological genetics. | *oral questioning* |
|  | Genetic toxicology | *oral questioning* |
|  | Genetic bases of selection | *oral questioning* |
|  | Genetic foundations of biotechnology. | *oral questioning* |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

Sample list of questions for oral survey:

1. Name the general principles of cell organization.
2. What organelles are required for all cell types?
3. List the non-membrane cell organelles.
4. What organelles have a double membrane?
5. What organelles are characterized by the presence of cristae?
6. List the main distinguishing features of pro- and eukaryotes.
7. Name the semi-autonomous structures of the cell.
8. Which organelles have their own synthetic apparatus?
9. How do pro- and eukaryotic ribosomes differ?
10. What cell organelles are similar to prokaryotic cells and how is this similarity expressed?
11. What are the similarities and differences between proteins synthesized on free ribosomes and ribosomes attached to the ESR?
12. Transport against a concentration gradient is ………… transport.
13. List the types of passive transport.
14. Why is passive transport not expended energy?
15. What type of transport is exocytosis?
16. What is the similarity of all biological membranes?
17. Where are lysosome enzymes synthesized?
18. How are AG, ER, ribosomes and lysosomes related?
19. Which cell organelles contain hydrolytic enzymes?
20. What cellular organelles are involved in the utilization of cellular structures?
21. What organelles are round?
22. What organelles are developed in secretory cells?
23. What can be said about the function of cells in which the SER is well developed?
24. Which organelles will be more developed than others in liver cells and why?
25. What determines the number of mitochondria in a cell?
26. What role does oxygen play in cells?
27. In what organelles is the breakdown of organic molecules?
28. Name the main class of membrane lipids.
29. What determines the selective semipermeability of the plasma membrane?
30. What cell organelles act as a "cleaner" of the cell?
31. What organelles are involved in cellular respiration?
32. In which organelles do proteins acquire an "address mark"?
33. What is the chemical composition of ribosomes?
34. "Stack of single-membrane flat tanksWhat organelle are we talking about?
35. What are the similarities between lysosomes and peroxisomes?
36. What organelles contain catalase?
37. Where are secondary lysosomes formed?
38. List the functions of the plasma membrane.
39. What lysosomes are present in cells
40. What is a nucleoid?
41. What are the similarities between prokaryotes and mitochondria?
42. What is the cytosol?
43. What part of the cell connects all organelles with each other?
44. What is the internal environment of the cell?
45. Where are lipids synthesized?
46. Where are proteins synthesized?
47. What links DNA, proteins and ribosomes?
48. What organ controls the life of the cell?
49. How are secondary lysosomes formed?

What is called autophagy? What cell organelles are involved in it?

**Cytological basis of heredity and variability:**

1. What is the role of the nucleus in eukaryotic cells?
2. What organelle determines biological activity in a prokaryotic cell?
3. What organelle plays a central role in cells?
4. What organelle controls the life of the cell?
5. Which cell in the human body does not have a nucleus? Why?
6. Name the characteristics of a eukaryotic cell
7. What advantages does the nucleus provide to the eukaryotic cell?
8. What organelle controls the activity of blue-green algae?
9. What organelle determines biological activity in a plant cell?
10. Name the information center euglena green.
11. What organelle controls the activity of Escherichia coli?
12. Which eukaryotic cell organelles are involved in the transmission of genetic information.
13. Where is the basic genetic information stored in eukaryotic cells?
14. List all the functions of the cell nucleus.
15. What is the function of a nucleoid?
16. What do nucleoid and nucleus have in common?
17. What is the main difference between a bacterial cell and a blue-green algae cell?
18. Name the main substance of the nucleus, thanks to which the nucleus is the main part of the eukaryotic cell.
19. How many nuclei are there in cells?
20. What shape can the nucleus have?
21. What role can the shape and appearance of the nucleus play?
22. What most often determines the size of the nuclei?
23. What space is called perinuclear?
24. What is the function of the nucleolus?
25. Give a morphofunctional characteristic of the nuclear membrane?
26. Name the most characteristic sizes of nuclei.
27. Name the role of the nuclear lamina.
28. How is the exchange of substances between the nucleus and cytoplasm of the cell?
29. Name the substances transported from the nucleus to the cytoplasm of the cell.
30. What substances are transported through the NPC?
31. How can one explain the high density of NPCs in the nuclei of some cells?
32. Name the nuclear structures.
33. Is mononuclearity a feature of eukaryotic cells?
34. Does the nucleus contain internal membranes?
35. What processes take place inside the kernel?
36. What substances move from the cytoplasm of the cell to the nucleus?
37. What is the structural unit of chromatin?
38. Name the types of chromatin.
39. What chromatin is called heterochromatin?
40. What chromatin is called euchromatin?
41. What chromatin contains the most structural genes?
42. List the chemical composition of chromatin.
43. What chromatin is active and why?
44. Give a morphological characteristic of interphase chromatin.
45. How does chromatin change during the transition to the prophase of meiosis.
46. What role does the size of heterochromatin play in a cell?
47. What are the proteins that make up the core of the nucleosome called?
48. What correlates the structural state of the genetic material?
49. What is the characteristic property of heterochromatin?
50. What is the characteristic property of heterochromatin?
51. What chromatin is called constitutive?
52. What chromatin is called facultative?
53. What is the function of chromatin?
54. Describe the chromatin of blue-green algae?
55. What set of chromosomes is typical for most somatic cells?
56. What chromosomes are called homologous?
57. What are kinetochores? Their function.
58. What is called a centromere?
59. What is the role of the centromere?
60. Name the types of chromosomes according to the position of the centromere.
61. What chromosomes are called metacentric?
62. What chromosomes are called submetacentric?
63. What chromosomes are called acrocentric?
64. What are the ends of chromosome arms called?
65. What is the role of chromosome telomeres?
66. What does the term "autosome" mean?
67. Describe the mitotic chromosome.
68. What underlies the formation of sister chromatids?
69. How many DNA molecules does a metaphase chromosome contain?
70. What cells contain a haploid set of chromosomes?
71. What is a karyotype?
72. What are called nucleolar organizers and what is their role?
73. What is included in the cell cycle?
74. List the functions of chromosomes.
75. List the periods of interphase.
76. In what period does increased protein synthesis occur?
77. What happens in the S-period of interphase?
78. When does DNA replication take place?
79. What characterizes the postsynthetic period of interphase?
80. At what stage of the cell cycle does a cell grow.
81. What is the period during which a cell prepares for division called?
82. What is the signal for a cell to enter mitosis?
83. What set of chromosomes do cells carry after the S-period of the cell cycle.
84. What is formed as a result of DNA replication in the synthetic phase of the interphase?
85. What is the importance of DNA replication in cell division?
86. What is the definition of mitosis?
87. What is the purpose of mitosis?
88. What cells divide by mitosis?
89. What is the role of centrosomes in cell division?
90. List in the correct order the phases of mitosis?
91. What is meant by diploidy and haploidy?
92. Let's say two chromosomes have the same morphology. What other criteria are needed for their homology?
93. How many chromatids are seen in the prophase of mitosis in a cell with 2n=16.
94. What is the set of chromosomes in the anaphase of mitosis.
95. Compare the telophase stage in plant and animal cells
96. What are the differences between the chromosomes of dividing bacterial and eukaryotic cells?
97. A diploid cell contains three pairs of homologous chromosomes: C1 C2, M1 M2 and S1 S2. What are the possible combinations of these chromosomes in two daughter cells after mitosis.
98. How many types of cells are formed as a result of mitosis?
99. Describe the arrangement of chromosomes in the metaphase plate during mitosis in a cell with 2n = 6
100. How do homologous chromosomes behave during the anaphase of mitosis?
101. At what stage of mitosis does centromere duplication occur?
102. The number of chromosomes in the epithelial cells of the body is 24. How many chromosomes will there be in osteocyte cells?
103. What period of cell division is characterized by a set of chromosomes 2n4c
104. In what phase do chromosomes consist of one chromatid?
105. What period of cell division is characterized by a set of chromosomes 4n4c
106. How many chromosomes will be in those formed as a result of mitosis if there were 16 chromosomes in the parent cell?
107. What happens to the number of chromosomes as a result of mitosis?
108. How many chromosomes will be in those formed as a result of mitosis if there were 44 chromosomes in the parent cell?
109. What phase of the cell cycle are we talking about: spindle microtubules attach to centromere kinetochores.
110. What phase of the cell cycle are we talking about: X-shaped chromosomes are formed, consisting of two sister chromatids.
111. What is the role of centrosomes in cell division?
112. Name the functions of the fission spindle.
113. What structures play a role in the division of chromosomes during mitosis.
114. What phase of the cell cycle are we talking about: the nuclear envelope and the nucleolus degrade
115. What phase of the cell cycle are we talking about: spindle microtubules attach to centromere kinetochores.
116. What phase of the cell cycle are we talking about: a metaphase plate is formed.
117. What phase of the cell cycle are we talking about: chromosomes condense.
118. *List the characteristics of prophase.*
119. *What are the characteristics of telophase?*
120. *Name the distinguishing features of cytokinesis in plant and animal cells.*
121. What explains the ordered distribution of chromosomes in***mitosis***between daughter cells?
122. What functions of life does cell division provide?
123. If chromosomes are visible in the cell, but the nuclear membrane and nucleolus are not visible, then what stage of mitosis is this?
124. If the spindle of division is clearly visible in the cell, and the centromeres of all chromosomes are in the same plane, then what is the stage of mitosis?
125. Which two stages of mitosis are opposite in terms of the processes occurring in them?
126. During abnormal mitosis in a human tissue culture in a cell with 46 chromosomes, the daughter chromosomes of one of the short chromosomes did not separate into daughter nuclei, but fell into one nucleus. This phenomenon is called nondisjunction of chromosomes. How many chromosomes were in the cells after that?
127. During mitosis, one chromosome was eliminated in a human tissue cell. How many chromosomes will be in two resulting cells?
128. If a cell with 14 chromosomes is treated with colchicine, a substance that prevents the chromosomes from separating to the poles, but does not affect the duplication of chromosomes, then how many chromosomes will the cell have?
129. Name the differences between mitosis in animal and plant cells.
130. What is the genetic significance of mitosis?
131. Why is mitosis the basis of tissue regeneration?
132. Plants propagated vegetatively? What will be the differences between them?
133. What cellular structures separate in the anaphase of mitosis?
134. What do root cells and leaf cells have in common?
135. What is the difference between spindle formation in plant cells?
136. The number of chromosomes in the somatic cells of a cockroach and a chimpanzee is 48. Why can't they be attributed to the same species?
137. How many chromosomes will be in those formed as a result of mitosis if there were 7 chromosomes in the parent cell?
138. Set of chromosomes in the parent cell 34. What set of chromosomes will be in the cells formed by mitosis.
139. At what stage of mitosis is the number of chromosomes 2n2c?
140. Why do the resulting cells have an identical genetic makeup?
141. How are polyploid cells formed?
142. The biological meaning of mitosis.
143. What is the main event that occurs during prophase?
144. Which part of the cell cycle takes the longest.

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The “good” mark is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic educational literature

1. Alberts B. Molecular biology of the cell. -M.: "Mir", 1987.-V.2.
2. Bostock C., Sumner E. The chromosome of a eukaryotic cell. M., "Mir", 1981
3. Dyban. Comparative cytogenetics of mammals. -M.: "Mir", 1982.
4. Vorsanova S. G., Yurov Yu. B., Chernyshev V. N. Medical cytogenetics - M. : Medpraktika-M, 2006. - 300 p.
5. . Genetic bases of plant breeding. General plant genetics. Volume 1 [Electronic resource]: monograph / A.V. Kilchevsky [et al.]. Electron. text data.— Minsk: Belarusian Science, 2008.— 551 pp.— Access mode: http://www.iprbookshop.ru/12295.html.— EBS “IPRbooks”
6. 2. Zhimulev I.F. General and molecular genetics [Electronic resource]: textbook for universities / Zhimulev I.F. — Electron. text data. Novosibirsk: Siberian University Publishing House, 2017. 480 pp. Access mode: http://www.iprbookshop.ru/65279.html.

6.2 Additional educational literature:

1. Bozhkova V.P. Fundamentals of genetics [Electronic resource]: textbook / Bozhkova V.P.— Electron. text data.— M.: PARADIGMA, 2009.— 270 pp.— Access mode: http://www.iprbookshop.ru/13033.html.— EBS “IPRbooks”

2. Fundamentals of genetics [Electronic resource]: textbook / - Electron. text data.— Komsomolsk-on-Amur: Amur Humanitarian and Pedagogical State University, 2012.— 145 pp.— Access mode: http://www.iprbookshop.ru/22281.html.— EBS “IPRbooks”

3. Bykov V.L. Cytology and general histology /V.L.Bykov. - St. Petersburg: SOTIS, 2002.

4. Vorsanova S.G., Yurov I.Yu., Soloviev I.V., Yurov Yu.B. Heterochromatic regions of human chromosomes: clinical and biological aspects. - M.: ID "MEDPRAKTIKA-M", 2008, 300 s.

5. Gudoshnikova T.N. Introduction to the cytoembryology of angiosperms / T.N. Gudoshnikova, V.A. Trofimov, V.I. Kudryashova. - Saransk: Mord Publishing House. gosun-ta, 2004.

6.3Periodicals

1. Genetics
2. medical genetics
3. Molecular genetics, microbiology and virology
4. Cytology and genetics
5. Annual Review of Genetics
6. Current Opinion in Genetics & Development
7. Cytogenetics and Genome Research
8. DNA Research
9. Gene
10. genetics
11. GenomeResearch
12. Genomics
13. **Modern professional databases and information reference systems**

http://www.ncbi.nlm.nih.gov/

<http://www.msu-genetics.ru/>

[www.nature.com](https://www.nature.com/)

[archive.neicon.ru](https://archive.neicon.ru/xmlui/handle/123456789/1947637/browse?type=source)

[www.scopus.com](https://www.scopus.com/)

[apps.webofknowledge.com](https://apps.webofknowledge.com/home.do?SID=Z1V9IS8DggMcH9KSZ1X)

1. **Software Composition**

1. System GARANT: electronic periodical reference [Electronic resource].

2. ConsultantPlus: reference and search system [Electronic resource]. -

4. Electronic library system "EBS URAIT www.biblio-online.ru

5. Electronic library system “National digital resource “Rukont”.

6. LLC Scientific electronic library. Integrated scientific information

a portal in the Russian zone of the Internet, including databases of scientific publications and services for information support of science and higher education.

http://elibrary.ru/

7. Information system "Single window for access to educational resources"

1. **Equipment and technical training aids**

*Teaching Labs*equipped with microscopes and reagents for cytogenetic studies

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"Chechen State University"

Work program of the discipline

**"Introduction to Biotechnology"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional  skills | GPC-5.1  GPC-5.2  GPC-5.3 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-5 | Able to apply in professional activities modern ideas about the basics of biotechnological and biomedical industries, genetic engineering, nanobiotechnology, molecular modeling; | **Know:**principles of modern biotechnology, genetic engineering techniques, fundamentals of nanobiotechnology, molecular modeling  **Be able to:**evaluate and predict the prospects of the objects of their professional activity for biotechnological industries  **Own:**methods for determining the biological safety of products of biotechnological and biomedical industries. |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 3/108 | 3/108 |  |
| **contact work**: | | 36 | 54 |  |
|  | **Lecture-type classes** | 18 | 18 |  |
| **Seminar type classes** | 18 | 36 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 72 | 54 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

1. credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Biotechnology. Brief historical information and its relationship with other sciences. | 2 |  |  |  |  |  | 9 |
| 2. | Basic objects and methods of biotechnology | 2 |  | 4 |  |  |  | 9 |
| 3. | The value of biotechnology for various areas of the national economy | 2 |  | 4 |  |  |  | 9 |
| 4. | Raw material base of biotechnology | 2 |  | 2 |  |  |  | 9 |
| 5. | Preparatory and auxiliary stages of biotechnological productions | 2 |  | 4 |  |  |  | 9 |
| 6 | genetic engineering | 2 |  |  |  |  |  | 9 |
| 7 | Cell engineering | 2 |  | 4 |  |  |  | 9 |
| 8 | Transgenic microorganisms, plants and animals. Cloning. | 4 |  |  |  |  |  | 9 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Biotechnology. Brief historical information and its relationship with other sciences. | 2 |  | 4 |  |  |  | 6 |

|  |  |  |
| --- | --- | --- |
|  | Genetic engineering | Discoveries that contributed to the emergence and development of genetic engineering. Achievements in genetic engineering. The main stages of the technology of recombinant DNA |
|  | Cell engineering | hybridization of somatic cells. Obtaining monoclonal antibodies. stem cells. Embryonic stem cells. somatic stem cells. Polyclonal and monoclonal antibodies. Anti-idiotypic antibodies in the body. Haptens, their main properties |
|  | Transgenic microorganisms, plants and animals. Cloning | Transgenesis, its role in modern biotechnology. Stages of obtaining transgenic organisms. Animal cloning. Cloning steps |

* + 1. The content of practical classes

|  |  |  |
| --- | --- | --- |
| **No. p / n** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
|  | Basic objects and methods of biotechnology | Obtaining pure cultures of microorganisms |
|  | The value of biotechnology for various areas of the national economy | Isolation of DNA from plant tissues. Nucleic acid gel electrophoresis |
|  | Raw material base of biotechnology | Getting curd |
|  | Preparatory and auxiliary stages of biotechnological productions | Isolation of DNA from animal tissues |
|  | genetic engineering | Method for PCR diagnostics of transgenic varieties of soybeans, corn and potatoes |
|  | Cell engineering | Obtaining pure cultures of microorganisms |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Biotechnology. Brief historical information and its relationship with other sciences | OR, P, IP |
| 2. | Basic objects and methods of biotechnology | OR, P, IP |
| 3. | The value of biotechnology for various areas of the national economy | OR, P, IP |
| 4. | Raw material base of biotechnology | OR, P, IP |
| 5. | Preparatory and auxiliary stages of biotechnological productions | OR, P, IP |
| 6. | genetic engineering | OR, P, IP |
| 7. | Cell engineering | OR, P, IP |
| 8. | Transgenic microorganisms, plants and animals. Cloning | OR, P, IP |

*List of evaluation tools:*

1. *oral questioning*
2. *Research project (abstract)*
3. *Information project (report)*
4. *Presentation*

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**6.1 Main literature**

1. Biotechnology and microbiology of anaerobic processing of organic municipal waste [Electronic resource]: collective monograph / - Electron. text data. -: Logos, University Book, 2016. - 320 pp. - Access mode: http://www.iprbookshop.ru/70738.html. — EBS «IPRbooks»
2. Chkhenkeli V.A. Biotechnology [Electronic resource]: textbook / Chkhenkeli V.A.— Electron. text data. - St. Petersburg: Prospekt Nauki, 2014. - 304 p. - Access mode: http://www.iprbookshop.ru/80077.html. — EBS «IPRbooks»
3. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [i dr.]. — Electron. text data. - Voronezh: Voronezh State University of Engineering Technologies, 2017. - 316 p. - Access mode: http://www.iprbookshop.ru/70810.html. — EBS «IPRbooks»

**6.2 Further reading**

1. Biotechnology and microbiology of anaerobic processing of organic municipal waste [Electronic resource]: collective monograph / - Electron. text data. -: Logos, University Book, 2016. - 320 pp. - Access mode: http://www.iprbookshop.ru/70738.html. — EBS «IPRbooks»
2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [i dr.]. — Electron. text data. - Voronezh: Voronezh State University of Engineering Technologies, 2017. - 316 p. - Access mode: http://www.iprbookshop.ru/70810.html. — EBS «IPRbooks»
3. Neverova O.A. Food biotechnology of products from raw materials of plant origin [Electronic resource]: textbook / Neverova O.A., Gorelikova G.A., Poznyakovsky V.M. - Electron. text data. - Saratov: Higher education, 2014. - 415 p. - Access mode: http://www.iprbookshop.ru/4160.html. — EBS «IPRbooks»
4. Shleykin A.G. Introduction to Biotechnology [Electronic resource]: textbook / Shleikin A.G., Zhilinskaya N.T.— Electron. text data.— St. Petersburg: ITMO University, Institute of Refrigeration and Biotechnology, 2013.— 92 pp.— Access mode: http://www.iprbookshop.ru/65806.html.— EBS “IPRbooks”
5. Biotechnology and microbiology of anaerobic processing of organic municipal waste [Electronic resource]: collective monograph / - Electron. text data. -: Logos, University Book, 2016. - 320 pp. - Access mode: http://www.iprbookshop.ru/70738.html. - EBS "IPRbook

**6.3 Periodicals**

1. [Biotechnology](http://ru.wikipedia.org/w/index.php?title=%D0%96%D1%83%D1%80%D0%BD%D0%B0%D0%BB_%C2%AB%D0%91%D0%B8%D0%BE%D1%82%D0%B5%D1%85%D0%BD%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D1%8F%C2%BB&action=edit&redlink=1),[Moscow](http://ru.wikipedia.org/wiki/%D0%9C%D0%BE%D1%81%D0%BA%D0%B2%D0%B0). Magazine[State Research Institute of Genetics](http://ru.wikipedia.org/wiki/%D0%93%D0%BE%D1%81%D0%9D%D0%98%D0%98%D0%B3%D0%B5%D0%BD%D0%B5%D1%82%D0%B8%D0%BA%D0%B0).
2. [Genetics and breeding of cultivated plants](http://ru.wikipedia.org/w/index.php?title=%D0%93%D0%B5%D0%BD%D0%B5%D1%82%D0%B8%D0%BA%D0%B0_%D0%B8_%D1%81%D0%B5%D0%BB%D0%B5%D0%BA%D1%86%D0%B8%D1%8F_%D0%B2%D0%BE%D0%B7%D0%B4%D0%B5%D0%BB%D1%8B%D0%B2%D0%B0%D0%B5%D0%BC%D1%8B%D1%85_%D1%80%D0%B0%D1%81%D1%82%D0%B5%D0%BD%D0%B8%D0%B9&action=edit&redlink=1). abstract journal[VINITI](http://ru.wikipedia.org/wiki/%D0%92%D0%98%D0%9D%D0%98%D0%A2%D0%98)
3. [Molecular genetics, microbiology and virology](http://ru.wikipedia.org/w/index.php?title=%D0%9C%D0%BE%D0%BB%D0%B5%D0%BA%D1%83%D0%BB%D1%8F%D1%80%D0%BD%D0%B0%D1%8F_%D0%B3%D0%B5%D0%BD%D0%B5%D1%82%D0%B8%D0%BA%D0%B0,_%D0%BC%D0%B8%D0%BA%D1%80%D0%BE%D0%B1%D0%B8%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D1%8F_%D0%B8_%D0%B2%D0%B8%D1%80%D1%83%D1%81%D0%BE%D0%BB%D0%BE%D0%B3%D0%B8%D1%8F&action=edit&redlink=1)
4. [Current Opinion in Genetics & Development](http://ru.wikipedia.org/w/index.php?title=Current_Opinion_in_Genetics_%26_Development&action=edit&redlink=1), 1991
5. [DNA Research](http://ru.wikipedia.org/w/index.php?title=DNA_Research&action=edit&redlink=1), published in[Tokyo](http://ru.wikipedia.org/wiki/%D0%A2%D0%BE%D0%BA%D0%B8%D0%BE),[Japan](http://ru.wikipedia.org/wiki/%D0%AF%D0%BF%D0%BE%D0%BD%D0%B8%D1%8F), 1994
6. [Genome Research](http://ru.wikipedia.org/w/index.php?title=Genome_Research&action=edit&redlink=1),[USA](http://ru.wikipedia.org/wiki/%D0%A1%D0%A8%D0%90),
7. [Genomics](http://ru.wikipedia.org/w/index.php?title=Genomics&action=edit&redlink=1),[USA](http://ru.wikipedia.org/wiki/%D0%A1%D0%A8%D0%90), 1987
8. [Hereditas](http://ru.wikipedia.org/w/index.php?title=Hereditas&action=edit&redlink=1), With[1920](http://ru.wikipedia.org/wiki/1920_%D0%B3%D0%BE%D0%B4)published by the Mendelska sällskapet i Lund (Mendelian Society of Lund).
9. [Heredity](http://ru.wikipedia.org/w/index.php?title=Heredity&action=edit&redlink=1)
10. [International Journal of Biological Sciences](http://ru.wikipedia.org/w/index.php?title=International_Journal_of_Biological_Sciences&action=edit&redlink=1)
11. [Journal of Heredity](http://ru.wikipedia.org/w/index.php?title=Journal_of_Heredity&action=edit&redlink=1)
12. [Molecular Psychiatry](http://ru.wikipedia.org/w/index.php?title=Molecular_Psychiatry&action=edit&redlink=1),[Great Britain](http://ru.wikipedia.org/wiki/%D0%92%D0%B5%D0%BB%D0%B8%D0%BA%D0%BE%D0%B1%D1%80%D0%B8%D1%82%D0%B0%D0%BD%D0%B8%D1%8F), 1997
13. [Nature Reviews Genetics](http://ru.wikipedia.org/wiki/Nature_Reviews_Genetics)
14. [PLoS Genetics](http://ru.wikipedia.org/wiki/PLoS_Genetics),[USA](http://ru.wikipedia.org/wiki/%D0%A1%D0%A8%D0%90), 2005
15. [Theoretical and Applied Genetics](http://ru.wikipedia.org/w/index.php?title=Theoretical_and_Applied_Genetics&action=edit&redlink=1)
16. [Trends in Genetics](http://ru.wikipedia.org/w/index.php?title=Trends_in_Genetics&action=edit&redlink=1)

**7.Modern professional databases and information reference systems**

1.www.slideshare.net/galinahurtina/ss-3897383Biotechnology in the form of a slide lecture (presentation).

2.biotechnolog.ru/Materials for the training course Biotechnology

3.library.krasu.ru/ft/ft/\_umkd/1323/u\_lab.pdfElectronic textbook (laboratory work) on Biotechnology.

4.sdb.su/svalka/529-vvedenie-v-biotexnologiyu.htmlIntroduction to biotechnology.

5.window.edu.ru/window\_catalog/pdf2txt?p\_id=44908Biotechnology Manual

6.www.rusdocs.com/biotexnologiiElectronic manual on Biotechnology.

7.biomolecule.ru/content/927Biotechnology Perspectives

8.window.edu.ru/window\_catalog/pdf2txt?p\_id=28505&p\_page=1Biosynthesis of biologically active substances

9.window.edu.ru/window\_catalog/pdf2txt?p\_id=9435Biotechnology / T. G. Volova. - 10. Novosibirsk: Publishing House of the Siberian Branch of the Russian Academy of Sciences, 1999. - 252 p.

11.mcrm.ru/exstrakorporalnoe\_oplodotvorenie.phpIVF - in vitro fertilization.

12.zorgbiogas.ru/biblioteka/book-o-biogazeMaterials about biogas and installations for its production.

13.humbio.ru/humbio/genexp/000ed605.htmElectronic textbook Human biology, section Genetic engineering.

14.[www.nauka.kz/biol\_med/razd4/](http://www.nauka.kz/biol_med/razd4/)vivovoco.rsl.ru/VV/PAPERS/NATURE/SPIDER.HTM Biotechnology for fiber production.

15.www.biorosinfo.ru/press/chto-takoe-biotekhnologija/Website of the Society of Biotechnologists of Russia

16.biotechnolog.ru/ Materials for the training course Biotechnology

17.[www.biofit.ru/biotehnologii/dostizheniya-geneticheskoi-inzhenerii.html General engineering achievements](http://www.biofit.ru/biotehnologii/dostizheniya-geneticheskoi-inzhenerii.html Достижения%20ген.инженерии)

**8.Composition of software**

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

Unified information system UComplexprovides:

access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;

1. http://www.ncbi.nlm.nih.gov/
2. <http://www.msu-genetics.ru/>
3. [SAGE (STM&HSS)](http://online.sagepub.com/browsejournals.dtl)-Journals on natural science and humanitarian topics
4. [Science](http://www.sciencemag.org/magazine.dtl)-
5. [Scientific monographs](http://www.springerlink.com/books/)
6. [Book series (BookSeries)](http://www.springerlink.com/book-series/)
7. [Electronic reference books (E-References)](http://www.springerlink.com/reference-works/)

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

When reading lectures on Introduction to Biotechnology, computer technology is used to demonstrate presentation multimedia materials. In practical classes, students present presentations prepared by them during self-study hours.

Information Technology:

* office suite,
* mail client,
* Internet browser

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

In accordance with the Order of the Ministry of Education and Science of the Russian Federation dated October 4, 2010 No. 986 "On approval of federal requirements for educational institutions in terms of the minimum equipment of the educational process and equipment of classrooms", FGBOU HE "Chechen State University" has the necessary material and technical base, providing for all types of disciplinary and interdisciplinary training, including modern computer technology, integrated into a local area network, has access to global electronic communication networks. The educational process takes place in classrooms for lectures, practical classes, laboratory workshops. Premises for lectures,06.03.01. "Biology"equipped with specialized educational furniture, technical means that serve to present educational information to students.

For lectures and practical classes, the Faculty of Biology and Chemistry uses audiences 4-15, 4-14, 4-13.4-08, where projection equipment is installed (multimedia projector, laptop)to demonstrate educational and visual aids, ensuring the implementation of thematic illustrations.

The main equipment for the educational process, the preparation of nutrients and disinfection / sterilization: autoclaves (“clean” and “dirty”), dry heat sterilizer, distiller, thermostat, refrigerator.

Specialized educational laboratories with a set of equipment for microscopic, bacteriological and immunological research (microscope, dyes, spirit lamp, stands, trays, bacteriological loops, test tubes, pipettes, sets of disks with antibiotics, vaccines, sera, diagnostic preparations).

Special equipment for bacteriological research: automatic dispensers, devices for gel electrophoresis, thermal cycler for PCR research.

Special equipment for immunological studies: automatic dispensers, enzyme immunoassay analyzer, centrifuge.

Visual aids (tables and posters) for the diagnosis of major infectious diseases.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Biochemistry and Molecular Biology"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional  skills | GPC-2.1; |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| Competency codes | Content of competencies | List of planned learning outcomes by discipline |
| GPK-2.1 | Able to apply the principles of structural and functional organization, use physiological, cytological, biochemical, biophysical methods of analysis to assess and correct the state of living objects and monitor their habitat | **Know:**  basic systems of life support and homeostatic regulation of vital functions in plants and animals, methods of perception, storage and transmission of information, orientated in modern methodological approaches, concepts and problems of physiology, cytology, biochemistry, biophysics |

**3. Volume of discipline**

|  |  |  |
| --- | --- | --- |
| Form of work of students / Types of training sessions | Labor intensity, hours | |
| full-time | Part-time |
| 3 semester | 4 semester |
| **Contact classroom work of students with the teacher:** | **54** | **34** |
| Lectures (L) | 18 | 17 |
| Practical exercises (PZ) |  |  |
| Laboratory studies (LZ) | 36 | 17 |
| **Independent work:** |  |  |
| Course project (CP), course work (CR) |  |  |
| Settlement and graphic task (RGZ) |  |  |
| Abstract (R) |  |  |
| Essay (E) |  |  |
| Independent study of sections | 45 | 38 |
| Control work (K) | - | - |
| **Test, exam** | ex(45) | ex(36) |

Notes:

1. credit and credit with assessment for full-time and part-time education is carried out within the framework of seminar-type classes. The curriculum does not include hours.
2. **The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

Testing and crediting with assessment for full-time and part-time forms of education is carried out within the framework of seminar-type classes, hours are not allocated in the curriculum. The hours allocated for intermediate certification in the “control” column of the curriculum include: contact classroom work (its volume is established by the order “On the standards for calculating the volume of the annual workload of the teaching staff for the HE program”) and independent work.

**4.2 The program of the discipline, structured by topics / sections**

**4.2.1 Lecture content**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | 2 | 3 |
| 1 | Subject and tasks of biochemistry. Chemical composition of organisms | Subject and tasks of biochemistry. Brief history of the development of biochemistry. Modern directions of research in the field of biochemistry. Communication of biochemistry with other sciences. The chemical composition of the human body. |
| 2 | Amino acids. Squirrels. | Classification, structure, properties, biological role of amino acids. Primary, secondary, tertiary, quaternary structures of proteins. Physico-chemical properties of proteins. Classification of proteins. Simple and complex proteins. The biological role of chromoproteins, glycoproteins, lipoproteins, metalloproteins, phosphoproteins and nucleoproteins. |
| 3 | Vitamins. Enzymes. | Classification of vitamins. The biological role of the main representatives of water-soluble and fat-soluble vitamins, provitamins. Hypo- and hypervitaminosis. General characteristics of enzymes as biological catalysts. Structural organization of enzymes. The role of coenzymes and prosthetic groups in biocatalysis. Coenzyme forms of vitamins. The mechanism of action of enzymes. Dependence of the rate of enzymatic reactions on the concentration of the substrate, pH and temperature. Classification and nomenclature of enzymes. The practical importance of enzymes. |
| 4 | Carbohydrates | Classification, nomenclature, structure, properties, biological role of carbohydrates. Monosaccharides. The structure and significance of the most important representatives of pentoses (ribose, deoxyribose) and hexoses (glucose, fructose). Significance and use of monosaccharides Disaccharides. The structure of molecules and chemical properties. Representatives of disaccharides: maltose, lactose, sucrose, their significance in nature, application. Polysaccharides: homopolysaccharides, heteropolysaccharides. |
| 5 | Nucleic acids | Nitrogen bases. carbohydrate components. Chemical structure and functions of natural nucleosides and nucleotides. Structural organization of polynucleotides (nucleic acids). Characteristics of the DNA structure. The principle of complementarity. Structure, properties and functions of matrix, ribosomal and transfer RNAs.. |
| 6 | Lipids | Classification, nomenclature, structure, properties, biological role of lipids. Fats. Phospholipids. Glycolipids. Steroids. |
| 7 | Hormones | The mechanism of action of hormones. Classification of hormones. The physiological role of the most important hormones. Hormones - derivatives of amino acids, peptide, steroid hormones. |
| 8 | Metabolism and energy | The most important biochemical principles of metabolism and energy. macroergic compounds. protein biosynthesis. Protein transformations during digestion. Complete and incomplete proteins. Metabolism of amino acids. biosynthesis of carbohydrates. The transformation of carbohydrates during digestion. Glycolysis. General ideas about the tricarboxylic acid cycle. Transformation of lipids in the body. Lipolysis. biosynthesis of lipids. Integration and regulation of metabolism. The role of hormones in the regulation of metabolism. Energy of biochemical processes |

**FULL-TIME EDUCATION**

**4.3. Sections of the discipline**

Sections of the discipline studied in the 3rd semester

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Contact work of students | | | | |
| Total | classroom  Job | | | Outside  Job |
| L | PZ | LZ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Subject and tasks of biochemistry. Chemical composition of organisms |  | 2 |  | 4 | 5 |
| 2 | Amino acids. Squirrels |  | 2 |  | 4 | 5 |
| 3 | Vitamins. Enzymes |  | 2 |  | 4 | 5 |
| 4 | Carbohydrates |  | 2 |  | 4 | 5 |
| 5 | Nucleic acids |  | 2 |  | 4 | 6 |
| 6 | Lipids |  | 2 |  | 4 | 6 |
| 7 | Hormones |  | 2 |  | - | 6 |
| 8 | Metabolism and energy |  | 4 |  | 8 | 6 |
| 1-8 | ex |  |  |  |  |  |

**4.4. Independent work of students**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of the topic of the discipline or section | Type of independent extracurricular work of students, incl. DAC | Estimator | Number of hours | Code  competent  tion(s) |
| 1 | 2 | 3 | 4 | 5 |
| Subject and tasks of biochemistry. Chemical composition of organisms | Preparing for testing | R, OR | 12 | OPK-5 |
| Amino acids. Squirrels. | Independent study of literature | R, T, OR | 12 | OPK-5 |
| Vitamins. Enzymes. | Writing the text of the report | R, T, OR | 12 | OPK-5 |
| Carbohydrates | Writing the text of the report | R, T, OR | 12 | OPK-5 |
| Nucleic acids | Preparing for testing | R, T, OR | 12 | OPK-5 |
| Lipids | Independent study of literature | R, T, OR | 12 | OPK-5 |
| Hormones | Independent study of literature | R, T, OR | 12 | OPK-5 |
| Metabolism and energy | Writing the text of the report | R, T, OR | 12 | OPK-5 |

**4.5. Laboratory studies**

Form of study OFO

|  |  |  |
| --- | --- | --- |
| section number | Name of laboratory work | Number of hours |
| 1 | 2 | 3 |
| 1 | 1. Chemical composition of living organisms | 4 |
| 2 | 1. Qualitative color reactions for functional groups of proteins and amino acids  2. Physicochemical properties of proteins  3. Determination of protein content by the biuret method  4. Control questions on the topic “proteins” | 4 |
| 3 | 1. Enzymatic hydrolysis of starch  2. Enzyme specificity  3. Influence of pH on the activity of salivary amylase  4. Effect of activators and inhibitors on salivary amylase  5. Control questions on the topic “enzymes” | 2 |
| 3 | 1. Water soluble vitamins  2. Fat-soluble vitamins.  3. Control questions on the topic “vitamins and coenzymes” | 2 |
| 4 | 1. Qualitative reactions to carbohydrates  2. Quantification of sugars in biological fluids  3. Control questions on the topic “carbohydrates” | 4 |
| 5 | 1. Isolation of ribonucleoproteins from yeast  2. Hydrolysis of yeast ribonucleoproteins and discovery of hydrolysis products.  3. Control questions on the topic “nucleic acids” | 4 |
| 6 | 1. Acylglycerols  2, Sterols, sterides  3.Phospholipids  4. Control questions on the topic “lipids” | 4 |
| 8 | 1. Carbohydrate exchange  2. Protein metabolism  3. Lipid metabolism | 8 |

**CORRESPONDENCE FORM OF TRAINING**

**4.3. Sections of the discipline**

Sections of the discipline studied in the 4th semester

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Contact work of students | | | | |
| Total | classroom  Job | | | Outside  Job |
| L | PZ | LZ |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Subject and tasks of biochemistry. Chemical composition of organisms |  | 2 |  | 2 | 4 |
| 2 | Amino acids. Squirrels |  | 2 |  | 2 | 4 |
| 3 | Vitamins. Enzymes |  | 2 |  | 4 | 4 |
| 4 | Carbohydrates |  | 2 |  | 2 | 6 |
| 5 | Nucleic acids |  | 2 |  | 2 | 6 |
| 6 | Lipids |  | 2 |  | 2 | 6 |
| 7 | Hormones |  | 2 |  | - | 6 |
| 8 | Metabolism and energy |  | 3 |  | 3 | 6 |
| 1-8 | ex |  |  |  |  |  |

**4.4. Independent work of students**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of the topic of the discipline or section | Type of independent extracurricular work of students, incl. DAC | Estimator | Number of hours | Code  competent  tion(s) |
| 1 | 2 | 3 | 4 | 5 |
| Subject and tasks of biochemistry. Chemical composition of organisms | Preparing for testing | R, UO | 12 | OPK-5 |
| Amino acids. Squirrels. | Independent study of literature | R, T, UO | 14 | OPK-5 |
| Vitamins. Enzymes. | Writing the text of the report | R, T, UO | 14 | OPK-5 |
| Carbohydrates | Writing the text of the report | R, T, UO | 14 | OPK-5 |
| Nucleic acids | Preparing for testing | R, T, UO | 14 | OPK-5 |
| Lipids | Independent study of literature | R, T, UO | 14 | OPK-5 |
| Hormones | Independent study of literature | R, T, UO | 14 | OPK-5 |
| Metabolism and energy | Writing the text of the report | R, T, UO | 14 | OPK-5 |

**4.5. Laboratory studies**

Form of study OFO

|  |  |  |
| --- | --- | --- |
| section number | Name of laboratory work | Number of hours |
| 1 | 2 | 3 |
| 1 | 1. Chemical composition of living organisms | 2 |
| 2 | 1. Qualitative color reactions for functional groups of proteins and amino acids  2. Physicochemical properties of proteins  3. Determination of protein content by the biuret method  4. Control questions on the topic “proteins” | 2 |
| 3 | 1. Enzymatic hydrolysis of starch  2. Enzyme specificity  3. Influence of pH on the activity of salivary amylase  4. Effect of activators and inhibitors on salivary amylase  5. Control questions on the topic “enzymes” | 2 |
| 3 | 1. Water soluble vitamins  2. Fat-soluble vitamins.  3. Control questions on the topic “vitamins and coenzymes” | 2 |
| 4 | 1. Qualitative reactions to carbohydrates  2. Quantification of sugars in biological fluids  3. Control questions on the topic “carbohydrates” | 2 |
| 5 | 1. Isolation of ribonucleoproteins from yeast  2. Hydrolysis of yeast ribonucleoproteins and discovery of hydrolysis products.  3. Control questions on the topic “nucleic acids” | 2 |
| 6 | 1. Acylglycerols  2, Sterols, sterides  3.Phospholipids  4. Control questions on the topic “lipids” | 2 |
| 8 | 1. Carbohydrate exchange  2. Protein metabolism  3. Lipid metabolism | 3 |

**4.6. Practical classes (seminars)**

Not included in the curriculum

**4.7. Course project (term paper)**

Not included in the curriculum

**MODULE 2. MOLECULAR BIOLOGY**

**4.1. Structure of the discipline**

The total labor intensity of the module for full-time and part-time education - 4 credits (module 2. Molecular biology)

|  |  |  |
| --- | --- | --- |
| Form of work of students / Types of training sessions | Labor intensity, hours | |
| full-time | Part-time |
| 4th semester | 5th semester |
| Contact classroom work of students with the teacher: | 54 | thirty |
| Lectures (L) | 18 | 15 |
| Practical exercises (PZ) |  |  |
| Laboratory studies (LZ) | 36 | 15 |
| Independent work (SIW): |  |  |
| Course project (CP), course work (CR) |  |  |
| Settlement and graphic task (RGZ) |  |  |
| Abstract (R) |  |  |
| Essay (E) |  |  |
| Independent study of sections | 45 | 78 |
| Control work (K) |  |  |
| Intermediate certification | Test /45/ | Test/36/ |

Testing and crediting with assessment for full-time and part-time forms of education is carried out within the framework of seminar-type classes, hours are not allocated in the curriculum. The hours allocated for intermediate certification in the “control” column of the curriculum include: contact classroom work (its volume is established by the order “On the standards for calculating the volume of the annual workload of the teaching staff for the HE program”) and independent work.

**4.2. The content of the sections of the discipline**

|  |  |
| --- | --- |
| section number | Section name |
| 1 | 2 | 4 |
| 1 | Subject and methodology of molecular biology. | History of development of molecular biology. Features of living systems and levels of their organization. Features of applying a systematic approach to understanding the principles of functioning of living systems. Molecular bases of the organization and functioning of living systems. Principles of reductionism, holism and integratism in molecular biology. Research methods in molecular biology. Using the achievements of physicochemical analysis, analytical biochemistry, structural biology, mathematical modeling and computational biology to solve problems in molecular biology. |
| 2 | Molecular Biology of the Cell and Cell Biology | Concepts, definitions, subject and tasks of cell molecular biology. Structural molecular biology of the cell and molecular biology of cellular functions. The process of existence of living systems as a system of coordinated performance of functions leading to the achievement of a certain ultimate goal. The concept of molecular mechanisms of cellular functions. Molecular machines as a structural basis for the functioning of the cell. Cell structure from the point of view of molecular biology. Basic principles of the structural and functional organization of the cell at the molecular level |
| 3 | Molecular biology of the gene  Molecular bioenergy  cytoskeleton  Molecular mechanisms of cell reproduction and regulation of its life time | Structure of nucleic acids. Structure of DNA. RNA structure. RNA types. DNA packaging in chromosomes. Structure and organization of genes and genomes of pro- and eukaryotes. The structure of prokaryotic genes.. The structure of eukaryotic genes.  Organization of the prokaryotic genome. Features of the organization of prokaryotic genes.  eukaryotic genome. Mobile genetic elements. CR, PR, SR of inherited elements. Replisome as a molecular machine.  The paradox of stable variability as the basis for the development of living nature. The need for a balance between constancy and variability of the genome. Mutation process from the point of view of molecular biology. Random and purposeful variability. Causes of damage to the DNA structure by external factors. Repair as a set of measures to eliminate accidental damage to the genome. Directed modification of the cell's genetic information. Recombination in genome modification. Modification of the genome by invasion of foreign hereditary information. Retrotransposons. Movable (mobile) elements of the genome as the main element of the system of purposeful variability.  Realization of the genotype into the phenotype. Realization of the genotype into the phenotype. Types of cells in the human body. Molecular mechanisms of formation of phenotypic differences in cells with the same genotype. cell differentiation. Special ways of realizing the genotype during cell differentiation. Somatic recombination as a mechanism for the implementation of functional polymorphism in B lymphocytes. The sequence of molecular events during the implementation of the genotype: transcription, RNA maturation, translation, protein maturation. Sorting and post-translational modification of proteins. molecular chaperones. The role of the rough endoplasmic reticulum in protein processing. The relationship of the phenotype with a specific profile of gene expression. Dynamic nature of the gene expression profile. Cell homeostasis. Gene expression and adaptation.  Cell enantiostasis. 'DNA-array' analysis. Genomics, proteomics and metabolonomics. |
| Molecular mechanisms of cellular energy. Energy metabolism as a result of the coordinated work of macromolecular machines of the oxidative phosphorylation system and the general path of catabolism. Mitochondria as a single supramolecular machine. The special role of mitochondria in the energy of animal cells.  Bioenergetics of plant cells. Molecular mechanisms of photophosphorylation and photosynthesis. Molecular mechanisms of regulation of consumption and formation of energy in the cell.  Molecular mechanisms of intracellular transport. Intracellular transport of substances and particles. Molecular transport. Vesicular intracellular transport system. Golgi apparatus and various types of intracellular vesicles. Energy dependence of vesicular transport. The role of axonal transport in the functioning of the human nervous system. |
| Structural organization and functions of the cytoskeleton. Trabecular network of the cell. KR, SR  Proteins are the main components of the cytoskeleton. The role of covalent modifications of cytoskeletal proteins. Architecture of the cytoskeleton in different cell types. Intracellular regulation of the functional activity of the cytoskeleton. Molecular mechanisms of regulation of the shape, volume and movement of the cell. Interaction of the cytoskeleton with the plasma membrane and extracellular matrix. The role of the cytoskeleton in intracellular transport. Interrelation of cytoskeletal functions with gene expression. |
| cell reproduction. Molecular mechanisms of proliferation. Cell cycle and its regulation. The role of the cytoskeleton in the processes of cell division. regulation of cell division. Proliferation of eukaryotic cells and telomeric divisions of chromosomes. Telomeres, telosomes and telomerase. Telomerase and aging. Hayflick effect. regulation of the cell cycle. Redox homeostasis and the cell cycle. Cell control over the passage of the cell cycle. Mechanisms of regulation of the cell cycle as a target for therapeutic effects.  regulation of cell life. Possible ways of cell death. Necrosis and apoptosis (programmed death). Energy dependence of apoptosis. Causes of apoptosis. Apoptosis as a defense mechanism. Molecular mechanisms of induction, development, regulation and cancellation of apoptosis. Transition to apoptosis from different stages of the cell cycle. Secondary (postapoptotic) necrosis. Significance of the phenomenon of apoptosis for practical medicine. |
| 4 | Molecular mechanisms of intercellular signaling and integration  Molecular  cancer biology  Molecular Clinical  diagnostics | Integration of a cell into a multicellular organism. The balance between the independence of a single cell and the control of its development and functioning by the body. Mechanisms of intercellular communication. molecular reception. Multi-stage systems of signal transmission into cells and the multiplicity of points of regulation. Mutual regulation of the functional activity of various signal transmission systems. Antagonism and synergy of external influences.  Modulation of the processes of regulation of the cell cycle, differentiation and apoptosis of cells by external signals. tissue homeostasis. Adhesive interactions of cells. adhesive membrane proteins. The role of cell adhesion in physiological and pathological processes. The role of the intercellular matrix in intercellular integration and communication. Concepts of tissue and organismal enantiostasis. The law of deviation of homeostasis. Mechanisms for maintaining enantiostasis as a target for therapeutic action. |
| Molecular biology of cancer. The concept of transformed and tumor cells. Causes of carcinogenesis. Molecular mechanisms of tumor transformation. Cell genetic theories of oncogenesis. Concept  Theory of autocrine regulation. Complementation of oncogenes. Immortalization and tumor promotion. tumor suppressors. Theory of cell cycle dysregulation and apoptosis. The concept of a carcinogenic profile. Intercellular cooperation and tumor transformation. Tissue theory of oncogenesis. Molecular basis of tumor cell metastasis. Possibilities of stimulation of tumor cell differentiation and reversal of tumor phenotype. Molecular markers of tumors |
| Molecular clinical diagnostics. Genotyping and phenotyping of intact cells and cell extracts. Hybridization of nucleic acids. Polymerase chain reaction in the diagnosis of diseases. The two main components of PCR analysis are amplification and detection. Methods for detecting amplification products. Real-time PCR and in situ PCR in intact cells.  Molecular diagnosis of hereditary diseases. Human Genome Project. Methods for identifying genomic damage in hereditary pathologies. Application of genomics, proteomics and bioinformatics methods in the development of new drugs. |
| 5 | Fundamentals of genetic engineering.  Subject and methodology of molecular biology. | Molecular biological principles of recombinant DNA technology. Enzymes of genetic engineering. Sources and specificity of restrictases. Vectors for the transfer of altered genetic material. Artificial change in the structure of genes and genomes. Site-specific mutagenesis. The use of DNA cloning technology in genetic engineering. Transgenic and hybrid cells and organisms. Genetic engineering and medicine. Principles of gene therapy. Technology for obtaining and cultivating animal and plant cell lines. transgenic cell lines. Preparation of biologically active substances in cell cultures. Pharmacobiotechnology. The value of cell engineering for experimental and clinical medicine. |
| History of development of molecular biology. Features of living systems and levels of their organization. Features of applying a systematic approach to understanding the principles of functioning of living systems. Molecular bases of the organization and functioning of living systems. Principles of reductionism, holism and integratism in molecular biology. Research methods in molecular biology. Using the achievements of physicochemical analysis, analytical biochemistry, structural biology, mathematical modeling and computational biology to solve problems in molecular biology. |
| 6 | Molecular Biology of the Cell and Cell Biology  Molecular biology of the gene | Concepts, definitions, subject and tasks of cell molecular biology. Structural molecular biology of the cell and molecular biology of cellular functions. The process of existence of living systems as a system of coordinated performance of functions leading to the achievement of a certain ultimate goal. The concept of molecular mechanisms of cellular functions. Molecular machines as a structural basis for the functioning of the cell. Cell structure from the point of view of molecular biology. Basic principles of the structural and functional organization of the cell at the molecular level |
| Structure of nucleic acids. Structure of DNA. RNA structure. RNA types. DNA packaging in chromosomes. Structure and organization of genes and genomes of pro- and eukaryotes. The structure of prokaryotic genes.. The structure of eukaryotic genes.  Organization of the prokaryotic genome. Features of the organization of prokaryotic genes.  eukaryotic genome. Mobile genetic elements. CR, PR, SR of inherited elements. Replisome as a molecular machine.  The paradox of stable variability as the basis for the development of living nature. The need for a balance between constancy and variability of the genome. Mutation process from the point of view of molecular biology. Random and purposeful variability. Causes of damage to the DNA structure by external factors. Repair as a set of measures to eliminate accidental damage to the genome. Directed modification of the cell's genetic information. Recombination in genome modification. Modification of the genome by invasion of foreign hereditary information. Retrotransposons. Movable (mobile) elements of the genome as the main element of the system of purposeful variability.  Realization of the genotype into the phenotype. Realization of the genotype into the phenotype. Types of cells in the human body. Molecular mechanisms of formation of phenotypic differences in cells with the same genotype. cell differentiation. Special ways of realizing the genotype during cell differentiation. Somatic recombination as a mechanism for the implementation of functional polymorphism in B lymphocytes. The sequence of molecular events during the implementation of the genotype: transcription, RNA maturation, translation, protein maturation. Sorting and post-translational modification of proteins. molecular chaperones. The role of the rough endoplasmic reticulum in protein processing. The relationship of the phenotype with a specific profile of gene expression. Dynamic nature of the gene expression profile. Cell homeostasis. Gene expression and adaptation.  Cell enantiostasis. 'DNA-array' analysis. Genomics, proteomics and metabolonomics. |
| 7 | Molecular bioenergy | Molecular mechanisms of cellular energy. Energy metabolism as a result of the coordinated work of macromolecular machines of the oxidative phosphorylation system and the general path of catabolism. Mitochondria as a single supramolecular machine. The special role of mitochondria in the energy of animal cells.  Bioenergetics of plant cells. Molecular mechanisms of photophosphorylation and photosynthesis. Molecular mechanisms of regulation of consumption and formation of energy in the cell.  Molecular mechanisms of intracellular transport. Intracellular transport of substances and particles. Molecular transport. Vesicular intracellular transport system. Golgi apparatus and various types of intracellular vesicles. Energy dependence of vesicular transport. The role of axonal transport in the functioning of the human nervous system. |
| 8 | cytoskeleton  Molecular mechanisms of cell reproduction and regulation of its life time | Structural organization and functions of the cytoskeleton. Trabecular network of the cell. KR, SR  Proteins are the main components of the cytoskeleton. The role of covalent modifications of cytoskeletal proteins. Architecture of the cytoskeleton in different cell types. Intracellular regulation of the functional activity of the cytoskeleton. Molecular mechanisms of regulation of the shape, volume and movement of the cell. Interaction of the cytoskeleton with the plasma membrane and extracellular matrix. The role of the cytoskeleton in intracellular transport. Interrelation of cytoskeletal functions with gene expression. |
| cell reproduction. Molecular mechanisms of proliferation. Cell cycle and its regulation. The role of the cytoskeleton in the processes of cell division. regulation of cell division. Proliferation of eukaryotic cells and telomeric divisions of chromosomes. Telomeres, telosomes and telomerase. Telomerase and aging. Hayflick effect. regulation of the cell cycle. Redox homeostasis and the cell cycle. Cell control over the passage of the cell cycle. Mechanisms of regulation of the cell cycle as a target for therapeutic effects.  regulation of cell life. Possible ways of cell death. Necrosis and apoptosis (programmed death). Energy dependence of apoptosis. Causes of apoptosis. Apoptosis as a defense mechanism. Molecular mechanisms of induction, development, regulation and cancellation of apoptosis. Transition to apoptosis from different stages of the cell cycle. Secondary (postapoptotic) necrosis. Significance of the phenomenon of apoptosis for practical medicine. |
| 9 | Molecular mechanisms of intercellular signaling and integration  Molecular  cancer biology  Molecular Clinical  diagnostics | Integration of a cell into a multicellular organism. The balance between the independence of a single cell and the control of its development and functioning by the body. Mechanisms of intercellular communication. molecular reception. Multi-stage systems of signal transmission into cells and the multiplicity of points of regulation. Mutual regulation of the functional activity of various signal transmission systems. Antagonism and synergy of external influences.  Modulation of the processes of regulation of the cell cycle, differentiation and apoptosis of cells by external signals. tissue homeostasis. Adhesive interactions of cells. adhesive membrane proteins. The role of cell adhesion in physiological and pathological processes. The role of the intercellular matrix in intercellular integration and communication. Concepts of tissue and organismal enantiostasis. The law of deviation of homeostasis. Mechanisms for maintaining enantiostasis as a target for therapeutic action. |
| Molecular biology of cancer. The concept of transformed and tumor cells. Causes of carcinogenesis. Molecular mechanisms of tumor transformation. Cell genetic theories of oncogenesis. Concept  Theory of autocrine regulation. Complementation of oncogenes. Immortalization and tumor promotion. tumor suppressors. Theory of cell cycle dysregulation and apoptosis. The concept of a carcinogenic profile. Intercellular cooperation and tumor transformation. Tissue theory of oncogenesis. Molecular basis of tumor cell metastasis. Possibilities of stimulation of tumor cell differentiation and reversal of tumor phenotype. Molecular markers of tumors |
| Molecular clinical diagnostics. Genotyping and phenotyping of intact cells and cell extracts. Hybridization of nucleic acids. Polymerase chain reaction in the diagnosis of diseases. The two main components of PCR analysis are amplification and detection. Methods for detecting amplification products. Real-time PCR and in situ PCR in intact cells.  Molecular diagnosis of hereditary diseases. Human Genome Project. Methods for identifying genomic damage in hereditary pathologies. Application of genomics, proteomics and bioinformatics methods in the development of new drugs. |
| 10 | Fundamentals of genetic engineering. | Molecular biological principles of recombinant DNA technology. Enzymes of genetic engineering. Sources and specificity of restrictases. Vectors for the transfer of altered genetic material. Artificial change in the structure of genes and genomes. Site-specific mutagenesis. The use of DNA cloning technology in genetic engineering. Transgenic and hybrid cells and organisms. Genetic engineering and medicine. Principles of gene therapy. Technology for obtaining and cultivating animal and plant cell lines. transgenic cell lines. Preparation of biologically active substances in cell cultures. Pharmacobiotechnology. The value of cell engineering for experimental and clinical medicine. |

**FULL-TIME EDUCATION**

**4.3. Sections of the discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Contact work of students | | | | |
| Total | classroom  Job | | | Outside  Job  SR |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | The history of the formation of biochemistry as a science Methods of biochemical blood tests |  | 2 | - |  | 5 |
| 2 | Physico-chemical properties of blood |  | 2 | 4 |  | 5 |
| 3 | Plasma proteins |  | 2 | 4 |  | 5 |
| 4 | Enzymes |  | 2 | 4 |  | 5 |
| 5 | Carbohydrates and blood glycoproteins |  | 2 | 4 |  | 5 |
| 6 | blood lipids |  | 2 | 4 |  | 5 |
| 7 | pigment exchange |  | 2 | 4 |  | 5 |
| 8 | vitamins |  | 2 | 4 |  | 5 |
| 9 | electrolytes |  | 1 | 4 |  | 5 |
| 10 | Viruses |  | 1 | 4 |  | - |
| 1-10 | offset |  |  |  |  |  |
| TOTAL: | |  |  |  |  |  |

**4.4. Independent work of students**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Name of the topic of the discipline or section | Type of independent extracurricular work of students, incl. DAC | Estimator | Number of hours | Code  competence(s) |
|  | 1 | 2 | 3 | 4 | 5 |
| 1 | Subject and methodology of molecular biology | Essay writing | Topics and requirements for  abstract structure | 5 | OPK |
| DAC |
| 2, 4, 5, 10 | 2. Molecular biology of the cell and cell biology.  4. Molecular bioenergetics.  5. Cytoskeleton.  10.Fundamentals of genetic engineering. | Preparing for the Interrogation and Decision of the SZ | List of questions  Methodological materials for solving problems | 20 | OPK |
| DAC |
| 3, 6, 7-9 | 3.Molecular biology of the gene.  6. Molecular mechanisms of cell reproduction and regulation of its life time.  7. Molecular mechanisms of intercellular signaling and integration.  8.Molecular  biology of cancer.  9.Molecular clinical diagnostics. | Preparing for testing | Test tasks | 20 | OPK |
| DAC |
| TOTAL HOURS | | | |  |  |

**4.5. Laboratory studies**

|  |  |  |  |
| --- | --- | --- | --- |
| No. LR | section number | Name of laboratory work | Number of hours |
| 1 | 2 | 3 | 4 |
| 1 | 2 | Determination of the total content of nucleic acids in biological material by phosphorus | 4 |
| 2 | 3 | Determination of DNA concentration in plasma by fluorescence spectrophotometry | 4 |
| 3 | 4 | Quantification of protein in biological fluid | 4 |
| 4 | 5 | Isolation of chromosomal DNA from lymphocytes | 4 |
| 5 | 6 | Isolation of proteins from muscle tissue | 4 |
| 6 | 7 | Determination of protein structure and molecular weight by SDS-PAGE electrophoresis | 4 |
| 7 | 9 | Fluorometric determination method  endonuclease activity | 6 |
| 8 | 10 | Determination of the level of antibodies to nDNA in serum. | 6 |
|  |  | Analysis of current performance |  |
| TOTAL: | | |  |

**4.6. Practical (seminar) classes**

Not included in the curriculum

**4.7. Course project (term paper)**

Not included in the curriculum

**CORRESPONDENCE FORM OF TRAINING**

**4.3. Sections of the discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Contact work of students | | | | |
| Total | classroom  Job | | | Outside  Job  SR |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Subject and methodology of molecular biology. |  | 1 |  |  | 8 |
| 2 | Molecular Biology of the Cell and Cell Biology |  | 2 |  | 2 | 8 |
| 3 | Molecular biology of the gene |  | 2 |  | 2 | 8 |
| 4 | Molecular bioenergy |  | 2 |  | 2 | 8 |
| 5 | cytoskeleton |  | 2 |  | 2 | 8 |
| 6 | Molecular mechanisms of cell reproduction and regulation of its life time |  |  |  | 2 | 8 |
| 7 | Molecular mechanisms of intercellular signaling and integration |  | 2 |  | 2 | 8 |
| 8 | Molecular  cancer biology |  | 2 |  | 2 | 8 |
| 9 | Molecular Clinical Diagnostics |  | 1 |  | 1 | 8 |
| 10 | Fundamentals of genetic engineering |  | 1 |  | 3 | 6 |
| 1-10 | offset |  |  |  |  |  |
| TOTAL: | | 144 | 15 |  | 15 | 78 |

**4.4. Independent work of students**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Name of the topic of the discipline or section | Type of independent extracurricular work of students, incl. DAC | Estimator | Number of hours | Code  competence(s) |
|  | 1 | 2 | 3 | 4 | 5 |
| 1 | Subject and methodology of molecular biology | Essay writing | Topics and requirements for  abstract structure |  | OPK |
| DAC |
| 2, 4, 5, 10 | 2. Molecular biology of the cell and cell biology.  4. Molecular bioenergetics.  5. Cytoskeleton.  10.Fundamentals of genetic engineering. | Preparing for the Interrogation and Decision of the SZ | List of questions  Methodological materials for solving problems |  | OPK |
| DAC |
| 3, 6, 7-9 | 3.Molecular biology of the gene.  6. Molecular mechanisms of cell reproduction and regulation of its life time.  7. Molecular mechanisms of intercellular signaling and integration.  8.Molecular  biology of cancer.  9.Molecular clinical diagnostics. | Preparing for testing | Test tasks |  | OPK |
| DAC |
| TOTAL HOURS | | | |  |  |

**4.5. Laboratory studies**

|  |  |  |  |
| --- | --- | --- | --- |
| No. LR | section number | Name of laboratory work | Number of hours |
| 1 | 2 | 3 | 4 |
| 1 | 2 | Determination of the total content of nucleic acids in biological material by phosphorus |  |
| 2 | 3 | Determination of DNA concentration in plasma by fluorescence spectrophotometry |  |
| 3 | 4 | Quantification of protein in biological fluid |  |
| 4 | 5 | Isolation of chromosomal DNA from lymphocytes |  |
| 5 | 6 | Isolation of proteins from muscle tissue |  |
| 6 | 7 | Determination of protein structure and molecular weight by SDS-PAGE electrophoresis |  |
| 7 | 9 | Fluorometric determination method  endonuclease activity |  |
| 8 | 10 | Determination of the level of antibodies to nDNA in serum. |  |
|  |  | Analysis of current performance |  |
| TOTAL: | | |  |

**4.6. Practical (seminar) classes**

Not included in the curriculum

**4.7. Course project (term paper)**

Not included in the curriculum

**5. LIST OF EDUCATIONAL AND METHODOLOGICAL SUPPORT FOR INDEPENDENT WORK OF STUDENTS IN THE DISCIPLINE**

In the discipline "Biochemistry and Molecular Biology" a set of educational and methodological materials has been developed in printed and electronic form, which performs teaching, information, reference and control functions and provides, among other things, the organization of students' independent work. The complex includes the following educational and methodological materials: guidelines for independent work of students, a short course of lectures (in electronic form), test tasks, individual tasks.

Support for independent work:

1. [Full-text database of dissertations of the RSL](http://weblib.samsu.ru/level23.html#14)
2. [RFBR Scientific Electronic Library (Elibrary)](http://weblib.samsu.ru/level23.html#18)
3. Electronic databases on physiology PubMed and Medline
4. [DB publishing house ELSEVIER](http://weblib.samsu.ru/level23.html#22)
5. [Oxford University Press](http://weblib.samsu.ru/level23.html#27)
6. Magazines NATURE PG
7. Abstract journal VINITI "Biology"
8. [University Library ONLINE](http://weblib.samsu.ru/level23.html#28)
9. [University Information System Russia](http://weblib.samsu.ru/level23.html#29)

**6. LIST OF BASIC AND ADDITIONAL LITERATURE REQUIRED FOR MASTERING THE DISCIPLINE**

**6.1. Main literature**

1. Poleva N.V. Biochemistry: textbook. allowance / N.V. Polev. – Krasnoyarsk KSPU im. V.P. Astafieva, 2009. - 316 p.
2. Proskurina I.K. Biochemistry: Proc. Allowance for students of higher education. Proc. Institutions. - Publishing house VDADOS-PRESS, 2001. - 240 p.
3. Kutuzova N.M., Filippovich Yu.B., Konichev A.S. Biochemical foundations of human life - uch. allowance for universities - "Vlados" - 2005.
4. Menshikov V.V. Biochemistry M. 1986
5. Mikhailov S.S. Sports biochemistry. Textbook for universities and colleges of physical culture. - 5th ed., additional .. - M .: Soviet sport 2009. - 384 p.
6. Volkov N.I., Nein E.N., Osipenko A.A., Korsun S.N. Biochemistry of Muscular Activity -2000
7. Alberts D. et al. Molecular biology of the cell. M.: Mir, 1994
8. Dzhambetova P.M. Reutova N.V. Molecular biology, course of lectures. Grozny, 2011 Llewyn B. Genes. M.: Mir. 1987
9. Molecular biology. Structure and Biosynthesis of Nucleic Acids, Ed. Spirina A.S.. M.: Higher School, 1986
10. Singer M., Berg P. Genes and genomes. M.: Mir, 1998
11. Spirin A.S. Molecular biology. protein biosynthesis. Moscow: Higher School, 1984
12. Stepanov V.M. Molecular biology. Structure and functions of proteins. Moscow: Higher School, 1996
13. Watson D. Molecular biology of the gene. M.: Mir, 1980
14. Schultz G., Schirmer R. Principles of the structural organization of proteins. M.: Mir, 1983

**6.2. additional literature**

1. Artemova E.K. Biochemistry. Textbook for independent work of students of institutes of physical culture - F and C - 2006.
2. Biochemical foundations of human life: textbook / Yu.B. Filipovich [i dr.]. M.: VLADOS, 2005. - 407 p.
3. Komov V.P. Biochemistry: Proc. for universities / V.P. Komov, V.N. Shvedova. M.: Bustard, 2004. - 640 p.
4. Duson R., Eliot D. Biochemist's Handbook - M.: Mir, 1991.
5. Alberts D. et al. Molecular biology of the cell. M.: Mir, 1994
6. Dzhambetova P.M. Reutova N.V. Molecular biology, course of lectures. Grozny, 2011
7. Lewin B. Genes. M.: Mir. 1987
8. Molecular biology. Structure and Biosynthesis of Nucleic Acids, Ed. Spirina A.S.. M.: Higher School, 1986
9. Singer M., Berg P. Genes and genomes. M.: Mir, 1998
10. Spirin A.S. Molecular biology. protein biosynthesis. Moscow: Higher School, 1984
11. Stepanov V.M. Molecular biology. Structure and functions of proteins. Moscow: Higher School, 1996
12. Watson D. Molecular biology of the gene. M.: Mir, 1980

6.3 Periodicals

1. "Biological membranes"
2. "Biochemistry", "Biophysics", "Biotechnology"
3. "Proceedings of the Russian Academy of Sciences. Biological Series»
4. "Microbiology, epidemiology, immunology",
5. "Molecular biology",
6. "Applied Biochemistry and Microbiology".

**7. LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" (hereinafter referred to as the "INTERNET" NETWORK) NECESSARY FOR MASTERING THE DISCIPLINE**

Internet resources

* Electronic library system "IPRbooks"http://www.iprbookshop.ru/
* <file://localhost/F:/internet-resursy-po-fiziologii%20%201111.htm>
* Internet Resources for Physiology
* <http://biobsu.org/phha/index.htm>
* Educational site in physiology.
* <http://www.iqlib.ru>**-**Electronic library of educational and scientific publications.
* <http://www.cir.ru>– University information system of Russia.
* www.osp.mesi.ru - website of the MESI educational process

**8. METHODOLOGICAL INSTRUCTIONS FOR STUDENTS ON MASTERING THE DISCIPLINE**

***Lecture****.*The main task of the student at the lecture is to learn to think, to understand the ideas presented by the lecturer. Lectures must take notes. Taking notes creates favorable conditions for remembering what you hear, since auditory, visual and motor memory take part in this process. But an indispensable condition conducive to memorization is the student's understanding of the material being presented. For all unclear questions, please contact the lecturer for advice. The abstract should be kept in a separate notebook for each academic discipline, leaving wide margins so that you can supplement the abstract with extracts from textbooks and other books. It should be written large, legible, highlighting topics and dividing the text into semantic parts with subheadings. You should learn to write at a speed of at least 120 letters per minute. You can use word abbreviations, abbreviations and symbols, for example, > - more; <- less; That. - thus, etc.; each student can create their own system of abbreviations in relation to the discipline being studied. Keeping notes should be an interesting job, and the appearance of the notes should be satisfying.

Before each new lecture, it is recommended to read the summary of the previous lecture, and after the lecturer finishes reading any major section of the course, you should work it out both from the summary and from the textbook. In this case, the academic discipline is absorbed so deeply that before the exam, there is only a little left to do to consolidate knowledge. When attending lectures, each student must remember that the lecturer does not inform about all the characteristics of the subject of the lecture, he gives the logic of obtaining knowledge, formulating concepts, reveals the main contradictions and questions, the answers to which the student will seek already within the framework of his own independent work.

***Laboratory work****.*Practical classes are conducted in the form of laboratory work, thematic video material is also shown.

Before visiting the laboratory, the student must study the theory of the question proposed for research, read the manual for the relevant work and prepare a protocol for the work, which includes:

- job title;

- preparation of tables (if necessary);

- calculation formulas (if necessary).

Reporting, if possible, should be carried out after the end of work in the laboratory.

To prepare for the defense of the report, it is necessary to analyze the results, compare them with known theoretical provisions or reference data, summarize the research results in the form of conclusions on the work, and prepare answers to the questions given in the guidelines for laboratory work.

A fully prepared and properly executed work is submitted for verification to the teacher who conducts practical classes in the discipline.

***Situational tasks****.*A situational task is a type of educational task that simulates situations that may arise in real life. The solution of situational problems is carried out in order to check the level of skills (possessions) of the student in solving a practical situational problem. The condition of the problem is announced to the student, the solution of which he sets out orally.

An effective interactive way to solve problems is to compare the results of solving one task by two or more small groups of students.

The main actions of students in working with a situational task are:

* preparation for the lesson;
* acquaintance with the criteria for assessing a situational task;
* clarification of the essence of the task and clarification of the algorithm for solving a situational problem;
* development of options for decision-making, selection of decision criteria, evaluation and forecast of options being sorted out;
* presentation of a solution to a situational problem (written or oral);
* receiving an assessment and its comprehension.

To successfully master the techniques for solving situational problems, three stages can be distinguished. At the first stage, it is necessary to familiarize students with the methodology for solving problems using printed publications on the methodology for solving problems, materials contained in databases, video lectures, and computer simulators. At this stage, the student is offered typical tasks, the solution of which allows him to work out the stereotypical techniques used in solving problems, to realize the connection between the theoretical knowledge gained and the specific problems that they can be aimed at solving.

For self-control at this stage, it is reasonable to use informal tests that not only state the correctness of the answer, but also provide detailed explanations if the wrong answer is chosen; in this case, tests perform not only a controlling, but also a learning function. To answer questions that arise, consultations are held with the teacher leading the course.

At the second stage, tasks of a creative nature are considered. In this case, the role of the teacher increases. Such classes not only form creative thinking, but also develop the skills of a business discussion of the problem, provide an opportunity to master the language of professional communication.

At the third stage, control work is performed to test the skills of solving situational problems.

***Test tasks****.*The test is a tool for assessing students' learning, consisting of a system of test tasks, a standardized procedure for conducting, processing and analyzing the results. The teacher must determine for students the initial data for preparing for testing: name the sections (topics, questions) for which there will be tasks in the test form and theoretical sources for preparation. Preparation involves the study of lecture material, the preparation of auxiliary schemes in workbooks for visual structuring of the material in order to simplify its memorization. Pay attention to the basic terminology, classification, distinctive features, the presence of appropriate links between individual processes. Testing time, usually at least 40 minutes.

***Test****.* The control work is carried out by students on the basis of independent study of the recommended literature, with the aim of systematizing, consolidating and expanding theoretical knowledge, developing the creative abilities of students, mastering the skills of independent work with literature, developing the ability to analyze and answer questions posed by the topic of work, draw conclusions based on the analysis. Works also involve students in research activities, play an important role in their professional training.

The most important requirements for control work as a study of a specific problem are:

* application of general and special methods of scientific research;
* the ability to work with literature, while showing a creative approach to the material being studied;
* a fairly high theoretical level;
* the ability to independently, consistently use the studied material.

The work must be written competently, clearly, legibly, with the selection of paragraphs. Usually it is prepared on a computer, in extreme cases it is carefully copied by hand on sheets of standard A4 format. The field on the left side must be at least 25 mm, on the right side - at least 5 mm, and at the top and bottom - 25 mm each. All pages are numbered centered at the top. The first page (title page) is not numbered. The work is drawn up in 14 font through 1.5 intervals.

On the title pagetest work are indicated: the name of the university, the direction of training, the study group, the course, the period of study, the number of the test work, the student's surname and initials, the surname and initials of the teacher who checks the work.

***Essay****.*An abstract (from Latin referre - to report, to report) is a brief, precise summary of the content of a scientific document, including basic factual information and conclusions, without additional interpretation or critical remarks of the author of the abstract. The purpose of the abstracting carried out by the student is to acquire valuable skills of independent literature search, processing, note-taking and analysis of sources, building the logic of presentation of the material, competent design of scientific work (links, footnotes, quotations, figures, tables, etc.).

The abstract, as a rule, should contain the following structural elements:

1. Title page;
2. Content;
3. Introduction;
4. Main part;
5. Conclusion;
6. List of sources used;
7. Applications (if necessary).

The approximate volume in typewritten pages of the components of the abstract is presented in the table.

Recommended volume of structural elements of the abstract

|  |  |
| --- | --- |
| Name of parts of the abstract | Number of pages |
| Title page | 1 |
| Content (indicating pages) | 1 |
| Introduction | 2 |
| Main part | 15-20 |
| Conclusion | 1-2 |
| List of sources used | 1-2 |
| Applications | No limits |

The content contains the names of the structural parts of the abstract, chapters and paragraphs of its main part, indicating the page number from which the corresponding part, chapter, paragraph begins.

The introduction gives a general description of the abstract:

* justifies the relevance of the chosen topic;
* the purpose of the work and the tasks to be solved to achieve it are determined;
* describes the object and subject of the study, the information base of the study;
* brief description of the structure of the abstract by chapters.

The main part should contain the material necessary to achieve the goal and tasks to be solved in the process of completing the abstract. It includes 2-3 chapters, each of which, in turn, is divided into 2-3 paragraphs. The content of the main part should exactly correspond to the theme of the project and fully disclose it. Chapters and paragraphs of the abstract should disclose the description of the solution of the tasks set in the introduction. Therefore, the headings of chapters and paragraphs, as a rule, should correspond in their essence to the wording of the tasks of the abstract. The heading "MAIN PART" in the content of the abstract should not be.

Mandatory for the abstract is the logical connection between the chapters and the consistent development of the main topic throughout the work, independent presentation of the material, reasoned conclusions. It is also obligatory to have references to the sources used in the main part of the abstract.

The presentation must be conducted in a third person (“The author believes ...”) or use impersonal constructions and indefinite personal sentences (“At the second stage, the following approaches are explored ...”, “The study made it possible to prove ...”, etc.) .

In the conclusion, the conclusions that the student came to as a result of the essay are logically sequentially stated. The conclusion should briefly characterize the solution of all the tasks set in the introduction and the achievement of the goal of the abstract.

The list of sources used is an integral part of the work and reflects the degree of study of the problem under consideration. The number of sources in the list is determined by the student independently, for the abstract their recommended number is from 10 to 20. At the same time, the list must contain sources published in the last 3 years.

The appendix should include auxiliary material that, when included in the main part of the work, clutters up the text (tables of auxiliary data, instructions, methods, forms of documents, etc.).

Applications should be designed as a continuation of the abstract on its subsequent pages.

Each application must start on a new page. At the top of the page on the right is the word "Appendix" and its number. The application must have a title that is centered on the page on a separate line and printed in capital letters.

Applications should be numbered sequentially with Arabic numerals.

All applications in the text of the work should be referenced. Appendices should be arranged in the order in which references to them appear in the text.

Design Requirements

When performing extracurricular independent work in the form of an abstract, the following requirements must be observed:

* printing on one side of A-4 white paper
* font-size-14; Times New Roman, color - black
* line spacing - 1.5
* margins on the page - the size of the left margin is 2.5 cm, the right margin is 1.5 cm, the top margin is 1.5 cm, the bottom margin is 2 cm.
* formatted to the width of the sheet.

***offset****.*The test is a form of intermediate control of knowledge and one of the components of the overall assessment of knowledge in the discipline. Preparation for the test should go according to a strictly thought-out schedule, with a consistent transition from topic to topic, from section to section, without skipping and jumping from the beginning of the course to the end. Questions that may appear in the process of preparing for the exam must be written down and answered by the teacher during the consultation. The main task of preparing a student for the test should be considered the systematization of knowledge of educational material, its creative comprehension. When preparing, it is necessary to focus on lecture notes, recommended literature and resources of the Internet information and telecommunication network.

***Exam****.*The exam is a form of intermediate knowledge control and one of the components of the overall assessment of knowledge in the discipline. Preparation for the exam should follow a strictly thought-out schedule, with a consistent transition from topic to topic, from section to section, without skipping and jumping from the beginning of the course to the end. Questions that may appear in the process of preparing for the exam must be written down and answered by the teacher during the pre-exam consultation. The main task of preparing a student for the exam should be considered the systematization of knowledge of educational material, its creative comprehension. When preparing, it is necessary to focus on lecture notes, recommended literature and resources of the information and telecommunication network "Internet"

**8. METHODOLOGICAL INSTRUCTIONS FOR STUDENTS ON MASTERING THE DISCIPLINE**

***Lecture****.*The main task of the student at the lecture is to learn to think, to understand the ideas presented by the lecturer. Lectures must take notes. Taking notes creates favorable conditions for remembering what you hear, since auditory, visual and motor memory take part in this process. But an indispensable condition conducive to memorization is the student's understanding of the material being presented. For all unclear questions, please contact the lecturer for advice. The abstract should be kept in a separate notebook for each academic discipline, leaving wide margins so that you can supplement the abstract with extracts from textbooks and other books. It should be written large, legible, highlighting topics and dividing the text into semantic parts with subheadings. You should learn to write at a speed of at least 120 letters per minute. You can use word abbreviations, abbreviations and symbols, for example, > - more; <- less; That. - thus, etc.; each student can create their own system of abbreviations in relation to the discipline being studied. Keeping notes should be an interesting job, and the appearance of the notes should be satisfying.

Before each new lecture, it is recommended to read the summary of the previous lecture, and after the lecturer finishes reading any major section of the course, you should work it out both from the summary and from the textbook. In this case, the academic discipline is absorbed so deeply that before the exam, there is only a little left to do to consolidate knowledge. When attending lectures, each student must remember that the lecturer does not inform about all the characteristics of the subject of the lecture, he gives the logic of obtaining knowledge, formulating concepts, reveals the main contradictions and questions, the answers to which the student will seek already within the framework of his own independent work.

***Laboratory work****.*Practical classes are conducted in the form of laboratory work, thematic video material is also shown.

Before visiting the laboratory, the student must study the theory of the question proposed for research, read the manual for the relevant work and prepare a protocol for the work, which includes:

- job title;

- preparation of tables (if necessary);

- calculation formulas (if necessary).

Reporting, if possible, should be carried out after the end of work in the laboratory.

To prepare for the defense of the report, it is necessary to analyze the results, compare them with known theoretical provisions or reference data, summarize the research results in the form of conclusions on the work, and prepare answers to the questions given in the guidelines for laboratory work.

A fully prepared and properly executed work is submitted for verification to the teacher who conducts practical classes in the discipline.

***Situational tasks****.*A situational task is a type of educational task that simulates situations that may arise in real life. The solution of situational problems is carried out in order to check the level of skills (possessions) of the student in solving a practical situational problem. The condition of the problem is announced to the student, the solution of which he sets out orally.

An effective interactive way to solve problems is to compare the results of solving one task by two or more small groups of students.

The main actions of students in working with a situational task are:

* preparation for the lesson;
* acquaintance with the criteria for assessing a situational task;
* clarification of the essence of the task and clarification of the algorithm for solving a situational problem;
* development of options for decision-making, selection of decision criteria, evaluation and forecast of options being sorted out;
* presentation of a solution to a situational problem (written or oral);
* receiving an assessment and its comprehension.

To successfully master the techniques for solving situational problems, three stages can be distinguished. At the first stage, it is necessary to familiarize students with the methodology for solving problems using printed publications on the methodology for solving problems, materials contained in databases, video lectures, and computer simulators. At this stage, the student is offered typical tasks, the solution of which allows him to work out the stereotypical techniques used in solving problems, to realize the connection between the theoretical knowledge gained and the specific problems that they can be aimed at solving.

For self-control at this stage, it is reasonable to use informal tests that not only state the correctness of the answer, but also provide detailed explanations if the wrong answer is chosen; in this case, tests perform not only a controlling, but also a learning function. To answer questions that arise, consultations are held with the teacher leading the course.

At the second stage, tasks of a creative nature are considered. In this case, the role of the teacher increases. Such classes not only form creative thinking, but also develop the skills of a business discussion of the problem, provide an opportunity to master the language of professional communication.

At the third stage, control work is performed to test the skills of solving situational problems.

***Test tasks****.*The test is a tool for assessing students' learning, consisting of a system of test tasks, a standardized procedure for conducting, processing and analyzing the results. The teacher must determine for students the initial data for preparing for testing: name the sections (topics, questions) for which there will be tasks in the test form and theoretical sources for preparation. Preparation involves the study of lecture material, the preparation of auxiliary schemes in workbooks for visual structuring of the material in order to simplify its memorization. Pay attention to the basic terminology, classification, distinctive features, the presence of appropriate links between individual processes. Testing time, usually at least 40 minutes.

***Test****.* The control work is carried out by students on the basis of independent study of the recommended literature, with the aim of systematizing, consolidating and expanding theoretical knowledge, developing the creative abilities of students, mastering the skills of independent work with literature, developing the ability to analyze and answer questions posed by the topic of work, draw conclusions based on the analysis. Works also involve students in research activities, play an important role in their professional training.

The most important requirements for control work as a study of a specific problem are:

* application of general and special methods of scientific research;
* the ability to work with literature, while showing a creative approach to the material being studied;
* a fairly high theoretical level;
* the ability to independently, consistently use the studied material.

The work must be written competently, clearly, legibly, with the selection of paragraphs. Usually it is prepared on a computer, in extreme cases it is carefully copied by hand on sheets of standard A4 format. The field on the left side must be at least 25 mm, on the right side - at least 5 mm, and at the top and bottom - 25 mm each. All pages are numbered centered at the top. The first page (title page) is not numbered. The work is drawn up in 14 font through 1.5 intervals.

On the title pagetest work are indicated: the name of the university, the direction of training, the study group, the course, the period of study, the number of the test work, the student's surname and initials, the surname and initials of the teacher who checks the work.

***Essay****.*An abstract (from Latin referre - to report, to report) is a brief, precise summary of the content of a scientific document, including basic factual information and conclusions, without additional interpretation or critical remarks of the author of the abstract. The purpose of the abstracting carried out by the student is to acquire valuable skills of independent literature search, processing, note-taking and analysis of sources, building the logic of presentation of the material, competent design of scientific work (links, footnotes, quotations, figures, tables, etc.).

The abstract, as a rule, should contain the following structural elements:

1. Title page;
2. Content;
3. Introduction;
4. Main part;
5. Conclusion;
6. List of sources used;
7. Applications (if necessary).

The approximate volume in typewritten pages of the components of the abstract is presented in the table.

Recommended volume of structural elements of the abstract

|  |  |
| --- | --- |
| Name of parts of the abstract | Number of pages |
| Title page | 1 |
| Content (indicating pages) | 1 |
| Introduction | 2 |
| Main part | 15-20 |
| Conclusion | 1-2 |
| List of sources used | 1-2 |
| Applications | No limits |

The content contains the names of the structural parts of the abstract, chapters and paragraphs of its main part, indicating the page number from which the corresponding part, chapter, paragraph begins.

The introduction gives a general description of the abstract:

* justifies the relevance of the chosen topic;
* the purpose of the work and the tasks to be solved to achieve it are determined;
* describes the object and subject of the study, the information base of the study;
* brief description of the structure of the abstract by chapters.

The main part should contain the material necessary to achieve the goal and tasks to be solved in the process of completing the abstract. It includes 2-3 chapters, each of which, in turn, is divided into 2-3 paragraphs. The content of the main part should exactly correspond to the theme of the project and fully disclose it. Chapters and paragraphs of the abstract should disclose the description of the solution of the tasks set in the introduction. Therefore, the headings of chapters and paragraphs, as a rule, should correspond in their essence to the wording of the tasks of the abstract. The heading "MAIN PART" in the content of the abstract should not be.

Mandatory for the abstract is the logical connection between the chapters and the consistent development of the main topic throughout the work, independent presentation of the material, reasoned conclusions. It is also obligatory to have references to the sources used in the main part of the abstract.

The presentation must be conducted in a third person (“The author believes ...”) or use impersonal constructions and indefinite personal sentences (“At the second stage, the following approaches are explored ...”, “The study made it possible to prove ...”, etc.) .

In the conclusion, the conclusions that the student came to as a result of the essay are logically sequentially stated. The conclusion should briefly characterize the solution of all the tasks set in the introduction and the achievement of the goal of the abstract.

The list of sources used is an integral part of the work and reflects the degree of study of the problem under consideration. The number of sources in the list is determined by the student independently, for the abstract their recommended number is from 10 to 20. At the same time, the list must contain sources published in the last 3 years.

The appendix should include auxiliary material that, when included in the main part of the work, clutters up the text (tables of auxiliary data, instructions, methods, forms of documents, etc.).

Applications should be designed as a continuation of the abstract on its subsequent pages.

Each application must start on a new page. At the top of the page on the right is the word "Appendix" and its number. The application must have a title that is centered on the page on a separate line and printed in capital letters.

Applications should be numbered sequentially with Arabic numerals.

All applications in the text of the work should be referenced. Appendices should be arranged in the order in which references to them appear in the text.

Design Requirements

When performing extracurricular independent work in the form of an abstract, the following requirements must be observed:

* printing on one side of A-4 white paper
* font-size-14; Times New Roman, color - black
* line spacing - 1.5
* margins on the page - the size of the left margin is 2.5 cm, the right margin is 1.5 cm, the top margin is 1.5 cm, the bottom margin is 2 cm.
* formatted to the width of the sheet.

***offset****.*The test is a form of intermediate control of knowledge and one of the components of the overall assessment of knowledge in the discipline. Preparation for the test should go according to a strictly thought-out schedule, with a consistent transition from topic to topic, from section to section, without skipping and jumping from the beginning of the course to the end. Questions that may appear in the process of preparing for the exam must be written down and answered by the teacher during the consultation. The main task of preparing a student for the test should be considered the systematization of knowledge of educational material, its creative comprehension. When preparing, it is necessary to focus on lecture notes, recommended literature and resources of the Internet information and telecommunication network.

***Exam****.*The exam is a form of intermediate knowledge control and one of the components of the overall assessment of knowledge in the discipline. Preparation for the exam should follow a strictly thought-out schedule, with a consistent transition from topic to topic, from section to section, without skipping and jumping from the beginning of the course to the end. Questions that may appear in the process of preparing for the exam must be written down and answered by the teacher during the pre-exam consultation. The main task of preparing a student for the exam should be considered the systematization of knowledge of educational material, its creative comprehension. When preparing, it is necessary to focus on lecture notes, recommended literature and resources of the information and telecommunication network "Internet"

**9. LIST OF INFORMATION TECHNOLOGIES USED IN THE EDUCATIONAL PROCESS IN THE DISCIPLINE, INCLUDING THE LIST OF SOFTWARE AND INFORMATION REFERENCE SYSTEMS**

**9.1. multimedia presentations**

Presentation is a form of presentation of material in the form of slides, on which tables, diagrams, figures, illustrations, audio and video materials can be presented.

* <file://localhost/F:/30.htm>

*Lectures (presentations)*

9.2.Material and technical base

Training room for lecture-type, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

Classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

Seminar-type classroom, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive board-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1);

Rooms for independent work with Internet access (Classroom board, study furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces ) (for independent work) (room No. 07 of the TsKP).

Educational Laboratory for Microbiology and Virology (4-15)

Equipment:

1. Sterilizer steam BES -15L-LED-N automatic
2. Drying cabinet ShS-40 (40l. 180C)
3. Shaker medical series S:S -3. 02LA20
4. Air irradiator-recycler ultraviolet
5. Medical laboratory centrifuge
6. Biological microscope Mikromed S-11 with accessories
7. Scales Mass-1
8. Electric water distiller
9. Support for test tubes ShPU Kront
10. Water bath Senco, W-2- 1003 p
11. Electric stove Irit IR-8201 1 burner with thermostat
12. Measuring technology
13. Savochek laboratory
14. Porcelain cups of various sizes
15. Small plastic petri dishes
16. Large plastic petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY"

Work program of the discipline

**"**BIOLOGY OF REPRODUCTION AND DEVELOPMENT**»**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | Able to apply knowledge of the basics of evolutionary theory, use modern ideas about the structural and functional organization of the genetic program of living objects and the methods of molecular biology, genetics and developmental biology to study the mechanisms of ontogenesis and phylogenesis in professional activities | OPK-3 |

* + - 1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-3 | GPC-3.1 | Knows: the basics of evolutionary theory, analyzes modern trends in the study of evolutionary processes.  Able to: use in professional activities modern ideas about the manifestation of heredity and variability at all levels of the organization of the living.  Skilled in: basic methods of genetic analysis. |
| OPK-3 | GPC-3.2 | Knows: the basics of evolutionary theory, analyzes modern trends in the study of evolutionary processes.  Able to: use in professional activities modern ideas about the manifestation of heredity and variability at all levels of the organization of the living.  Skilled in: basic methods of genetic analysis. |
| OPK-3 | GPC-3.3 | Knows: the basics of evolutionary theory, analyzes modern trends in the study of evolutionary processes.  Able to: use in professional activities modern ideas about the manifestation of heredity and variability at all levels of the organization of the living.  Skilled in: basic methods of genetic analysis. |
| OPK-3 | GPC-3.5 | Knows: the basics of biology of reproduction and individual development.  Able to: use in professional activities modern ideas about the mechanisms of growth, morphogenesis and cytodifferentiation, about the causes of developmental anomalies.  Owns: methods of obtaining embryonic material, reproduction of living organisms in laboratory and production conditions. |
| OPK-3 | GPC-3.6 | Knows: the basics of biology of reproduction and individual development.  Able to: use in professional activities modern ideas about the mechanisms of growth, morphogenesis and cytodifferentiation, about the causes of developmental anomalies.  Owns: methods of obtaining embryonic material, reproduction of living organisms in laboratory and production conditions. |

* + - 1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Types of educational work** | | **Forms of study** | | |
| **full-time** | **Part-time** | **Correspondence** |
| **General labor intensity**: credits/hours | | 108/3 | 108/3 |  |
| **contact work**: | | 48 | thirty |  |
|  | Lecture-type classes | 16 | 15 |  |
| Seminar type classes | 32 | 15 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 60 | 42 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

1. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***
   1. Distribution of hours by sections/topics and types of work
      1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Introduction | 2 |  |  |  | 2 |  | 15 |
| 2. | Gametogenesis. Morphology and physiology  gametes | 4 |  |  |  | 6 |  | 15 |
| 3. | Embryonic development | 5 |  |  |  | 12 |  | 15 |
| 4. | Postembryonic development | 5 |  |  |  | 12 |  | 15 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| Lectures | Other training sessions | Practical lessons | Semi bunk | Laboratory works. | Other activities |
| 1. | Introduction | 2 |  |  |  | 2 |  | 10 |
| 2. | Gametogenesis. Morphology and physiology | 4 |  |  |  | 4 |  | 10 |
| 3. | gametes | 5 |  |  |  | 5 |  | 10 |
| 4. | Embryonic development | 4 |  |  |  | 4 |  | 12 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Introduction | The subject of biology of individual development, its place in the system of biological sciences. The history of the doctrine of individual development. Preformism and epigenesis.  Methods of biology of individual development.  The significance of achievements in the field of studying the patterns of individual development of animals for medicine, animal husbandry and other sectors of the national economy.  Periodization of animal ontogeny. |
|  | Gametogenesis. Morphology and physiology  gametes | sex and somatic cells. The concept of iso- and heterogamy. Oocytes, structure and properties.  Classification of eggs according to the amount of reserve nutrients and their distribution in the cytoplasm.  Sperm. Types of structure and properties of sperm.  The structure of the ovaries. successive stages of oogenesis. Types of egg nutrition: solitary, alimentary nutritional and follicular. Vitellogenesis. Divisions of maturation and reduction of the number of chromosomes in meiosis. Segregation of the cytoplasm in oogenesis and its significance for subsequent development. Polar organization of the egg. Cortex.  The structure of the seed. Sequential stages of spermatogenesis. Cells - Sertoli. |
|  | Embryonic development | 1. Fertilization.   General characteristics of the fertilization process and its biological significance. Insemination internal and external. The meeting of gametes, the question of attracting sperm to the egg, gamons. Acrosomal reaction of sperm and its role in the connection of gametes; physiological mono- and polyspermia. egg activation. Syngamy.  2. Crushing.  General characteristics of the crushing process. Features of cell division during the period of crushing - lack of cell growth, short duration of the mitotic cycle. Rules of cell division. Gert - Whig - Saxa.  Types of crushing, their dependence on the amount of yolk, its distribution in the cytoplasm, the properties of the cytoplasm. The structure of the blastula in animals with different types of cleavage. Features and formation of the blastocyst in mammals.  Gastrulation.  General characteristics of gastrulation processes. The formation of a two- and three-layer embryo: ectoderm, endoderm, mesoderm. Teloblastic, proliferative and enterocelous methods of mesoderm formation. Gastrulation in lancelets, amphibians, reptiles, birds and mammals.  4. Neurulation.  The formation of the neural tube and the determination of its departments. Neural crest. Dissection of the chordo - mesodermal rudiment / chord, somite, somite noma, lateral plate, parietal and visceral sheets and the formation of a secondary body cavity.  5. Organogenesis in vertebrates.  Normalization of the body of the embryo, separation of the head and tail sections in holoblastic and meroblastic types of development.  The provisional organs in insects are the amniotic and serous membranes. Provisional organs in the amniote: yolk sac, amnion, chorion and allantois: their development, structure, functions. Formation and types of mammalian placenta. |
|  | Postembryonic development | Differences in the degree of development of an individual by the end of the embryonic period in different animals.  Aging as a stage of ontogenesis.  1.Metamorphosis  Direct and indirect development. Different types of larvae in invertebrates. Biological significance of metamorphosis, its distribution and its main patterns / on the example of metamophosis of insects and amphibians.  2. Periodic shaping processes  Periodic change and recoloring of integuments in invertebrates and vertebrates. The adaptive value of this phenomenon and the influence of temperature and light regimes on it. Managing the processes of changing covers for practical purposes.  3. Development of secondary - sexual characteristics  Classification and biological significance of secondary - sexual characteristics.  4. Animal growth  Growth and shaping processes. Growth Research Methods. Types of animal growth: definite, indefinite and periodical. allometric growth. Growth and change in body proportions.  Animal growth factors. Growth regulation factors. Mechanisms of growth regulation. Influence on growth of environmental factors and mechanisms of their action.  . Regeneration. Sponges, Coelenterates, Ascidia. somatic embryogenesis. Types of regeneration, distribution in the animal world. Regulation. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of laboratory classes*** |
|  | The structure of germ cells. The structure of the testicles and spermatozoa. | The structure of the testis and sperm |
|  | The structure of germ cells. The structure of the ovaries. Classification of eggs. | The structure of the ovary and egg |
|  | Fertilization. Process characteristic. Crushing, types of crushing. | Fertilization and crushing |
|  | The concept of gastrulation. Gastrulation in lancelets, amphibians, reptiles, birds, mammals | Gastrulation and neurulation in amphibians |
|  | Organogenesis. Types, fabrics. | Organogenesis |
|  | Mammal development | Stages of development of mammals |
|  | Formation of the placenta and amnion | The process of formation of the placenta and amnion. |
|  | Metamorphosis. Sex differentiation. Animal growth. | Metamorphosis. Direct and indirect development |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Introduction | UO, R, T, LR |
| 2. | Gametogenesis. Morphology and physiology  gametes |  |
| 3. | Embryonic development |  |
| 4. | Postembryonic development |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1. Main literature.

Lenchenko E.M. Cytology, histology and embryology. Textbook. - M. 2017.

Bolotov AV Biology of reproduction and development. Tutorial. - Irkutsk. 2011.

6.2. Additional literature.

Golenkov N.F. Biology of development. - M: Academy, 2007

Golichenkov V.A. Embryology. – M.: Ed. Center Academy, 2004.

Belousov L.V. Introduction to general embryology. 1998.

Gilbert S. Developmental Biology in three volumes. 2001.

* 1. Periodicals

1. "Biological Diversity of the Caucasus" (Grozny, Chechen State University, October 27-29, 2011) Publishing house of ChGU, 2011. - 388s

2. Actual problems of general parasitology: Studies of the scientific school of academician KI Skryabin. - M.: Nauka, 2000

1. **Modern professional databases and information reference systems**

Electronic library system IPRbooks - a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

Scientific electronic library[www.e-library.ru](http://www.e-library.ru). (<https://elibrary.ru/defaultx.asp>)

[Abstract database of world scientific publicationsWeb of Science (http://www.webofscience.com](file:///C:\Users\Студент\Desktop\РАЯНА\Реферативная%20база%20данных%20по%20мировым%20научным%20публикациям%20Web%20of%20Science%20(http:\www.webofscience.com))

1. **Software Composition**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

1. **Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base of the laboratory.Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**«BIOECOLOGY AND RATIONAL NATURE MANAGEMENT»**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional competencies | General professional skills | GPC-4.1;  GPC-4.2;  GPC-4.3 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-4 | Able to carry out activities for the protection, use, monitoring and restoration of biological resources, using knowledge of the laws and methods of general and applied ecology | **Knows**fundamentals of interactions between organisms and their environment, environmental factors and mechanisms of responses of organisms, principles of population ecology, community ecology; fundamentals of organization and sustainability of ecosystems and the biosphere as a whole  **Can**use in professional activities methods of analysis and modeling of environmental processes, anthropogenic impacts on living systems and environmental forecasting; substantiate the ecological principles of rational nature management and nature protection  **owns**skills in identifying and predicting the response of living organisms, communities and ecosystems to anthropogenic impacts, determining environmental risk |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 108/3 | 108/3 |  |
| **contact work**: | | 48 | thirty |  |
|  | Lecture-type classes | 16 | 15 |  |
| Seminar type classes | 32 | 15 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(SRS) | | 60 | 78 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

1. credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction.  The subject and tasks of ecology. | 2 |  |  |  | 4 |  | 6 |
| 2. | environmental factors. General patterns and their effects on the organism adaptation of the organism. | 2 |  |  |  | 4 |  | 6 |
| 3. | Biotic factors as a habitat for the life of an organism. | 2 |  |  |  | 4 |  | 6 |
| 4. | Population structure (Sex structure. Age structure. Territorial structure). | 2 |  |  |  | 4 |  | 8 |
| 5. | Biocenoses. The structure of the biocenosis. Ecosystems.. | 2 |  |  |  | 4 |  | 8 |
| 6. | The concept of classifying the structure and energy flow of ecosystems | 2 |  |  |  | 4 |  | 8 |
| 7. | Biosphere as a global ecosystem. | 2 |  |  |  | 4 |  | 8 |
| 8. | Anthropogenic impacts nature management and nature protection | 2 |  |  |  | 4 |  | 10 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. | 2 |  |  |  | 2 |  | 8 |
| 2. | The subject and tasks of ecology. | 2 |  |  |  | 2 |  | 10 |
| 3. | Biotic factors as a habitat for the life of an organism. | 2 |  |  |  | 2 |  | 10 |
| 4. | Population structure (Sex structure. Age structure. Territorial structure).. | 2 |  |  |  | 2 |  | 10 |
| 5. | Biocenoses. The structure of the biocenosis. Ecosystems.. | 1 |  |  |  | 1 |  | 10 |
| 6. | The concept of classifying the structure and energy flow of ecosystems | 2 |  |  |  | 2 |  | 10 |
| 7. | Biosphere as a global ecosystem | 2 |  |  |  | 2 |  | 10 |
| 8. | Anthropogenic impacts nature management and nature protection | 2 |  |  |  | 2 |  | 10 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Introduction.  The subject and tasks of ecology. | Characteristics of ecology as a fundamental scientific discipline. Subject, tasks and main sections of modern ecology. Brief history of the formation of ecology as a science.  Methods of modern ecology (field observations, experimental studies, modeling). |
|  | Fundamentals of general ecology. | The concept of "living matter of the biosphere", its functions, patterns of distribution of living organisms in the biosphere, the circulation of substances in nature, as well as global environmental problems.  Structure, patterns of functioning and development of ecosystems, approaches to their typification.  The structure and functioning of populations and communities, the role of the biotic environment and biotic factors, the patterns of population dynamics, the processes of regulation and self-regulation of numbers in the population, the relationship between members of the population.  Patterns of the action of environmental factors on living organisms, characteristics of the main living environments, as well as adaptation of organisms to various environmental factors.  Information about man as a biological species, human habitat and his adaptations to it.  Radiation aspects of human ecology, characteristics of the modern ecological crisis. |
|  | Section 2. Fundamentals of rational nature management and environmental protection. | The essence and principles of rational nature management.  Natural resource potential as a key factor in sustainable development, properties of resources, various classifications of natural resources, the most important natural conditions for managing the economy, the concepts of "natural resource potential" and "resource availability", the structure and magnitude of natural resource potential.  The study of anthropogenic impact on the biosphere and its consequences for natural ecosystems and society as a whole. The sources and types of anthropogenic impact on the hydrosphere, atmosphere, lithosphere, flora and fauna, biosphere as a global ecosystem, socio-ecological and economic consequences of anthropogenic impact on the biosphere are considered.  Essence, tasks, directions and strategy of sustainable development of society and nature.  The main directions of the rational use of various types of natural resources. Functions and tasks of state authorities for nature management and environmental protection in Russia |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | ***The content of laboratory classes*** |
|  | Section 1. Introduction.  The subject and tasks of ecology. | Characteristics of ecology as a fundamental scientific discipline. Subject, tasks and main sections of modern ecology. Brief history of the formation of ecology as a science.  Methods of modern ecology (field observations, experimental studies, modeling). |
|  | Section 2. Environmental factors. General patterns and their effects on the organism of adaptation of the organism | The concept of "living matter of the biosphere", its functions, patterns of distribution of living organisms in the biosphere, the circulation of substances in nature, as well as global environmental problems. |
|  | Section 3. Population structure (Sex structure. Age structure. Territorial structure). | Structure, patterns of functioning and development of ecosystems, approaches to their typification. |
|  | Section 4. Biocenoses. The structure of the biocenosis. Ecosystems.. | The structure and functioning of populations and communities, the role of the biotic environment and biotic factors, patterns of population dynamics, the processes of regulation and self-regulation of numbers in a population, relationships between members of a population. |
|  | Section 5The concept of classifying the structure and energy flow of ecosystems | Patterns of the action of environmental factors on living organisms, characteristics of the main environments of life, as well as adaptation of organisms to various environmental factors. |
|  | Section 6Biosphere as a global ecosystem | Radiation aspects of human ecology, characteristics of the modern ecological crisis. |
|  | Section 7The concept of classifying the structure and energy flow of ecosystems | The main stages of interaction between society and the natural environment, typical types of economic burden and environmental consequences, from ancient civilizations to the present |
|  | Section 8Structure and functions of the biosphere | The essence of rational nature management, the principles of rational nature management are considered. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Introduction.  The subject and tasks of ecology. | UO, R, T, LR |
| 2. | environmental factors. General patterns and their effects on the organism adaptation of the organism. |  |
| 3. | Biotic factors as a habitat for the life of an organism. |  |
| 4. | Population structure (Sex structure. Age structure. Territorial structure). |  |
| 5. | Biocenoses. The structure of the biocenosis. Ecosystems.. |  |
| 6. | The concept of classifying the structure and energy flow of ecosystems |  |
| 7. | Biosphere as a global ecosystem. |  |
| 8. | Anthropogenic impacts nature management and nature protection. |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1. Main literature

State Pedagogical University. A.I. Herzen, 2016. - Access mode: http://www.iprbookshop.ru/51700.html

Tulyakova, O. V. Ecology [Electronic resource]: textbook. - Saratov: Higher education, 2014. - Access mode: http://www.iprbookshop.ru/21904.html

Ecology and nature management [Electronic resource]: materials of the scientific conference "Science Week 2013". - Rostov-on-Don: Southern Federal University, 2013. - Access mode: http://www.iprbookshop.ru/47195.html

6.2. Additional literature.

Krasnova, T. A. Ecology [Electronic resource]: textbook for university students. - Kemerovo: Kemerovo Technological Institute of Food Industry, 2014. - Access mode: http://www.iprbookshop.ru/61287.html

Panin, V. F. Ecology. General ecological concept of the biosphere and economic levers for overcoming the global ecological crisis. Review of modern principles and methods of biosphere protection [Electronic resource]: textbook. - Tomsk: Tomsk Polytechnic University, 2014. - Access mode: http://www.iprbookshop.ru/34735.html

* 1. Periodicals

1. "Biological Diversity of the Caucasus" (Grozny, Chechen StateUniversity, October 27-29, 2011) Publishing House of ChSU, 2011. - 388s

**7.Modern professional databases and information reference systems**

Unified information system UComplex: provides access to curricula, work programs of disciplines (modules), practices, publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process.

Kaspersky Endpoint Security for Business Standard, license no. 658/2018.

Software "Anti-plagiarism, university", license agreement No. 298/2018.

/

**8.Composition of software**

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solution of organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. To check texts for originality, the Anti-plagiarism program

4. For intermediate certification (exam), a computer form for checking written work

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

The use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the available instrumental (instrumental) base of the laboratory.

Laboratory studies:

Workplace of the teacher, equipped with a computer;

workplaces of students equipped with the equipment necessary for practical training.

Technical training aids:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD films.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Human Biology AND BIOETHICS"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

* + - 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| General professional | General professional  skills | GPC-3.1; GPC-3.4 |

* + - 1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| OPK-6 | Able to use in professional activities the basic laws of physics, chemistry, earth sciences and biology, apply the methods of mathematical analysis and modeling, theoretical and experimental research, acquire new mathematical and natural science knowledge using modern educational and information technologies | **Knows**basic concepts and methods, modern trends in mathematics, physics, chemistry and earth sciences, topical problems of biological sciences and prospects  interdisciplinary research. |
|

* + - 1. **Scope of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***full-time*** | ***Part-time*** | |
| 7 semester | 9 semester | 10 semester |
| **General labor intensity**: credits/hours | | 2/72 | 2/72 | 2/72 |
| **contact work**: | | 32 | 54 | 36 |
|  | Lecture-type classes | 16 | 18 | 18 |
| Seminar type classes | 16 | 36 | 18 |
| Intermediate certification: credit / credit with grade / exam |  |  |  |
| **Independent work**(SRS) | | 40 | 18 | 36 |
| Of which for course work (course project) | |  |  |  |

Notes:

credit and credit with assessment for full-time and part-time education is carried out within the framework of seminar-type classes. The curriculum does not include hours.

**4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

7 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Anthropogenesis | 1 |  | 1 |  |  |  | 4 |
| 2 | The structure of the human body | 2 |  | 2 |  |  |  | 6 |
| 3 | Racial science | 1 |  | 1 |  |  |  | 4 |
| 4 | Typology of temperament | 2 |  | 2 |  |  |  | 4 |
| 5 | Cognitive sphere of man | 2 |  | 2 |  |  |  | 6 |
| 6 | Adaptation | 2 |  | 2 |  |  |  | 4 |
| 7 | Growth and development | 2 |  | 2 |  |  |  | 4 |
| 8 | human genetics | 2 |  | 2 |  |  |  | 4 |
| 9 | Ontogenesis | 2 |  | 2 |  |  |  | 4 |

4.1.2 Part-time education

9 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1 | Anthropogenesis | 4 |  | 8 |  |  |  | 2 |
| 2 | The structure of the human body | 4 |  | 8 |  |  |  | 4 |
| 3 | Racial science | 2 |  | 4 |  |  |  | 4 |
| 4 | Typology of temperament | 4 |  | 8 |  |  |  | 4 |
| 5 | Cognitive sphere of man | 4 |  | 8 |  |  |  | 4 |

10 semester

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other*  *training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 6 | Adaptation | 4 |  | 4 |  |  |  | 8 |
| 7 | Growth and development | 6 |  | 6 |  |  |  | 10 |
| 8 | human genetics | 4 |  | 4 |  |  |  | 8 |
| 9 | Ontogenesis | 4 |  | 4 |  |  |  | 10 |

4.2 The program of the discipline, structured by topics / sections

4.2.1 Lecture content

|  |  |  |  |
| --- | --- | --- | --- |
| **No.**  **p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** | |
| **Subject** | **Content** |
| 1 | Anthropogenesis | The position of man in nature | Man as a biological species. Zoological systematics of man. Its place in organic nature and in relation to animals similar to it. Evidence of the unity of the origin of man and animals. Anatomical and physiological features that are similar in all representatives of the class Mammals. Examples of rudimentary and atavistic signs that testify to the relationship of man with animals. Signs of similarities and differences between humans and great apes |
| 2 | The structure of the human body | General body measurements | Total body measurements: body length, body weight, chest girth. Partial (partial) body measurements (lower limb length, neck, wrist, waist circumference) |
| Body type and constitution. Somatotype | The concept of body type and human constitution. Somatotype and its criteria. Schemes of normal body constitutions: classification according to M.V. Chernorutsky; according to V.N. Shevkunenko (1935) - on a morphological basis; according to the scheme of V.T. Shtefko and A.D. Ostrovsky (1929) modified by S.S. Darskoy (1975). Individual typology of women: leptosomal, mesosomal, megalosomal types of constitutions. Constitutions and physiological features |
| 3 | Racial science | Racial and entoterritorial distinctions | The main differences between racial and constitutional features. Racial differences associated with a particular territory (adaptive types). Race classification. Characteristics of large and small races |
| 4 | Typology of temperament | Humoral theory of temperament | The oldest description of temperament according to Hippocrates (humoral theory): sanguine, choleric, melancholic and phlegmatic type of temperament. Character, temperament, personality. temperament properties. The role of temperament in activity and profession |
| Dependence of temperament on the type of nervous system | Three parameters for characterizing the types of GNI according to I.P. Pavlov. Types of GNI according to I.P. Pavlov. Specific types of GNI according to I.P. Pavlov. Children's types of temperament. Theory of temperament V.M. Rusalova. Functional asymmetry of the human brain |
| Constitutional theory of temperament according to W. Sheldon | The connection of temperament with the innate constitution of a person. Classification of temperament types depending on the predominance in the development of one of the germ layers |
| 5 | Cognitive sphere of man | Psychophysiological features | Thinking - a brief description, physiological foundations and biological role. Human speech as a reflection of his inner world. Human emotions. The main functions and properties of attention. Human memory. Types of memory |
| 6 | Adaptation | Human adaptation | Types and levels of adaptation. General adaptation syndrome (GAS), its stages. The concept of stress. Stress and maladaptation |
| 7 | Growth and development | Features of the growth and development of the body | Biological age, its definition. Human sexual dimorphism: genetic, morphological and physiological aspects. Acceleration and retardation. Disadvantages of acceleration Hypodynamia |
| 8 | human genetics | human heredity | Methods for studying human heredity: genealogical method; cytogenetic method; biochemical method; methods of hybridization of somatic cells; modeling of hereditary diseases; population-statistical method |
| Heredity and pathology | *Chromosomal diseases, their classification. Origin mechanisms*  1. Characteristics of chromosomal diseases (Down's syndrome, Edward's syndrome, Patau's syndrome, Shereshevsky-Turner syndrome, X-chromosome trisomy, Klinefelter's syndrome.)  2. Structural abnormalities of chromosomes.  *Metabolic diseases (enzymopathies)*  1. Diseases associated with metabolic disorders (proteins, fats, carbohydrates, hormones) |
| 9 | Ontogenesis | Prenatal ontogeny | Stages of intrauterine development. Embryo formation. Organogenesis and histogenesis. Critical periods of embryogenesis |
| Postnatal ontogeny | Age periods of human life. Neonatal period. Breast period. Periods of early, first and second childhood. Teenage years. Youthful age. Mature age. Elderly and senile age. Age crises |

4.2.1 Content of practical exercises

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the practical lesson** |
| 1 | Anthropogenesis | 1. Anthropogenesis. The driving forces of anthropogenesis. Stages of human development.  2. Evidence of the origin of man from animals. Video presentation "Anthropogenesis" |
| 2 | The structure of the human body | 1. Evaluation of the harmony of the physique.  2. Determination of body weight and body fat percentage  3. Determination of body type (body constitution) |
| 3 | Racial science | 1. Races, racial classification.  2. Racial and individual features of the skull |
| 4 | Typology of temperament | 1. Determining the type of your temperament.  2. Questionnaire for the structure of temperament (OST) according to V.M. Rusalov.  3. Determining the type of GNI of students in terms of strength, balance, mobility of nervous processes.  4. Cybernetic study of the functional asymmetry of the brain |
| 5 | Cognitive sphere of man | The study of the human cognitive sphere: linear eye, observation, speed of thinking, short-term memory |
| 6 | Adaptation | 1. Multilevel personal questionnaire "Adaptiveness".  Video presentation "General Adaptation Syndrome" |
| 7 | Growth and development | 1. Evaluation of biological age and body aging index according to anthropometric data.  2. The proportions of the human body, taking into account gender characteristics |
| 8 | human genetics | 1. Genetics of sex. Inheritance of sex-linked traits (development of skills for solving genetic problems).  Video presentation "Human hereditary diseases" |
| 9 | Ontogenesis | Ontogenesis |

**5. Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

* ongoing monitoring of progress;
* intermediate certification of students in the discipline.

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1 | Anthropogenesis | Cases (situations and tasks with given conditions)  Test  Practical work report |
| 2 | The structure of the human body | Practical skills |
| 3 | Racial science | Information project (report)  Practical work report |
| 4 | Typology of temperament | Cases (situations and tasks with given conditions)  Practical work report |
| 5 | Cognitive sphere of man | Test  Practical work report |
| 6 | Adaptation | Test  Practical work report |
| 7 | Growth and development | Cases (situations and tasks with given conditions)  Practical work report |
| 8 | human genetics | Information project (report)  Practical work report |
| 9 | Ontogenesis | Test  Practical work report |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current and midterm control

**Approximate typical task in a practical lesson**

Do practical work on the topic

"DETERMINATION OF BODY TYPE (BODY CONSTITUTION)"

The purpose of the work: to determine the type of physique using indices, nomograms and formulas.

Equipment: diagrams, tables, nomogram for determining the constitution of the body, stadiometer, scales, centimeter tape.

PROGRESS

1. Determine your individual body type

Most often, body type is determined using the Solovyov index, which is equal to the girth of the wrist in centimeters.

1. The measurement is made on the leading hand (right - for right-handers and left - for left-handers).

2. The circumference is measured with a centimeter tape at the narrowest part of the wrist (wrist joint).

3. The measuring tape should fit snugly around the wrist without squeezing it.

Table 1 -Determination of body type by the size of the wrist

|  |  |  |
| --- | --- | --- |
| Body type (TT) | Wrist circumference (cm) | |
| Men | Women |
| Asthenic TT (narrow bone) | < 18 | < 16 |
| Normosthenic TT (normal) | 18-20 | 16-18 |
| Hypersthenic TT (large-boned) | >20 | > 18 |

2.*Verweck index*

IV \u003d DT: (2xMT + WGC), where

DT - body length in cm;

BW – body weight in kg;

OGK - chest circumference in cm.

If the IV is 0.75-0.85, this indicates a moderate predominance of transverse dimensions over the longitudinal ones (brachymorphy), IV within 0.85-1.25 - harmonious development, IV equal to 1.25-1.35 - moderate predominance of growth in length (dolichomorphy).

3. Determine the constitution of the body by the Pignet index

To determine body type, measure height L (cm). Determine the body weight (weight) P (kg), and the circumference of the chest on exhalation T (cm).

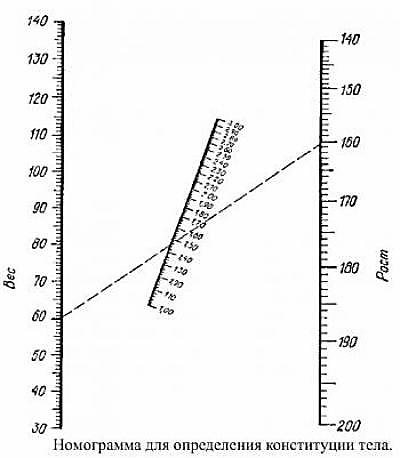
Calculate the Pinier index (PI) using the formula:

PI \u003d height - (body weight + chest circumference (ECG) on exhalation),

or IP \u003d L - (P + T)

Table 2 -Correspondence of the value of the Pignet index to the human constitution

|  |  |
| --- | --- |
| Pinier index | Constitution |
| Less than 10 | Strong (dense) physique - hypersthenic |
| 10 - 25 | Normal physique - normosthenic |
| 26 - 35 | Weak physique - asthenic |
| Over 35 | Very weak physique - pronounced asthenic |

4. Determine the constitution of the body according to the nomogram (Fig. 1)

Rice. 1**-**Nomogram to determine the constitution of the body

To a large extent, the somatotype is genetically determined. However, under the influence of various factors, primarily an increase in motor activity and normalization of nutrition, some change in the somatotype can be achieved.

There are many ways to determine the constitution of the body. One of the simplest is the definition of a nomogram. The accuracy of this method is approximate, but it gives some idea of ​​the physique. It is necessary to connect the dots corresponding to height and weight with a ruler. The number at the point of intersection of this line with the average scale will be an indicator of the constitution.

The harmonious ratio of adipose and muscle tissue corresponds to values ​​from 1.30 to 1.50, the predominance of adipose tissue - from 1.50 to 2.05, muscle - from 1.00 to 1.30.

Registration of the protocol

1. Complete table 3.

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| Body weight, kg | Body length, cm | OGK on exhalation | IV | wrist circumference | Pinier index | Nomogram |
|  |  |  |  |  |  |  |
| Type of constitution | | |  |  |  |  |

Table 3 -Results of own research

2. Draw appropriate conclusions about the type of your constitution.

Control questions

1. The concept of the human constitution.
2. Basic body types. A brief description of.

**An exemplary set of tests for current control**

|  |  |
| --- | --- |
| № r / d | Exemplary test tasks for sections of the discipline |
| 5 | Cognitive sphere of man |
| 1. The psychology of cognitive processes studies  +: memory  -: capabilities  -: character  -: motivation |
| 2. Memory is  -: processes associated with the passage of impulses through a certain group of neurons, causing electrical and mechanical changes in the places of their contact and leaving behind a physical trace  -: processes of storing information due to chemical changes  -: the processes of formation of connections between different representations and are determined not so much by the content of the memorized material, but by what a person does with it  +: processes of memorization, preservation and reproduction by a person of his experience |
| 3. The development of abstract thinking in humans is possible due to  -: first alarm system  +: second signal system  -: third alarm system  -: fourth signal system |
| 4. Voluntary attention is such attention  -: which comes after the involuntary, but qualitatively differs from it  +: which develops as a result of training and education  -: which arises without the intention of a person to see or hear something, without a pre-set goal, without effort of will  -: which is characterized by activity, purposeful concentration of consciousness, the maintenance of the level of which is associated with certain volitional efforts |
| 6 | Adaptation |
| 1. Features of the long-term stage of adaptation are  +: functioning of a new functional system, the formation of structural changes in a new functional system  -: mobilization of all functional systems, formation of a new specific functional system, erasure of old functional systems  -: mobilization of all functional systems, formation of a new specific functional system, formation of structural changes in a new functional system |
| 2. Standard non-specific adaptive responses  +: training, activation, stress  -: training, activation, adaptation  -: activation, stress, adaptation |
| 3. Under the action of stress factors, the secretion of hormones increases  -: intermedin and oxytocin  -: somatotropic and thyrotropic  - parathyroid hormone and thyrocalcitonin  +: adrenocorticotropic and glucocorticoids |
| 4. The stressor is  +: stimulus causing stress response  -: reaction, various brain structures to irritation  - defense mechanisms of the body  -: the ratio of the divisions of the autonomic nervous system |
| 10 | Ontogenesis |
| 1. Name an example of developmental disorders associated with the absence of an organ anlage  - microcephaly  -: encephaly  -: dwarfism  +: anencephaly |
| 2. What signs temporarily return in a normal human fetus  +: gill slits  - cloaca  -: the toe is shorter than the others and is located at an angle to them  -: chord |
| 3. The most informative at preschool age (4-6 years) are the following indicators of biological development  +: change in body proportions  -: annual increase in body length  -: the degree of development of secondary sexual characteristics  -: adaptation |
| 4. First of all, in the process of ontogenesis, the analyzer department matures  -: teenage  -: conductive  -: cortical  +: receptor |

**Approximate set of cases (situations and tasks with given conditions)**

|  |  |
| --- | --- |
| № r / d | Approximate situational tasks for sections of the discipline |
| 1 | Anthropogenesis |
| 1. This representative of the original genus of the hominid line was first discovered in North India in 1932. They were tetrapods, but with transient elements of bipedality, carried out object-tool activity, monogamy is characteristic, body weight did not exceed 12-16 kg.  1) What is the name of this representative?  2) Indicate the time of its existence on Earth?  Answer:  1) Ramapitek.  2) Its habitat on Earth dates back to the Miocene (about 12 million years ago) |
| 2. This monkey from the Hominid family lives in tropical Africa, in the basins of the Congo and Niger rivers. The body length of an adult is about 150 centimeters, weight is 50 kilograms, sexual demorphism in body size is weakly expressed. Genetic studies reveal a 96-98% similarity with the human genetic base.  1) Name the type of monkey.  2) What other primates belong to the Hominid family?  Answer:  1) Common chimpanzee.  2) Hominids also include gorillas and orangutans |
| 3. Travel back 200 thousand years to the territory of Western Europe.  1) What types of people of the genus Homo coexisted at the same time?  2) For how long?  Answer:  1) Neanderthals and Cro-Magnons.  2) From 5 to 30 thousand years |
| 4. On the test, the student determined the position of HOMO SAPIENS in animal taxonomy as a family.  1) What is his mistake?  2) To what family does a reasonable person belong? |
| 4 | Typology of temperament |
| 1. Which of the six situations related to educational activities will be more unfavorable for students with a weak nervous system (melancholic) and with an inert nervous system (phlegmatic).  1) Long hard work in the classroom and at home.  2) The educational material is delivered at a high pace.  3) The teacher asks an unexpected question and demands a quick answer.  4) Work in a noisy, turbulent environment.  5) Work with a hot-tempered, unrestrained teacher.  6) The teacher offers tasks that are diverse in content and methods of solution.  Answer: for melancholic situations 1,4,5 are more unfavorable; for phlegmatic people - 2,3,6 |
| 2. The literature describes cases when people who were forced to hide their serious illness from close relatives developed a nervous breakdown. What predominant type of nervous system can be assumed in these people?  Answer: when a person is forced to suppress any emotions in himself, this causes an overstrain of the inhibition process. The most vulnerable in this situation are people of two types of the nervous system - melancholic, who have a weakness of the main nervous processes and choleric, characterized by a relative weakness of the inhibition process. |
| 3. In the clinic, patients are waiting for their turn at the doctor's office. A nurse invites a patient, a participant in hostilities, to the doctor's office without a queue.  Patient A., quickly jumping up from his seat, begins to loudly, sharply and even rudely resent the actions of the nurse, causing a conflict situation.  Patient B., slowly approaching patient A., begins to calm him down, asks him to sit down, insistently offering to resolve the conflict.  Patient B. responds relatively easily to this situation, while perceiving everything that happens with a smile and actively communicating with other patients who are waiting for a doctor's appointment, he explains the legitimacy of the nurse's actions.  Patient G., feeling the awkwardness of this situation, is embarrassed, does not communicate with any of the other people, is hard pressed by the need for a longer stay in the clinic, there are tears in his eyes. Determine the temperament type of each patient.  Answer:   |  |  |  | | --- | --- | --- | | Patient | Type  temperament | Psychological features  temperament types | | Patient A. | choleric | Unbalanced, excitable, active, enterprising, but quickly exhausted in the process of work, abrupt, quick-tempered, creates conflict situations in the team. | | Patient B. | phlegmatic person | Slow, calm, unhurried, prone to order, to the familiar environment, in relations with people is even, moderately sociable. | | Patient V. | sanguine | Inquisitive, agile, sociable, friendly, quickly forgets insults, relatively easily experiences failures. | | Patient G. | melancholic | Sensitive, withdrawn, easily tiring, avoids communication with new people, suffers from a sense of his own inferiority. | |
| 7 | Growth and development |
| 1. The child (boy) was born on January 28, 2016.  1) Determine the age of the child on September 29, 2018 according to the rules adopted in age anthropology.  2) What age group does the child of this age belong to?  Answer:  1) Anthropologically, the child is 3 years old (2 years, 8 months, 1 day).  2) According to age periodization, this is early childhood |
| 2. A 1-year-old child has four milk teeth: two upper and two lower medial incisors.  1) Determine the variant of the child's development?  2) How many teeth must there be in order to recognize a developmental variant as banal?  Answer:  1) The variant of the development of the child is retarded, since the number of existing milk teeth is less than that provided for by age norms.  2) To recognize a developmental variant as banal, 8 teeth are needed |
| 3. Anthropometric parameters were determined for a 45-year-old man: body length 176 cm, waist circumference 98 cm, buttocks circumference 96 cm, body weight 89 kg.  1) Does the biological age correspond to the calendar age?  2) Which of the listed parameters make the greatest contribution to the processes of premature aging?  Answer:  1) The biological age of a man is ahead of the calendar and is 66 years old.  2) The greatest contribution to the processes of premature aging is made by the ratio of waist to buttocks |

**Approximate topics of reports**

Section 3

1. Origin of human races.
2. Skull and human races.
3. How different constitutions are represented in the most diverse populations of the globe.
4. The role of miscegenation and isolation within racially homogeneous groups.
5. Connections of the human constitution with race.
6. Connections of a person's race with inclinations to certain diseases.
7. The ability to adapt to different environmental conditions in representatives of different races.
8. Evidence of the unity of races. Criticism of racism.
9. The current state of the concept of race. Modern division into races.
10. fossil races.

Section 8. Human Genetics

1. Methods for studying human heredity.
2. Chromosomal theory of heredity.
3. Genetic factors influencing variations in the structure and development of the human body.
4. Investigation of twinning phenomena.
5. The study of the heredity of normal human traits.
6. Stability of the type in time.
7. Human genetics, its significance for medicine.
8. Genetic engineering and bioinformatics.
9. Human gene diseases.
10. Chromosomal diseases.

Section 9. General information about a person

1. Fabrics, their origin in individual and historical development.
2. Unity and diversity of cell types.
3. Physiological and pathological features of the visual analyzer.
4. Skin of various parts of the face and body.
5. Features of blood circulation in individual organs and systems.
6. Lymphatic system of the body and internal organs.
7. Modern methods of studying the activity of the heart.
8. Comparative anatomy of the respiratory system.
9. Comparative anatomy of the digestive system.
10. Influence on human morphology of nutrition, climate, soil and water composition.

**Approximate list of practical skills**

|  |  |
| --- | --- |
| № r / d | Section of discipline |
| 2 | The structure of the human body |
| Practicing the skills of assessing the structure and proportions of the body:   1. Assessment of body harmony. 2. Determination of body weight. 3. Determination of body fat percentage. 4. Determination of body type (body constitution).   Used equipment:   1. stadiometer, 2. scales, 3. tape measure, 4. caliper,   schemes, tables, nomogram for determining the constitution of the body |

5.3 Methodological materials definingprocedures for assessing knowledge, skills and (or) experience

**Practical lessons**

Practical classes allow you to combine theoretical knowledge and practical skills of students in the process of research activities.

Practical classes are held in a specialized classroom, equipped with educational and visual materials in the form of sets of demonstration and handouts: maps, tables, charts, regulations and equipped with the following equipment (projector; interactive whiteboard; computer, etc.).

The work should be carried out in groups, which forms a sense of collectivism and sociability. In the course of the practical work, thematic video material is also shown.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Theoretical study of the material | GPC-3.4 |
| 2 | Task execution technique |
| 3 | Ability to analyze and discuss assignment results and formulate conclusions |
| 4 | The correctness of the calculation of the results and the execution of the protocol |

*"Passed"*exhibited when all items are completed, not less than 70%.

*"Not counted"*exhibited in the absence or incorrectly executed protocol of a laboratory lesson, the student's inability to explain the results.

Students who have not attended laboratory classes work them out individually, one of the forms can be writing an essay on a missed topic.

**Test tasks**

The test is a tool for assessing students' learning, consisting of a system of test tasks, a standardized procedure for conducting, processing and analyzing the results. The teacher must determine for students the initial data for preparing for testing: name the sections (topics, questions) for which there will be tasks in the test form and theoretical sources for preparation. Preparation involves the study of lecture material, the preparation of auxiliary schemes in workbooks for visual structuring of the material in order to simplify its memorization. Pay attention to the basic terminology, classification, distinctive features, the presence of appropriate links between individual processes. Testing time, usually at least 40 minutes.

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Correct answer to the question | GPC-3.1 |

The grade "excellent" is given if 90-100% of the tasks are correctly completed.

The grade "good" is given if 70-89% of the tasks are correctly completed.

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed.

An "unsatisfactory" grade is given if less than 50% of the tasks are correctly completed.

**Cases (situations and tasks with given conditions)**

A situational task is a type of educational task that simulates situations that may arise in real life. The solution of situational problems is carried out in order to check the level of skills (possessions) of the student in solving a practical situational problem. The condition of the problem is announced to the student, the solution of which he sets out orally.

An effective interactive way to solve problems is to compare the results of solving one task by two or more small groups of students.

The main actions of students in working with a situational task are:

* preparation for the lesson;
* acquaintance with the criteria for assessing a situational task;
* clarification of the essence of the task and clarification of the algorithm for solving a situational problem;
* development of options for decision-making, selection of decision criteria, evaluation and forecast of options being sorted out;
* presentation of a solution to a situational problem (written or oral);
* receiving an assessment and its comprehension.

To successfully master the techniques for solving situational problems, three stages can be distinguished. At the first stage, it is necessary to familiarize students with the methodology for solving problems using printed publications on the methodology for solving problems, materials contained in databases, video lectures, and computer simulators. At this stage, the student is offered typical tasks, the solution of which allows him to work out the stereotypical techniques used in solving problems, to realize the connection between the theoretical knowledge gained and the specific problems that they can be aimed at solving.

For self-control at this stage, it is reasonable to use informal tests that not only state the correctness of the answer, but also provide detailed explanations if the wrong answer is chosen; in this case, tests perform not only a controlling, but also a learning function. To answer questions that arise, consultations are held with the teacher leading the course.

At the second stage, tasks of a creative nature are considered. In this case, the role of the teacher increases. Such classes not only form creative thinking, but also develop the skills of a business discussion of the problem, provide an opportunity to master the language of professional communication.

At the third stage, control work is performed to test the skills of solving situational problems.

|  |  |
| --- | --- |
| *Evaluation criteria* | *Code of the formed competence* |
| Possession of theoretical knowledge in a particular section and special terminology | GPC-3.1  GPC-3.4 |
| Response reasoning |
| Use of additional material |

Grade "excellent" - the problem is solved correctly and framed according to the proposed rules. Complete answers to all questions of the problem are given.

Rating "good" - the problem is solved correctly, but contains minor errors in the evaluation of indicators (no more than 30%) and design. Answers to all questions are incomplete.

Grade "satisfactory" - the problem is solved correctly, but contains errors in the evaluation of indicators (no more than 50%) and design. Not all questions of the problem have been answered.

Rating "unsatisfactory" - the problem is solved incorrectly. Contains errors in the assessment of indicators (more than 50%). Incorrect answers were given to the questions of the problem.

**Information project (report)**

The report is a small informational work devoted to one narrow topic. It can be done both in writing and orally. The report is intended to inform the audience. The performance usually lasts 5-10 minutes. Volume 5-6 pages. Structure of the report: Title page; Table of contents; Introduction; Main part; Conclusion; List of used literature (bibliography).

The preparation of the report is aimed at developing and consolidating the students' skills of independent deep, creative and comprehensive analysis of scientific, methodological and other literature on topical issues of the discipline; to develop skills and abilities to correctly and convincingly present the material, clearly formulate theoretical generalizations, conclusions and practical recommendations.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Compliance of the content of the report with the stated topic | GPC-3.1 |
| 2 | Completeness of disclosure of the topic |
| 3 | Target orientation and clarity of construction |
| 4 | Free presentation of material |
| 5 | List of used literature |
| 6 | Ability to answer questions about the text of the report |
| 7 | Contact with the audience |
| 8 | Presentation |
| 9 | Complied with the rules of speech |

Grade*"Great"*- the educational material is mastered by the student in full, he easily navigates the material, fully and reasonably answers additional questions, presents the material logically sequentially, draws independent conclusions, conclusions, demonstrates his horizons, uses material from additional sources, Internet resources. The message is exploratory in nature. Speech is characterized by emotional expressiveness, clear diction, stylistic and orthoepic literacy. Uses visual material (presentation).

Evaluation "good" - according to its characteristics, the student's message corresponds to the characteristics of an excellent answer, but the student may experience some difficulties in answering additional questions, make some errors in speech. There is no research component in the message.

Grade "satisfactory" - the student experienced difficulties in the selection of material, its structuring. I used mainly educational literature, did not use additional sources of information. Unable to answer additional questions on the topic of the message. The material is presented inconsistently, does not establish logical connections, and finds it difficult to formulate conclusions. Makes stylistic and spelling mistakes.

Grade "unsatisfactory" - the message is not prepared by the student or prepared according to one source of information, or does not correspond to the topic.

**Practical skills**

Practical skills. Practical skill is the use of theoretical and practical knowledge in practice, i.e. turning knowledge into skills.

Skill is the ability of a student to correctly perform a procedure or manipulation on their own.

For effective assimilation and implementation of practical skills, consistent step-by-step training is required, which consists of:

* explaining the need to perform the skill;
* performance by the teacher of the skill with an explanation;
* independent step by step implementation of the skill by each student;
* the teacher's observation of the performance of the skill;
* discussion of completed skills.

For practical skills training, the following conditions must be created:

* the student must know in what situation this skill needs to be applied - the following must be presented: the purpose, indications, necessary equipment and the implementation of the stages of each specific practical skill;
* it is better to start learning the skill with demonstration materials: showing video material, slides, photographs, drawings;
* each student should have a step-by-step instruction (description) of the skill being performed;
* it is necessary to provide an opportunity and conditions for independent performance of the skill;
* in order to achieve competence in performing a skill, the student must repeatedly perform this skill and pass it to the teacher.

|  |  |  |
| --- | --- | --- |
| *Evaluation criteria* | | *Code of the formed competence* |
| 1 | Instruments and equipment | UC-6.4  PC-1.3 |
| 2 | Demonstration of research methodology |
| 3 | Conducted measurements |
| 4 | Research results |

Grade "excellent" - the student correctly names the research method, correctly names the device, correctly demonstrates the research / measurement methodology, correctly evaluates the result.

Evaluation "good" - the student correctly names the research method, correctly names the device, makes single errors in demonstrating the research methodology / measurement and evaluating its results.

The “satisfactory” rating is that the student incorrectly names the research method, but at the same time gives the correct name of the device. Makes multiple errors in demonstrating research/measurement methodology and evaluating its results.” -

Grade "unsatisfactory" - the student incorrectly names the research method, gives the wrong name of the device. Cannot demonstrate the test/measurement technique and evaluate the result.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Main literature

1. Belyakova G.A. Dictionary of biological terms [Electronic resource]: Textbook / G.A. Belyakova - M.: Publishing House of Moscow State University, 2013. - 288 p. – ISBN 978-5-211-06470-6 – Access mode:<http://www.studentlibrary.ru/book/ISBN9785211064706.html>
2. Verkhoshentseva Yu.P. Biology with the basics of ecology [Electronic resource]: textbook / Verkhoshentseva Yu.P.— Electron. text data. - Orenburg: Orenburg State University, EBS DIA, 2013. - 146 p. - Access mode:<http://www.iprbookshop.ru/30101>
3. Tulyakova O.V. Biology [Electronic resource]: textbook / Tulyakova O.V.— Electron. text data. - Saratov: Higher education, 2014. - 448 p. - Access mode:<http://www.iprbookshop.ru/21902>.
4. Chebyshev N.V. Biology. Guide to laboratory studies [Electronic resource]: textbook. allowance / ed. N.V. Chebyshev. - 2nd ed., Rev. and additional - M.: GEOTAR-Media, 2015. - 384 p. – ISBN 978-5-9704-3411-6 – Access mode:<http://www.rosmedlib.ru/book/ISBN9785970434116.html>

6.2 Further reading

1. Aleksandrova L.A. Special questions of human biology [Electronic resource]: textbook / L.A. Alexandrova, I.A. Mikhailova, V.V. Thomson. — Electron. text data. - St. Petersburg. : ITMO University, 2009. - 99 p. — 2227-8397. - Access mode:<http://www.iprbookshop.ru/68144.html>
2. Andreev V.P. Biological Dictionary [Electronic resource] / Andreev V.P., Pavlovich S.A., Pavlovich N.V.— Electron. text data. - Minsk: Higher School, 2011. - 336 p. - Access mode:<http://www.iprbookshop.ru/20061>
3. Korochkin L.I. Biology of individual development. Genetic aspect [Electronic resource]: textbook / L.I. Korochkin. — Electron. text data. - M .: Moscow State University named after M.V. Lomonosov, 2002. - 264 p. — 5-211-04480-0. - Access mode:<http://www.iprbookshop.ru/13054.html>
4. Rodionova O.M. Lectures on the disciplines "Ecological Physiology" and "Human Biology". Part 1 [Electronic resource]: textbook / Rodionova O.M., Glebov V.V. - Electron. text data. - M .: Russian University of Peoples' Friendship, 2012. - 244 p. - Access mode:<http://www.iprbookshop.ru/22191>
5. Sych V.F. General biology [Electronic resource]: textbook / VF Sych. — Electron. text data. - M .: Academic Project, Culture, 2007. - 336 p. — 978-5-8291-0916-5. - Access mode:<http://www.iprbookshop.ru/36438.html>
6. Tulyakova O.V. Biology with the basics of ecology [Electronic resource]: textbook / Tulyakova O.V.— Electron. text data. - Kirov: Vyatka State University for the Humanities, 2011. - 373 p. - Access mode:<http://www.iprbookshop.ru/21900>
7. Chebyshev N.V. Biology [Electronic resource] / Chebyshev N.V., Grineva G.G. - M.: GEOTAR-Media, 2010. - 416 p. - ISBN 978-5-9704-0553-6 - Access mode:<http://www.studentlibrary.ru/book/ISBN9785970405536.html>

6.3 Periodicals

1. JOURNAL "BULLETIN OF EXPERIMENTAL BIOLOGY AND MEDICINE". Publishing house: RAMS (Moscow). HAC. Publishes short experimental papers on topical issues of biology and medicine. For more than 20 years, it has been completely translated into English. 12 issues per year. The journal contains the planned work of scientific research institutions in the form of brief original reports on topical issues in the field of biology and medicine, containing new significant scientific results. Priority articles are published first.

Journal website:<http://www.iramn.ru/journal/bbm_cont.htm>

2. JOURNAL OF GENERAL BIOLOGY. Publishing House: Federal State Unitary Enterprise "Academic Scientific Publishing, Production, Printing and Book Distribution Center of the Russian Academy of Sciences" Publishing House "Nauka". Moscow. Founded in 1940. 6 issues per year. Publishes materials on issues of interest to a wide range of biologists.

Journal website:<http://elementy.ru/genbio>

3. PROBLEMS OF MODERN BIOLOGY. Publishing house: Limited liability company "Publishing house "Sputnik +". Year of foundation: 2011. 4 issues per year. Moscow.

4. SUCCESS IN MODERN BIOLOGY. Publishing House: Federal State Unitary Enterprise "Academic Scientific Publishing, Production, Printing and Book Distribution Center of the Russian Academy of Sciences" Publishing House "Nauka". Year of foundation: 1936. 6 issues. Moscow. HAC.

Journal website:<http://www.maik.ru/cgi-bin/list.pl?page=uspbio>

**7. Modern professional databases and information reference systems**

Internet resources

* Electronic library system "IPRbooks"<http://www.iprbookshop.ru/>
* EBS "Student Advisor"<http://www.studentlibrary.ru/>
* <http://obi.img.ras.ru/humbio/default.htm>
* Site about human biology

**8. Composition of the software**

Windows7 Professional OS OPEN agreement 93592430ZZE1605 License 63588548 (perpetual);

MS Office Standard 2010 Russian Agreement OPEN 93592432ZZE1605 License 63588550 (perpetual);

Kaspersky Endpoint Security for Business Standard, license number 2304-000451-57227148.

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;
* rooms for independent work with Internet access.

Technical training aids

For lectures, a specialized auditorium equipped with the following equipment is used:

* Epson video projector, stulus, console;
* interactive board;
* computer / laptop;
* educational audio and video, animations and presentations;
* a package of applied training programs;
* electronic library of the course;
* demonstration tables.

For laboratory classes, specially equipped

laboratory: "Human Physiology", equipped with presentation equipment (Epson video projector, stulus, remote control, screen, computer / laptop) based on BHF.

Devices and equipment for educational purposes

1. Scales with height meter electronic WB-3000 TANITA.
2. Tonometer AUTOMATIC OMRON MHZ.
3. Scales with stadiometer RGT-160 mechanical floor.
4. Height meter electronic REP.
5. Scales medical VMEN-150 NPV-150 kg, floor, electronic, remote control (from batteries).
6. Dynamometer DMER-120-0.5 electronic manual.
7. Pulse oximeter YUTASOKSI-200.
8. Microscopes.

[MINISTRY OF SCIENCE AND HIGHER EDUCATION](https://minobrnauki.gov.ru/" \t "_blank)

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY"

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

MEDICAL INSTITUTE

Department of Life Safety and Disaster Medicine

WORKING PROGRAMM

EDUCATIONAL DISCIPLINE

"Life Safety"

|  |  |
| --- | --- |
| Direction of training | Biology |
| Code of direction of training | 06.03.01 |
| Training profile | Microbiology |

Grozny, 2022

1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Universal | Self-organization and self-development (including health savings) | UK-8 Able to create and maintain safe living conditions, including in case of emergencies |

1. **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning outcomes by discipline** |
| UK-8 Able to create and maintain safe living conditions, including in case of emergencies | UK-8.1 Complybasic information security requirements | ***Know:***character  the impact of harmful and dangerous factors on humans and the natural environment.  ***Be able to:*** identify the main hazards of the human environment, evaluate  the risk of their implementation.  ***Own:*** legislative and legal acts in the field of safety and environmental protection. |
| UK-8.2 Freely orientated in the choice of rules of conduct in the event of an emergency of natural, man-made or social origin. | ***Know:***  methods of protection against them in relation to the scope of their professional activities; |
| ***Be able to:***  choose methods of protection against dangers in relation to the scope of their professional activities and ways to ensure comfortable living conditions; |
| ***Own:*** safety requirements of technical regulations in the field of professional activity; ways and technologies of protection in emergency situations; conceptual and terminological apparatus in the field of security; skills to rationalize professional activities in order to ensure safety and protect the environment, |
| UK-8.3 Able to provide first aid to the victim. | ***Know:***about emergency conditions, causes and factors that cause them;  on the organizational bases for the provision of first aid in the event of mass lesions;  modern methods of resuscitation; main types of damaging factors, their characteristics and methods of protection |
| ***Be able to:***provide assistance in various, as a rule, emergency situations; |
| ***Own:*** methods of providing first aid for injuries, injuries and other urgent conditions. |
|  | UK - 8.4  Demonstrates knowledge of occupational safety | ***Know:***main types of damaging factors, their characteristics and methods of protection  ***Be able to:***identify possible safety violations in the workplace;  ***Own:*** available ways to eliminate safety violations in the workplace. |

1. **Scope of discipline**

|  |  |  |
| --- | --- | --- |
| ***Types of educational work*** | ***Forms of study*** | |
| ***full-time*** | ***part-time*** |
| **General labor intensity:**credits/hours | 2/72 | 2/72 |
| **Contact work:** | 34 | 28 |
| Lecture-type classes | 17 | 14 |
| Seminar type classes | 17 | 14 |
| Consultations |  |  |
| Intermediate certification: credit / credit with grade / exam | offset | offset |
| **Independent work**(SRS) | 38 | 44 |
| Of which for course work (course project) | - | - |

1. **The content of the discipline,structured by topics / sections indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | General life safety issues | 2 |  | 2 |  |  |  | 4 |
| 2. | General information and characteristics of emergency situations (ES) in peacetime. | 2 |  | 2 |  |  |  | 4 |
| 3. | Ensuring the safety of human life in industrial and residential (domestic)  Wednesday. | 2 |  | 2 |  |  |  | 4 |
| 4. | Ways to protect the population and territories from natural emergencies. | 2 |  | 2 |  |  |  | 4 |
| 5 | Ways of protection against emergency situations of technogenic character. | 2 |  | 2 |  |  |  | 4 |
| 6 | Characteristics of emergencies of a biological and social nature and methods of protection | 2 |  | 2 |  |  |  | 4 |
| 7 | Methods of providing first aid to victims in emergency situations. | 2 |  | 2 |  |  |  | 4 |
| 8 | Characteristics and features of wartime dangers | 2 |  | 2 |  |  |  | 4 |
| 9 | Preparation of the population and economic facilities for protection from emergency situations | 1 |  | 1 |  |  |  | 6 |
|  | Total | 17 |  | 17 |  |  |  | 38 |

4.1.2 Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | General life safety issues | 2 |  | 2 |  |  |  | 4 |
| 2. | General information and characteristics of emergency situations (ES) in peacetime. | 2 |  | 2 |  |  |  | 4 |
| 3. | Ensuring the safety of human life in industrial and residential (domestic)  Wednesday. | 2 |  | 2 |  |  |  | 4 |
| 4. | Ways to protect the population and territories from natural emergencies. | 2 |  | 2 |  |  |  | 4 |
| 5 | Ways of protection against emergency situations of technogenic character. | 2 |  | 2 |  |  |  | 4 |
| 6 | Characteristics of emergencies of a biological and social nature and methods of protection | 2 |  | 2 |  |  |  | 4 |
| 7 | Methods of providing first aid to victims in emergency situations. | 2 |  | 2 |  |  |  | 4 |
| 8 | Characteristics and features of wartime dangers |  |  |  |  |  |  | 8 |
| 9 | Preparation of the population and economic facilities for protection from emergency situations |  |  |  |  |  |  | 8 |
|  | Total | 14 |  | 14 |  |  |  | 44 |

**4.2 The program of the discipline, structured by topics / sections**

4.2.1 Lecture content

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the practical lesson** |
|  | General life safety issues | 1. Tasks and basic concepts of the discipline "Life safety".  2. Biosphere, the place of man in the biosphere.  3. Human environment, characteristics of its factors. Technosphere.  4. Human interaction with the environment. Brief description of human sensory systems.  5. Classification of the main forms of human activity. Features of physical and mental labor  6. Human energy costs in various activities. Fatigue. Occupational Safety and Health.  7. Forecasts of the main dangers on the territory of the Russian Federation.  8. Legal and organizational foundations of the Belarusian Railways. |
|  | General information and characteristics of emergency situations (ES) in peacetime | 1.Emergency situations (ES) in peacetime. Basic concepts and definitions: emergency events, emergency conditions, causes of emergency situations, emergency situations.  2. Phases of emergency development.  3. Classification of emergency situations in peacetime (natural, man-made and biological - social nature).  4.Characteristics and classification of natural emergencies.  5. Characteristics and classification of natural emergencies - lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides);  6. Characteristics and classification of natural emergencies - atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail);  7. Characteristics and classification of natural disasters - hydrospheric (floods, tsunamis, high waters);  8.Man-made emergencies: accidents in transport, chemically hazardous, radiation-hazardous, utility-energy and hydrodynamic facilities.  9. Emergencies of a biological and social nature: biological (infectious and viral diseases), social (terrorism) and environmental threats arising from the fault of a person.  10. Types and means of damaging effects of various emergencies, their classification. |
|  | Ensuring the safety of human life in the industrial and residential (domestic) environment. | 1. Life safety in the working environment: dangerous and harmful factors of the working environment.  2.Features of various forms of labor activity.  3. General sanitary requirementsto the organization of production.  4. Normative safety indicators of technical systems.  5.Methods for improving the safety of technological processes  6. Fatigue and its prevention.  7. Main groups of unfavorable factors of the living environment. |
|  | Ways to protect the population and territories from natural emergencies | 1. A set of measures to protect the population and territories from natural emergencies.  2. Observation and control over the state of the natural environment and potentially dangerous objects.  3. Organization of notification of the population in emergency situations (ES).  4. The order of actions on the signal "Attention everyone!"  5.Organization and conduct of evacuation activities.  6. Engineering protection of the population;  7. Medical measures;  8. Training of the population in the field of protection against emergency situations.  9. Methods of protection against lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides) natural emergencies:  10. Methods of protection against atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail) natural emergencies;  11. Methods of protection against hydrospheric (floods, floods, tsunamis) natural emergencies. |
|  | Ways of protection against emergency situations of technogenic character. | 1. A set of measures to protect the population and territories from man-made emergencies.  2. Methods of protection against man-made emergencies - accidents in transport (rail, road, air, water, metro).  3. Methods of protection against technogenic emergencies - accidents at chemically hazardous facilities (CHOO).  4. Methods of protection against man-made emergencies - accidents at radiation hazardous facilities (ROO).  5. Methods of protection against man-made emergencies - accidents in utility networks.  6. Methods of protection against man-made emergencies - accidents at fire and explosive objects.  7. Methods of protection against man-made emergencies - accidents at hydrodynamic hazardous facilities. |
|  | Characteristics of emergencies of a biological and social nature and methods of protection | 1. Classification and characteristics of emergency situations (ES) of a biological and social nature.  2. Infectious diseases (diseases of humans and animals, plant diseases and pests).  3.Ecological threats arising from the fault of man.  4.Emergency situations of a socio-political and military-political nature.  5. Terrorist acts  6. Characteristics of the main social dangers:  7. Causes and prevention of violence, cruel and aggressive behavior;  8. Prevention of national and religious intolerance among the population;  9. Causes and prevention of suicidal behavior;  10. Oppositiondrug addiction, alcoholism and smoking. |
|  | Methods of providing first aid to victims in emergency situations. | 1.Basic techniques and principles for providing first medical (pre-medical) care to those affected in an emergency.  2. First aid for poisoning with potent toxic substances.  3. First aid for injuries  4. First aid for bleeding,  5. First aid for dislocations and fractures of bones, bruises and sprains.  6. First aid for burns.  7. First aid for frostbite.  8. First aid for electrical injuries and drowning.  9. First aid for fainting  10. First medical and psychological assistance to victims of terrorist acts. |
|  | Characteristics and features of wartime dangers | 1.Civil defense of wartime  2. General characteristics of nuclear weapons  3. Damaging factors of a nuclear explosion: air shock wave, light radiation, penetrating radiation, radioactive contamination, electromagnetic pulse.  4. General characteristics of biological weapons  5. The main types of pathogens of infectious diseases and the features of their damaging effect  6. Poisoning with chemical warfare agents (CW)  7.Liquidation of the consequences of emergency situations |
|  | Preparation of the population and objects of the economy for protection from emergency situations. | 1.Basic principles and methods of protecting the population in emergency situations.  2. Personal protective equipment, their characteristics.  3. Preparation of objects of the economy for protection from emergency situations.  4. Place and role of the object commission for emergencies. |

4.2.2 Content of practical exercises

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the practical lesson** |
| 1 | General life safety issues | 1. Tasks and basic concepts of the discipline "Life safety".  2. Biosphere, the place of man in the biosphere.  3. Human environment, characteristics of its factors. Technosphere.  4. Human interaction with the environment. Brief description of human sensory systems.  5. Classification of the main forms of human activity. Features of physical and mental labor  6. Human energy costs in various activities. Fatigue. Occupational Safety and Health.  7. Forecasts of the main dangers on the territory of the Russian Federation.  8. Legal and organizational foundations of the Belarusian Railways. |
| 2 | General information and characteristics of emergency situations (ES) in peacetime | 1.Emergency situations (ES) in peacetime. Basic concepts and definitions: emergency events, emergency conditions, causes of emergency situations, emergency situations.  2. Phases of emergency development.  3. Classification of emergency situations in peacetime (natural, man-made and biological - social nature).  4.Characteristics and classification of natural emergencies.  5. Characteristics and classification of natural emergencies - lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides);  6. Characteristics and classification of natural emergencies - atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail);  7. Characteristics and classification of natural disasters - hydrospheric (floods, tsunamis, high waters);  8.Man-made emergencies: accidents in transport, chemically hazardous, radiation-hazardous, utility-energy and hydrodynamic facilities.  9. Emergencies of a biological and social nature: biological (infectious and viral diseases), social (terrorism) and environmental threats arising from the fault of a person.  10. Types and means of damaging effects of various emergencies, their classification. |
| 3 | Ensuring the safety of human life in the industrial and residential (domestic) environment. | 1. Life safety in the working environment: dangerous and harmful factors of the working environment.  2.Features of various forms of labor activity.  3. General sanitary requirementsto the organization of production.  4. Normative safety indicators of technical systems.  5.Methods for improving the safety of technological processes  6. Fatigue and its prevention.  7. Main groups of unfavorable factors of the living environment. |
| 4 | Ways to protect the population and territories from natural emergencies | 1. A set of measures to protect the population and territories from natural emergencies.  2. Observation and control over the state of the natural environment and potentially dangerous objects.  3. Organization of notification of the population in emergency situations (ES).  4. The order of actions on the signal "Attention everyone!"  5.Organization and conduct of evacuation activities.  6. Engineering protection of the population;  7. Medical measures;  8. Training of the population in the field of protection against emergency situations.  9. Methods of protection against lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides) natural emergencies:  10. Methods of protection against atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail) natural emergencies;  11. Methods of protection against hydrospheric (floods, floods, tsunamis) natural emergencies. |
| 5 | Ways of protection against emergency situations of technogenic character. | 1. A set of measures to protect the population and territories from man-made emergencies.  2. Methods of protection against man-made emergencies - accidents in transport (rail, road, air, water, metro).  3. Methods of protection against technogenic emergencies - accidents at chemically hazardous facilities (CHOO).  4. Methods of protection against man-made emergencies - accidents at radiation hazardous facilities (ROO).  5. Methods of protection against man-made emergencies - accidents in utility networks.  6. Methods of protection against man-made emergencies - accidents at fire and explosive objects.  7. Methods of protection against man-made emergencies - accidents at hydrodynamic hazardous facilities. |
| 6 | Characteristics of emergencies of a biological and social nature and methods of protection | 1. Classification and characteristics of emergency situations (ES) of a biological and social nature.  2. Infectious diseases (diseases of humans and animals, plant diseases and pests).  3.Ecological threats arising from the fault of man.  4.Emergency situations of a socio-political and military-political nature.  5. Terrorist acts  6. Characteristics of the main social dangers:  7. Causes and prevention of violence, cruel and aggressive behavior;  8. Prevention of national and religious intolerance among the population;  9. Causes and prevention of suicidal behavior;  10. Oppositiondrug addiction, alcoholism and smoking. |
| 7 | Methods of providing first aid to victims in emergency situations. | 1.Basic techniques and principles for providing first medical (pre-medical) care to those affected in an emergency.  2. First aid for poisoning with potent toxic substances.  3. First aid for injuries  4. First aid for bleeding,  5. First aid for dislocations and fractures of bones, bruises and sprains.  6. First aid for burns.  7. First aid for frostbite.  8. First aid for electrical injuries and drowning.  9. First aid for fainting  10. First medical and psychological assistance to victims of terrorist acts. |
| 8 | Characteristics and features of wartime dangers | 1.Civil defense of wartime  2. General characteristics of nuclear weapons  3. Damaging factors of a nuclear explosion: air shock wave, light radiation, penetrating radiation, radioactive contamination, electromagnetic pulse.  4. General characteristics of biological weapons  5. The main types of pathogens of infectious diseases and the features of their damaging effect  6. Poisoning with chemical warfare agents (CW)  7.Liquidation of the consequences of emergency situations |
| 9 | Preparation of the population and objects of the economy for protection from emergency situations. | 1.Basic principles and methods of protecting the population in emergency situations.  2. Personal protective equipment, their characteristics.  3. Preparation of objects of the economy for protection from emergency situations.  4. Place and role of the object commission for emergencies. |

1. **Fund of assessment tools for certification of students in the discipline**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

**5.1. Passport of the fund of evaluation funds for the current certification in the discipline (module)**

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled sections of the discipline** | **Name of the evaluation tool** |
| 1 | General life safety issues | Oral answer, testing, situational tasks. |
| 2 | General information and characteristics of emergency situations (ES) in peacetime | Oral answer, testing, situational tasks. |
| 3 | Ensuring the safety of human life in the industrial and residential (domestic) environment. | Oral answer, testing, situational tasks. |
| 4 | Ways to protect the population and territories from natural emergencies | Oral answer, testing, situational tasks. |
| 5 | Ways of protection against emergency situations of technogenic character. | Oral answer, testing, situational tasks. |
| 6 | Characteristics of emergencies of a biological and social nature and methods of protection | Oral answer, testing, situational tasks. |
| 7 | Methods of providing first aid to victims in emergency situations. | Oral answer, testing, situational tasks. |
| 8 | Characteristics and features of wartime dangers | Oral answer, testing, situational tasks. |
| 9 | Preparation of the population and economic facilities for protection from emergency situations | Oral answer, testing, situational tasks. |

**5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control**

**Questions for current control on topics and sections of the discipline (sample):**

1. Tasks and basic concepts of the discipline "Life safety".

2. Biosphere, the place of man in the biosphere.

3. Human environment, characteristics of its factors. Technosphere.

4. Human interaction with the environment. Brief description of human sensory systems.

5. Classification of the main forms of human activity. Features of physical and mental labor

6. Human energy costs in various activities. Fatigue. Occupational Safety and Health.

7. Forecasts of the main dangers on the territory of the Russian Federation.

8. Legal and organizational foundations of the Belarusian Railways.

**Sample test task**

1. In case of approaching tornadoes, residents of settlements for their protection:

- occupy attics

- stay in the building

- leaving the premises

+: occupy basements

2. A method that does not take place when searching for victims:

**-:**cynological

+: photography

-: technical

- interviewing eyewitnesses

3. Spheres of occurrence of emergency situations:

**-:**air, atmospheric, oxygen

-: territorial, regional, federal

- household, personal, public

+: social, natural, technogenic

4. By scale, landslides are classified into

**+:**large, medium, small scale

-: fragile, ice, water

-: earthy, light, heavy

- solar, wind, rain

**Questions to set off:**

1. Tasks and basic concepts of the discipline "Life safety".

2. Biosphere, the place of man in the biosphere.

3. Human environment, characteristics of its factors. Technosphere.

4. Human interaction with the environment. Brief description of human sensory systems.

5. Classification of the main forms of human activity. Features of physical and mental labor

6. Human energy costs in various activities. Fatigue. Occupational Safety and Health.

7. Forecasts of the main dangers on the territory of the Russian Federation.

8. Legal and organizational foundations of the Belarusian Railways.

9.Emergency situations (ES) in peacetime. Basic concepts and definitions: emergency events, emergency conditions, causes of emergency situations, emergency situations.

10. Phases of emergency development.

11. Classification of emergency situations in peacetime (natural, man-made and biological - social nature).

12.Characteristics and classification of natural emergencies.

13Characteristics and classification of natural emergencies - lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides);

14Characteristics and classification of natural emergencies - atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail);

15Characteristics and classification of natural emergencies - hydrospheric (floods, tsunamis, high waters);

16.Man-made emergencies: accidents in transport, chemically hazardous, radiation-hazardous, utility-energy and hydrodynamic facilities.

17. Emergencies of a biological and social nature: biological (infectious and viral diseases), social (terrorism) and environmental threats arising from the fault of a person.

18. Types and means of damaging effects of various emergencies, their classification.

19. Life safety in the working environment: dangerous and harmful factors of the working environment.

20.Features of various forms of labor activity.

21. General sanitary requirementsto the organization of production.

22. Normative safety indicators of technical systems

23.Methods for improving the safety of technological processes

24. Fatigue and measures for its prevention.

25. Main groups of adverse factors of the living environment.

26. A set of measures to protect the population and territories from natural emergencies.

27. Observation and control over the state of the natural environment and potentially dangerous objects.

28. Organization of notification of the population in emergency situations (ES).

29. The order of actions on the signal "Attention everyone!"

30. Organization and conduct of evacuation activities.

31. Engineering protection of the population;

32. Medical measures;

33. Training of the population in the field of protection against emergency situations.

34. Methods of protection against lithospheric (earthquakes, mudflows, avalanches, volcanic eruptions, landslides) natural emergencies:

35 Methods of protection against atmospheric (hurricanes, storms, tornadoes, snowstorms, tornadoes, showers, hail) natural emergencies;

36 Methods of protection against hydrospheric (floods, floods, tsunamis) natural emergencies.

37. A set of measures to protect the population and territories from man-made emergencies.

38. Methods of protection against man-made emergencies - accidents in transport (rail, road, air, water, metro).

39. Methods of protection against man-made emergencies - accidents at chemically hazardous facilities (CHOO).

40. Methods of protection against man-made emergencies - accidents at radiation hazardous facilities (ROO).

41. Methods of protection against man-made emergencies - accidents in utility networks.

42. Methods of protection against man-made emergencies - accidents at fire and explosive objects.

43. Methods of protection against man-made emergencies - accidents at hydrodynamic hazardous facilities.

44. Classification and characteristics of emergency situations (ES) of a biological and social nature.

45. Infectious diseases (diseases of humans and animals, diseases and pests of plants).

46. ​​Ecological threats arising from the fault of man.

47. Emergency situations of a socio-political and military-political nature.

48. Terrorist acts

49. Characteristics of the main social dangers:

50 Causes and prevention of violence, cruel and aggressive behavior;

51. Prevention of national and religious intolerance among the population;

52 Causes and prevention of suicidal behavior;

53. Oppositiondrug addiction, alcoholism and smoking.

54. Basic techniques and principles for providing first medical (pre-medical) care to those affected in an emergency.

55. First aid for poisoning with potent toxic substances.

56. First aid for wounds

57. First aid for bleeding,

58. First aid for dislocations and fractures of bones, bruises and sprains.

59. First aid for burns.

60. First aid for frostbite.

61. First aid for electrical injuries and drowning.

62. First aid for fainting

63. First medical and psychological assistance to victims of terrorist acts.

64. Civil defense of wartime

65. General characteristics of nuclear weapons

66. Damaging factors of a nuclear explosion: air shock wave, light radiation, penetrating radiation, radioactive contamination, electromagnetic pulse.

67. General characteristics of biological weapons

68. The main types of pathogens of infectious diseases and features of their damaging effect

69. Poisoning by chemical warfare agents (CW)

70. Personal protective equipment, their characteristics.

71. Preparation of objects of the economy for protection against emergency situations.

72. Place and role of the object commission for emergencies.

**5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience**

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**6.1 Basic educational literature**

1. Life safety: Textbook for universities / S.V. Belov, V.A. Devisilov, A.V. Ilnitskaya, and others; Under the general editorship of S.V. Belova. - 8th edition, stereotypical - M .: Higher School, 2009. - 616 p. : ill.

2. Life safety and environmental protection (technosphere safety).Textbook for bachelors / S.V. Belov .. - 4th edition, revised. And extra. - M.: Yurayt Publishing House: ID Yurayt, 2013.- 682 p. – Series: bachelor.Basic eurs.

3.V.A. Akimov.Life safety. Safety in emergency situations of natural and man-made nature: Textbook / V.A. Akimov, Yu.L. Vorobyov, M.I. Faleev and others. 2nd edition, revised - M .: Higher School, 2007. -379p.

**6.2 Additional educational literature:**

1. Analysis of the risk assessment of production activities.Textbook / P.P. Kukin, V.N. Shlykov, N.L. Ponomarev, N.I. Serdyuk. - M .: Higher School, 2007. - 328 p.: ill.

2. Life safety. Safety of technological processes and productions. Occupational Safety and Health:Textbook for universities / P.P.[.Kukin,](http://shop.top-kniga.ru/persons/in/1968/)V.L[.Lapin,](http://shop.top-kniga.ru/persons/in/1969/)N.L.[Ponomarev. -](http://shop.top-kniga.ru/persons/in/1970/)Ed. 4th, revised. - M.: Higher school, 2007. - 335 p.: ill.

3.Life safety:Textbook for universities / Zanko N.G., Malayan K.R., Rusak O.N. - 12th edition, trans. and additional - St. Petersburg. : Lan, 2008 . - 672 p. : ill.

4.Life safety:Textbook for universities (under the editorship of Arustamov E.A.) 12th edition, revised, additional. - M.: Dashkov i K, 2007.- 420 p.

5.B.S. MastryukovDangerous situations of technogenic nature and protection against them. Textbook for universities / 6.B.S. Mastryukov. - M.: Academy, 2009. - 320 p.: ill.

7.B.S. MastryukovSafety in emergency situations. - Ed. 5th, revised - M.: Academy, 2008.- 334 p.: ill.

8.V.N. BashkinEcological risks: calculation, management, insurance: Textbook / V.N. Bashkin. - M .: Higher School, 2007. - 360 s: ill

9.Devisilov V.A.Occupational safety: textbook / V.A. Devisilov. - 4th ed., revised. and additional -M.: FORUM, 2009. -496 p.: ill. - (Professional education). - 592 p: ill.

10.E.V. GlebovaIndustrial sanitation and occupational health: Textbook for universities / E.V. Glebov. - 2nd edition, revised and supplemented - M: Higher School, 2007. - 382 p.: ill.

11. The human factor in ensuring safety and labor protection:Textbook / P.P. Kukin, N.L. Ponomarev, V.M. Popov, N.I. Serdyuk. - M .: Higher school, 2008. — 317 p.: ill.

**7. Periodicals**

Life Safety Journal

Journal "Labor safety in industry"

Journal "Labor protection and social insurance"

Journal "Handbook of labor protection specialist"

Journal "Technology of technosphere safety"

**8. Modern professional databases and information reference systems**

1. [**Chronicles of disasters: wonders of the world and nature**](http://www.school.edu.ru/catalog.asp?cat_ob_no=10&ob_no=7630&oll.ob_no_to=).  
   [*http://chronicl.chat.ru/security.htm*](http://chronicl.chat.ru/security.htm)
2. [**Rules of the road of the Russian Federation**](http://www.school.edu.ru/catalog.asp?cat_ob_no=10&ob_no=18342&oll.ob_no_to=).  
   [*http://www.shkolnik.ru/books/pdd/index.shtml*](http://www.school.edu.ru/click.asp?url=http%3A%2F%2Fwww%2Eshkolnik%2Eru%2Fbooks%2Fpdd%2Findex%2Eshtml)
3. [**Safety. Education. Man: information portal**](http://www.school.edu.ru/catalog.asp?cat_ob_no=10&ob_no=56696&oll.ob_no_to=)  
   [*http://www.bezopasnost.edu66.ru*](http://www.school.edu.ru/click.asp?url=http%3A%2F%2Fwww%2Ebezopasnost%2Eedu66%2Eru)
4. [**Safety and Health: Technology and Training**](http://www.school.edu.ru/catalog.asp?cat_ob_no=10&ob_no=55301&oll.ob_no_to=)  
   [*http://risk-net.ru*](http://www.school.edu.ru/click.asp?url=http%3A%2F%2Frisk%2Dnet%2Eru)
5. **Information site "Evacuation in case of fire"**
6. <http://www.fireevacuation.ru/pravila-povedeniya.php>
7. <http://www.alleng.ru/edu/saf3.htm>
8. <http://www.job-portal.ru/doc/view-439.html>
9. <http://artpb.ru/stats/stat7.html>
10. <http://www.tehbez.ru/>
11. [http://www.method](http://www.metod)– kopilka.ru/page –1 –2 –2.html
12. <http://promeco.h1.ru/lek/bgd>12.shtml

**9.Equipment and teaching aids**

FGBOU HE "Chechen State University" has a material and technical base that provides for all types of disciplinary and interdisciplinary training, has access to global electronic communication networks. The educational process takes place in classrooms for lecture and practical classes. Premises for lectures, practical classes are equipped with specialized educational furniture, technical means that serve to present educational information to students.

**10. Modern professional databases and information reference systems**

Official website of the company "ConsultantPlus" http://www.consultant.ru/

Information and legal portal "Garant" - http://base.garant.ru/

Guests, standards, regulations. – http://www.gostrf.com/

Professional standards: software and hardware complex. Register of professional standards - http://profstandart.rosmintrud.ru/obshchiy-informatsionnyy-blok/natsionalnyy-reestr-professionalnykh-standartov/reestr-professionalnykh-standartov/

Electronic educational environment of the university(http://www.chgu.org)

Electronic library system IPRBooks([http://www.iprbookshop.ru](http://www.iprbookshop.ru/))

Multidisciplinary educational resource "Student Advisor" (http://www.studentlibrary.ru)

Electronic library system "IVIS" (http://ivis.ru)

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY" \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

FACULTY OF HISTORY

Department "History and culture of the peoples of Chechnya"

**WORKING PROGRAMM**

**EDUCATIONAL DISCIPLINE**

**"History of the Chechen Republic"**

|  |  |
| --- | --- |
| Direction of training | Biology |
| Code of direction of training | 06.03.01 |
| Training profile | Physiology |

**1.Goals and objectives of mastering the discipline**

**aim**mastering the discipline "History of the Chechen Republic" is - the formation of students' holistic view of the complex processes of socio-economic, political and cultural development of the Chechen society in the context of the history of world and national history.

**Tasks:**

- show the place of the history of Chechnya in world history and the history of the Fatherland;

- trace, starting from ancient times, the main stages and patterns of the historical development of the Chechen people;

- identify and show the main directions that indicate that the Chechens are one of the most ancient peoples of the Caucasus, who played a prominent role in the ethnic, socio-economic, confessional and cultural development of the region;

- formation of competencies necessary forwork in a team, tolerantly perceiving social, ethnic, confessional and cultural differences.

**2. The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| UK | Demonstrates a tolerant perception of social, religious and cultural differences, respectful and careful attitude to the historical heritage and cultural traditions. (UK-5.1).  Shows in his behavior a respectful attitude to the historical heritage and socio-cultural traditions of various social groups, based on knowledge of the stages of Russia's historical development in the context of world history and cultural traditions of the world.  (UK-5.3). | *Know:*  the main stages and patterns of development of the history of Chechnya;  - navigate in historical scientific publications on the main stages of the historical development of the region and their theoretical provisions;  *Be able to:*to apply in the study of the main stages and patterns of the historical development of Chechnya, knowledge and skills in the methodology of searching, systematizing, analyzing and researching various sources;  *Own:*historical basic information on the main stages and patterns of historical development; skills of argumentation, discussion on key issues of regional history. |

1. **Scope of discipline**

|  |  |  |
| --- | --- | --- |
| ***Types of educational work*** | ***Forms of study*** | |
| ***full-time*** |  |
| **General labor intensity:**credits/hours | 3/108 |  |
| **Contact work:** | 68 |  |
| Lecture-type classes | 34 |  |
| Seminar type classes | 34 |  |
| Consultations |  |  |
| Intermediate certification: credit / credit with grade / exam | offset |  |
| **Independent work**(SRS) | 40 |  |
| Of which for course work (course project) | - |  |

1. **The content of the discipline,structured by topics / sections indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | **SR** |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| ***Lectures*** | ***Other training sessions*** | ***Practical lessons*** | ***Seminar***  ***classes*** | ***Laboratory***  ***work*** | ***Other activities*** |
| 1 | Chechnya from ancient times to the XVIII century. | 4 |  | 4 |  |  |  | 10 |
| 1.1 | Chechnya in antiquity and in the Middle Ages. | 2 |  | 2 |  |  |  |  |
| 1.2 | Chechnya inXVI-XVIII centuries | 2 |  | 2 |  |  |  |  |
| 2 | Chechnya in the 19th century. | 5 |  | 5 |  |  |  | 10 |
| 2.1 | Chechnya in the first half of the 19th century. | 3 |  | 3 |  |  |  |  |
| 2.2 | Chechnya in the second half of the 19th century. | 2 |  | 2 |  |  |  |  |
| 3 | Chechnya in the XX century. | 6 |  | 6 |  |  |  | 10 |
| 3.1 | Chechnya at the beginningXX century. | 2 |  | 2 |  |  |  |  |
| 3.2 | Chechnya during the Great Patriotic War | 2 |  | 2 |  |  |  |  |
| 3.3 | Chechen-Ingush Autonomous Soviet Socialist Republic in the years of perestroika. | 2 |  | 2 |  |  |  |  |
| 4 | Chechen Republic at the turn of the XX-XXI centuries. | 2 |  | 2 |  |  |  | 10 |
| 4.1 | Chechnya during the two "Chechen" wars | 2 |  | 2 |  |  |  |  |

**4.2 The program of the discipline, structured by topics / sections**

4.2.1 Lecture content

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | **Chechnya from ancient times to the XVIII century.** | |
| 1.1 | Chechnya in antiquity and in the Middle Ages. | The subject, tasks and problems of the course of the history of Chechnya.  Chechnya in the era of the primitive communal system.  Nakhi and the steppe world. Alan early feudal state in the North Caucasus.  Tatar-Mongol invasion and the struggle of the Chechens for independence. The invasion of Tamerlane and the struggle for independence. |
| 1.2 | Chechnya inXVI-XVIII centuries | Territory, population, economic activities.  Socio-political and social system of Chechnya.  People's liberation struggle in Chechnya and the North Caucasus under the leadership of Imam Mansur in 1785-1791.  Culture and life of the peoples of Chechnya. |
| **2** | **Chechnya in the 19th century** | |
| 2.1 | Chechnya in the first half of the 19th century. | Socio-political development and social system. B. Taimiev. Chechnya during Yermolov's governorship. People's liberation movement of the highlanders of Chechnya and Dagestan in the 30-50s. 19th century  Resettlement of Chechens to the territory of the Ottoman Empire. |
| **3** | **Chechnya in the 20th century** | |
| 3.1 | Chechnya at the beginningXX century. | Socio-economic and political development of Chechnya at the beginning of the 20th century.  Chechnya during the revolution of 1905-1907. and the First World War.  Chechnya in the Revolutions of 1917 and the Civil War.  Chechnya in the period of "socialist" modernizations (20-40s) |
| 3.2 | Chechnya during the Great Patriotic War. | The restructuring of the national economy on a war footing.  The exploits of the soldiers of Checheno-Ingushetia on the fronts of the Second World War.  Liquidation of the CHIASSR and deportation of Chechens and Ingush. Life in the conditions of "special settlement".  XX Congress of the CPSU and the restoration of the CHIASSR.  Culture, education and science in the CHIASSR in the 60-80s. |
| 3.3. | Chechen-Ingush Autonomous Soviet Socialist Republic in the years of perestroika. | The development of glasnost and democracy and the restructuring of the social and political life of the republic.  The course for the recovery of the economy. New forms of organization of labor activity.  Political struggle in Checheno-Ingushetia in the years of perestroika. |
| 4 | Chechnya at the turn of the XX-XXI centuries. | Causes of the Chechen crisis.  Chechnya during the first Chechen war 1994-1996.  Military operations in 1999-2000  The activities of the leadership of the Republic to stop hostilities and restore the economy and social sphere. Strengthening political stability and accelerating recovery processes. |
|  |  |  |

4.2.2 Content of practical exercises

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (section) of the discipline** | **The content of the practical lesson** |
| 1 | **Chechnya from ancient times to the XVIII century.** | |
| 1.1 | **Chechnya in antiquity and in the Middle Ages.** | Chechnya in the period of the primitive communal system. Nomads and Chechnya in the 7th century BC - IV century AD  Alan early feudal state and Chechens.  Khazars and Chechens.  Material and spiritual culture of Chechnya in the Middle Ages  Tatar-Mongol invasion and the struggle of the Chechens for independence. The invasion of Tamerlane and the struggle for independence. |
| 1.2 | **Chechnya inXVI-XVIII centuries**. | Ethnic map of Chechnya in the XVI-XVIII centuries: territory, population. Basic business activities.  Chechnya in international relations in the XVI-XVIII centuries.  Socio-political and social system of Chechnya.  People's liberation struggle in Chechnya and the North Caucasus under the leadership of Imam Mansur in 1785-1791.  Material and spiritual culture of Chechnya in the XVI-XVIII centuries. |
| **2** | **Chechnya in the 19th century.** | |
| 2.1 | **Chechnya in the first half of the 19th century.** | Socio-political development and social system. Chechnya in Russian policy in the Caucasus.  Campaign of General Bulgakov (1807). Chechnya during Yermolov's governorship. The offensive of tsarism on Chechnya (1818-1820). B. Taimiev.  People's liberation movement in the North-Eastern Caucasus in the 30-50s. XIX century. |
| 2.2 | **Chechnya in the second halfXIX century.** | Reforms in Chechnya in the 60-90s. XIX century.  Socio-political events in Chechnya in the post-reform period. Integration of the region into the economic system of Russia (60-90s)19th century).  Culture and life of Chechnya in the XIX century. Muhajirism. |
| **3** | **Chechnya in the 20th century** | |
| 3.1 | **Chechnya at the beginningXX century.** | Socio-economic development of Chechnya at the beginning of the 20th century. Development of capitalist relations in rural areas of the region.  Development of the Grozny oil region at the beginning of the 20th century.  Chechnya in the first Russian bourgeois-democratic revolution of 1905-1907.  Our region during the First World War.  Chechnya in the revolutions of 1917. The civil war and the struggle of the Chechens against the White Guard of Denikin.  State and cultural construction in the 20-30s. XX century. Collectivization and repression in Chechnya in the 30s of the XX century. |
| 3.2. | **Chechnya during the Great Patriotic War**. | CHIASSR on the eve of the Great Patriotic War.  The restructuring of the national economy on a war footing.  The exploits of the soldiers of Checheno-Ingushetia on the fronts of the Second World War.  Falsification of the history of Checheno-Ingushetia during the Great Patriotic War.  Deportation of Chechens and Ingush. Life in the conditions of "special settlement". |
| 3.3. | **Chechnya in 1959-1990** | XXth Congress of the CPSU and the rehabilitation of the Chechen people. Restoration of the CHIASSR. Industry, agriculture, culture, education and science in Chechnya in the 60-80s.  Socio-political situation in Chechnya in the 2nd half. 80s XX century.  National Congress of the Chechen people. Further intensification of the struggle for political power in the republic. |
| 4 | **Chechnya at the turn of the XX-XXI centuries.** | |
| 4.1. | **Chechnya during the "two" Chechen wars** | Causes of the Chechen crisis. Chechnya during the military operations of 1994-1996. Khasavyurt agreements.  Military operations in Chechnya in 1999-2000 Formation of federal and republican authorities. The activities of the leadership of the Republic to stop hostilities and restore the economy and social sphere. Strengthening political stability and accelerating recovery processes. |

1. **Fund of assessment tools for certification of students in the discipline**

The following types of quality control for mastering a particular discipline are provided:

– ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled Sections** | **Name of the evaluation tool** |
| 1. | Chechnya from ancient times to the XVIII century. | Oral survey, informational report, |
| 2. | Chechnya in the 19th century. | Oral survey, informational report, |
| 3. | Chechnya in the XX century. | Oral survey, informational report, |
| 4. | Chechen Republic at the turn of the XX-XXI centuries. | Oral survey, informational report, |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

**Questions for the exam:**

1. Subject, sources and periodization of the history of Chechnya.

2. Chechnya at the end of the Bronze and Early Iron Ages (Scythians, Sarmatians).

3. Chechnya in the 7th century BC. - IV century. AD

4. Chechnya as part of the Alanian early feudal state.

5. Chechnya on the eve of the Mongol invasion.

6. The struggle of the Chechens against the Genghisides.

7. Tamerlane's invasion of the North Caucasus and the struggle of his peoples for independence.

8. Material and spiritual culture of Chechnya in the XIII-XV centuries.

9. Chechens on the ethnic map of the Caucasus. The boundaries of the Chechen settlement in the XVI-XVIII centuries.

10. Socio-economic and political structure of the Chechens in the XVI-XVIII centuries.

11. Movement of Sheikh Mansur (1785-1791) in the North Caucasus.

12. Material culture of Chechnya (XVI-XVIII centuries).

13. Spiritual culture of the Chechens (XVI-XVIII centuries).

14. Social and family life. (XVI-XVIII centuries).

15. Strengthening the colonial policy of Russia in the North Caucasus and Chechnya (1st half of the 19th century).

16. Yermolov and his policy in Chechnya.

17. People's liberation movement in Chechnya in the 1st third of the 19th century.

18. Chechnya during the Caucasian War.

19.Administrative, judicial and agrarian reforms in Chechnya in the 2nd half. 19th century

20.Kunta-hadji and his teaching "dhikr". "Zikrists".

21. The participation of Chechens in the Russian-Turkish war of 1877-1878.

22. Uprising in Chechnya and Dagestan in 1877-78.

23. Socio-economic and political situation in Chechnya at the beginning of the twentieth century.

24.Activization of the peasant movement. Abrechestvo (early 20th century).

25. Development of industry in Chechnya in the conditions of monopolization (beginning of the 20th century).

26. Revolutionary movement in Chechnya in 1905-1907.

27. Chechnya during the First World War.

28. Chechnya in the revolutions of 1917

29.October revolution of 1917 and Chechnya.

30. Chechnya and the civil war.

31. Mountain Republic and Chechnya.

32. Chechnya during the period of restoration of the national economy (1920-1925).

33. Chechnya during the years of industrialization.

34. Cultural construction in 1920-1945.

35. State construction in Chechnya in the 20-30s. 20th century

36. Repressions in Chechnya in the 30s. XX century.

37. Chechnya in the prewar years (1938-1941).

38. Checheno-Ingushetia during the Great Patriotic War.

39. Culture and education of Chechnya during the Great Patriotic War.

40. Deportation of Chechens and Ingush.

41. Life of the deportees in the “special settlement”.

42. Chechens on the fronts of the Great Patriotic War.

43.XX Congress of the CPSU and the restoration of the CHIASSR.

44. Checheno-Ingushetia in the late 50s - early 60s. XX century.

45. Industrial construction in the CHIASSR in the 60-80s. XX century.

46. ​​Cultural development of the republic in the 60-80s. 20th century

47. Development of agriculture of the republic in the 70-80s. 20th century

48. Chechnya during the years of perestroika (1985-90).

49. Socio-political situation in the country and in Chechnya in the early 90s. 20th century

50. National Congress of the Chechen people (November 1990). The struggle for political power in the republic.

51. The entry of troops into the territory of the Chechen Republic and the hostilities of 1994-1995. Establishing "constitutional order".

52.Khasav-Yurt agreements. Strengthening of the socio-economic and political crisis in 1996-1999.

53. Military operations on the territory of Chechnya 1999-2001

54. Consequences of two wars in one decade for Chechnya.

55. Chechnya in the post-war period (economy, culture, social sphere).

56. Spiritual crisis of the Chechen society - as a result of two destructive wars.

57. Formation of federal and republican authorities (2000).

58. Activities of the Chechen Republic, headed by A.-Kh.A. Kadyrov.

59. Election of R.A. Kadyrov President of the Chechen Republic.

60.Strengthening political stability and accelerating recovery processes.

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) experience.

**Guidelines for preparing for the exam:**

When preparing for the exam, it is necessary to use educational and methodological materials on the discipline "History of the Chechen Republic”, lecture materials, recommended textbooks, training and reference manuals, notes in a workbook to prepare for practical exercises. Preparation for the exam should be carried out systematically. When repeating the educational material, it is necessary to focus on the list of questions for the exam.

It is advisable to plan answers for each question.

When answering the exam, you should avoid repetition, excessive verbosity and the involvement of materials that are not related to this issue. When presenting the material, it is necessary to use the concepts studied within the framework of this discipline. When using actual data, attention should be paid to the fact that they correspond to the stated theoretical provisions.

**Scales and evaluation criteria:**

|  |  |
| --- | --- |
| Grade | Criteria |
|  | |
| "Great" | An “excellent” mark is given to a student if he has deeply and firmly mastered the program material, sets it out exhaustively, consistently, clearly and logically, is able to closely link theory with practice, freely copes with tasks, questions and other types of application of knowledge, and does not find it difficult to answer when modifying the task, uses in the answer the material of various literary sources, possesses versatile skills and techniques for performing practical tasks |
| "Fine" | A “good” grade is given to a student if he knows the material well, presents it competently and to the point, does not allow significant inaccuracies in answering the question, correctly applies theoretical provisions in solving practical issues and tasks, possesses the necessary skills and techniques for their implementation |
| "Satisfactorily" | The grade "satisfactory" is given to the student if he has knowledge only of the basic material, but has not mastered its details, allows inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of the program material, and has difficulty performing practical work. |
| "Unsatisfactory" | The “unsatisfactory” mark is given to a student who does not know a significant part of the program material, makes significant mistakes, performs practical work uncertainly, with great difficulty. |

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Report with presentation**

The report with the presentation is aimed at stimulating the student's educational and cognitive activity with a pronounced heuristic orientation (search, selection and systematization of information about the object, its design for presentation).

The presentation is made in Power Point. Slides should be a visual reflection of the content of the work on the topic.

- The first slide should contain the following information: the topic of the report, the name of the author.

- The second slide contains text containing the purpose of the report.

- Subsequent slides may contain diagrams, pictures, short text, photographs with titles and, if necessary, explanations for them.

The text on the slides should be short. It can be used in slide titles, to explain illustrations, or to provide brief textual information.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, and does not answer questions.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline**

1.Electronic library system:[www.iprbookshop.ru](http://www.iprbookshop.ru)Student Advisor: www. studmedlib.ru

2.History of Chechnya from ancient times to the present day. In 2 volumes. T.1. History of Chechnya from ancient times to the end of the XIX century. Grozny, 2006. - 828 p.<https://elibrary.ru/item.asp?id=21678449>

3.History of Chechnya from ancient times to the present day. In 2 volumes, Vol. 2. History of Chechnya in the 20th and early 21st centuries. Grozny, 2008. - 832 p.<https://elibrary.ru/item.asp?id=21678449>

4. Actual problems of the history of Chechnya. Grozny, 2011.<https://www.dissercat.com/content/chechnya-v-30-50-e-gody-xix-veka-problemy-obshchestvenno-politicheskogo-razvitiya>

5. Akhmadov Ya.Z. History of Chechnya from ancient times to the XVIII century. M., 2001.<http://www.checheninfo.ru/>

6. Akhmadov Ya.Z., Khasmagomadov E. History of Chechnya in the XIX - XX centuries. M., 2005.<https://chenetbook.info/>

7. History of the peoples of the North Caucasus from ancient times to the end of the XVIII century. M., 1988.<http://www.elbrusoid.org/>

*6.1 Periodicals*

* Website of the Russian National Library - http:// www.nlr.ru
* Website of the Russian State Library - http://[www.rsl.ru](http://www.rsl.ru/)
* Website of the State Public Historical Library - http://[www.shpl.ru/](http://www.shpl.ru/)
* Scientific literature on historical topics - http:// www.auditorium.ru/
* Archaeobibliobase, information on the composition of archival funds in Russia - http://[www.openweb.ru/rusarch](http://www.openweb.ru/rusarch)
* Electronic library system:[www.iprbookshop.ru](http://www.iprbookshop.ru)
* **Student Advisor**: www. studmedlib.ru

**7.Modern professional databases and information reference systems**

Official website of the company "Consultant Plus" http://www.consultant.ru/

Information and legal portal "Garant" - http://base.garant.ru/

Guests, standards, regulations. – http://www.gostrf.com/

Professional standards: software and hardware complex. Register of professional standards - http://profstandart.rosmintrud.ru/obshchiy-informatsionnyy-blok/natsionalnyy-reestr-professionalnykh-standartov/reestr-professionalnykh-standartov/

Electronic educational environment of the university(http://www.chgu.org)

Electronic library system IPRBooks([http://www.iprbookshop.ru](http://www.iprbookshop.ru/))

Multidisciplinary educational resource "Student Advisor" (http://www.studentlibrary.ru)

Electronic library system "IVIS" (http://ivis.ru)

**8.Composition of software**

1.Microsoft Office Word

2.Microsoft PowerPoint

3.PDF

4.AdobeReader

**9. Equipment and teaching aids**

FGBOU VO "Chechen State University. A.A. Kadyrov” has a material and technical base that provides for all types of disciplinary and interdisciplinary training, has access to global electronic communication networks. The educational process takes place in classrooms for lecture and practical classes. Premises for lectures, practical classes are equipped with specialized educational furniture, technical means that serve to present educational information to students.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

Russian language and culture of speech

|  |  |
| --- | --- |
| ***Direction of training*** | **Biology** |
| ***Code*** | **06.03.01** |
| ***Orientation (profile)*** | **Microbiology** |
|  |  |

* + - 1. The list of competencies formed by the discipline in the process of mastering the educational program

|  |  |  |
| --- | --- | --- |
| Competence group | Category of competencies | Code |
| Universal | Communication | UK-4. Able to carry out business communication in oral and written forms in the state language of the Russian Federation and foreign language(s). |

* + - 1. Competences, indicators of their achievement and learning outcomes in the discipline

|  |  |  |
| --- | --- | --- |
| Competency code | Code and name of the indicator of competence | Learning Outcomes  by discipline |
| UK-4 | UK-4.1 Owns a system of norms  the Russian literary language and the norms of the foreign language(s); is able to logically and grammatically correctly build oral and written speech.  UK-4.2 Competently builds communication based on goals and situation; uses a communicatively acceptable style of communication, verbal and non-verbal means of interaction with partners.  UK-4.3 Fluently perceives, analyzes and critically evaluates oral and written business information in Russian, native and foreign language(s) | Know:the basics of mastering the rules and norms of the modern Russian literary language and culture of speech; normative, communicative, ethical aspects of oral and written speech; functional styles of the modern Russian language and features of their interaction;  Be able to: communicate, conduct a harmonious dialogue and achieve success in the communication process; build oral and written speech, based on the laws of logic, reasonably and clearly express their own opinion; build your speech in accordance with linguistic, communicative and ethical standards; spelling correctly to write words whose spelling is regulated by rules, as well as words with unchecked spellings, both from memory and using a dictionary  Own: basic methods and techniques of research and practical work in the field of oral and written communication;  public speaking skills with a clearly built system of argumentation; skills of working with dictionaries of various types; reference literature skills. |

* + - 1. Scope of discipline

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| *Types of educational work* | | *Forms of study* | | |
| *full-time* | *Part-time* | *Correspondence* |
| Total workload: credits/hours | | 2/72 |  |  |
| Contact work: | |  |  |  |
|  | Lecture-type classes |  |  |  |
| Seminar type classes | 34 | thirty |  |
| Intermediate certification: credit / credit with grade / exam \* | offset |  |  |
| Independent work (SIW) | | 44 |  |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes: credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

4.*The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions*

* 1. Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| No. p / p | Section/topic | Types of educational work (in hours) | | | | | | |
| contact work | | | | | | Independent work |
| Lecture-type classes | | Seminar type classes | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Language, speech, speech culture. language norm. Aspects and criteria. |  |  | 1 |  |  |  | 2 |
| 2. | From the history of the Russian language. Origin of the Russian language. Russian language in the modern world. Spelling and spelling in Russian. |  |  | 1 |  |  |  | 6 |
| 3. | Speech communication.  Varieties of speech. Oral and written form of speech. Spelling and culture of speech. |  |  | 2 |  |  |  | 6 |
| 4 | Culture of speech, its forms  and varieties.  Speech etiquette. Rules  speech etiquette. |  |  | 3 |  |  |  | 6 |
| 5. | Organization of verbal  interactions.  Non-verbal means  communication . Spelling and  spelling in Russian. |  |  | 3 |  |  |  | 6 |
| 6. | Functional-semantic types of speech. Narration.  Description. Reasoning. |  |  | 3 |  |  |  | 6 |
| 7. | The concept of monologue and dialogue. Business conversation. Spelling and  spelling in Russian. |  |  | 3 |  |  |  | 6 |
| 8. | Functional styles of Russian speech.  Formal business writing.  Document types. |  |  | 3 |  |  |  | 6 |
| 9. | Fundamentals of oratory. |  |  | 3 |  |  |  | 6 |
| 10. | Russian vocabulary and culture of speech. |  |  | 3 |  |  |  | 6 |
| eleven. | Dictionaries and speech culture.  Dictionary types. |  |  | 3 |  |  |  | 6 |
| 12. | The culture of writing. |  |  | 3 |  |  |  | 6 |
| 13. | Punctuation as an indicator of speech culture. |  |  | 3 |  |  |  | 6 |

* + 1. Course program structured by topics/sections

4.1.3 Lecture content

|  |  |  |
| --- | --- | --- |
| No. p / p | Name of the topic (section) of the discipline | *The content of the lecture* |
|  | Language, speech, speech culture. language norm. Aspects and criteria. | Introductory information. Goals and objectives of mastering the discipline. Basic concepts (language and speech, modern Russian literary language: social and functional differentiation, modern norms of the Russian literary language and speech culture). Language norm. Introduce various  definitions of the standard of the literary language. |
|  | From the history of the Russian language.  Origin of the Russian language.  Russian language in the modern world. Spelling and  spelling in Russian. | Origin of the Russian language.  The role of M.V. Lomonosov in the history of the Russian language. Why A. S. Pushkin is considered the creator of the modern Russian literary language. Russian language in the modern world. Spelling. Use  capital letters. |
|  | Speech communication.  Varieties of speech. Oral and written forms of speech.  Spelling and culture of speech. | Speech communication. Communication for a person is his habitat.  Basic units of verbal communication. speech situation. speech event. Speech interaction.  Specificity of oral and written business speech.  Spelling. Spelling of a soft sign in words of different parts of speech. |
|  | The culture of speech, its forms and varieties.  Speech etiquette. Rules  speech etiquette. | Characteristics of the concept of "culture of speech". Normative aspect of speech culture. Communicative qualities of speech. Ethical norms of speech culture (speech etiquette). Culture of written speech (Russian spelling). Rules of speech etiquette. Formulas of speech etiquette. |
|  | Organization of verbal  interactions.  Non-verbal means  Communication. Spelling and  spelling in Russian. | Theory and rules of speech acts of verbal communication.  Principle of politeness J.N. Leach.  Evidence and persuasiveness of speech. Arguments.  Non-verbal means of communication. Types of gestures and their difference.  Spelling. Basic spelling  difficulties of the Russian language,  ways to overcome them. |
|  | Functional-semantic types of speech. Narration.  Description. Reasoning. Spelling. | Text. Text features. Description. Narration. Reasoning.  Spelling. Consolidated and separate spelling of compound words |
|  | The concept of monologue and dialogue.Business conversation. Spelling and  spelling in Russian. | Basic unit of dialogue. Types of interaction between participants in the dialogue. The structure of the dialogue. monologue speech. Genre-stylistic variety of monologue. Functional-semantic type of monologue. Dialogical and polylogical situations of communication, establishing speech contact with other members of the language community. Basic requirements for business speech: correctness, accuracy, brevity and accessibility.  Spelling. Spelling of roots with alternating vowels. |
|  | Functional styles of Russian speech.  Formal business writing.  Document types.  Spelling and  spelling in Russian. | The concept of style. Colloquial and book vocabulary. The styles of the modern Russian language are a general characteristic. Genre concept. Stylistic mistakes. The main features of the scientific style. Types of scientific style texts (abstract, abstract, review, review, lecture, report, message). Varieties of official business style. Language models of documents.Unification of the language of service documents.  General document functions. General requirements for service information.Basic norms of business writing. Business papers of a personal nature. Business Etiquette. |

* 1. The content of practical classes

|  |  |  |
| --- | --- | --- |
| No. p / p | Name of the topic (section) of the discipline | *The content of the practical lesson* |
|  | Language, speech, speech culture. language norm. Aspects and criteria. | Goals and objectives of mastering the discipline. Basic concepts (language and speech, modern Russian literary language: social and functional differentiation, modern norms of the Russian literary language and speech culture). language norm. Get to know different  definitions of the standard of the literary language. |
|  | From the history of the Russian language.  Origin of the Russian language.  Russian language in the modern world. Spelling and  spelling in Russian. | Origin of the Russian language.  The role of M.V. Lomonosov in the history of the Russian language. Why A. S. Pushkin is considered the creator of the modern Russian literary language. Russian language in the modern world. Spelling. Use  capital letters. |
|  | Speech communication.  Varieties of speech. Oral and written forms of speech.  Spelling and culture of speech. | Speech communication. Communication for a person is his habitat.  Basic units of verbal communication. speech situation. speech event. Speech interaction.  Specificity of oral and written business speech.  Spelling. Spelling of a soft sign in words of different parts of speech. |
|  | The culture of speech, its forms and varieties.  Speech etiquette. Rules  speech etiquette. | Characteristics of the concept of "culture of speech". Normative aspect of speech culture. Communicative qualities of speech. Ethical norms of speech culture (speech etiquette). Culture of written speech (Russian spelling). Rules of speech etiquette. Formulas of speech etiquette. |
|  | Organization of verbal  interactions.  Non-verbal means  Communication. Spelling and  spelling in Russian. | Theory and rules of speech acts of verbal communication.  Principle of politeness J. N. Leach.  Evidence and persuasiveness of speech. Arguments.  Non-verbal means of communication. Types of gestures and their difference.  Spelling. Basic spelling  difficulties of the Russian language,  ways to overcome them. |
|  | Functional-semantic types of speech. Narration.  Description. Reasoning. Spelling. | Text. Text features. Description. Narration. Reasoning.  Spelling. Consolidated and separate spelling of compound words |
|  | The concept of monologue and dialogue. Business conversation. Spelling and  spelling in Russian. | Basic unit of dialogue. Types of interaction between participants in the dialogue. The structure of the dialogue. monologue speech. Genre-stylistic variety of monologue. Functional-semantic type of monologue. Dialogical and polylogical situations of communication, establishing speech contact with other members of the language community. Basic requirements for business speech: correctness, accuracy, brevity and accessibility.  Spelling. Spelling of roots with alternating vowels. |
|  | Functional styles of Russian speech.  Formal business writing.  Document types.  Spelling and  spelling in Russian. | The concept of style. Colloquial and book vocabulary. The styles of the modern Russian language are a general characteristic. . Genre concept. Stylistic mistakes. The main features of the scientific style. Types of scientific style texts (abstract, abstract, review, review, lecture, report, message). Varieties of official business style. Language models of documents.Unification of the language of service documents.  General document functions. General requirements for service information.Basic norms of business writing. Business papers of a personal nature. Business Etiquette.  Spelling and spelling in Russian.  Spelling prefixes. |

1. Fund of assessment tools for certification of students in the discipline (module)

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| No. p / p | Controlled sections (topics) | Name of the evaluation tool |
| 1. | Language, speech, speech culture. language norm. Aspects and criteria. | oral questioning |
| 2. | From the history of the Russian language.  Origin of the Russian language.  Russian language in the modern world. Spelling and  spelling in Russian. | Oral survey.  Information project (report) |
| 3. | Speech communication.  Varieties of speech. Oral and  written form of speech.  Spelling and culture of speech. | Oral survey. |
| 4. | The culture of speech, its forms and varieties.  Speech etiquette. Rules  speech etiquette. | Oral survey.  Information project (report).  Mini test. |
| 5. | Organization of verbal  interactions.  Non-verbal means  Communication. Spelling and  spelling in Russian. | Oral survey.  Information project (report).  Research project (abstract). |
| 6. | Functional-semantic types of speech. Narration.  Description. Reasoning. | Essay essay.  Oral survey. |
| 7. | The concept of monologue and dialogue. Business conversation. Spelling and  spelling in Russian. | Oral survey.  Information project (report). |
| 8. | Functional styles of Russian speech.  Formal business writing.  Document types. | Oral survey.  Research project (abstract).  Information project (report).  Mini test. |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

Topics of reports/abstracts

1. Non-verbal means of communication.

2. Communication: communication barriers and ways to overcome them.

3. Youth jargon and its specificity.

4. Vocabulary of limited and unlimited use.

5. National specificity of verbal communication.

6. The main features of the journalistic style.

7. Communication barriers. Non-verbal means of strengthening the communicative position of the speaker.

8. Strategies and tactics of verbal communication in the negotiation process.

9. Communication barriers.

10. Basic strategies, tactics and techniques of the dispute.

11. Speech roles of communication participants.

12. The main types of communication skills of people.

13. Speech etiquette in the activities of a specialist.

14. History of the development of the norms of the Russian literary language.

15. Non-verbal communication in the professional field.

16. Mastery of public speaking.

17. Russian language in the modern world.

18. Language as a mirror of culture.

19. Monologue about the word.

20. Monologue speech.

Questions for the oral survey

Section 1.Language, speech, speech culture. language norm. Aspects and criteria.

1.What is language?

2. What are the main functions of the language?

3. What is the structure of the language and its levels.

4. What is speech? How are language and speech related?

5. Language norm. What is a norm?

Section 2. From the history of the Russian language The origin of the Russian language. The Russian language in the modern world. Spelling and spelling in Russian.

1. Tell us about the origin of the Russian language.

2. What is the role of M.V. Lomonosov in the history of the Russian language?

3. Why A.S. Pushkin is considered the creator of modern Russian

literary language?

4. Russian language in the modern world.

5. What is spelling? General rules for spelling compound words.

Section 3. Verbal communication. Varieties of speech. Oral and written form of speech. Orthography and culture of speech.

1. What is speech activity?

2. What are the main types of speech?

3. What are the features of written and oral forms of speech?

4. How are they related to the functional styles of the Russian language?

5. Spelling. The use of capital letters in Russian.

Section 4. Culture of speech, its forms and varieties. Speech etiquette. Rules

speech etiquette.

1. What is the culture of speech?

2. What components does the culture of speech contain?

3. Communicative qualities of speech.

4. What is speech etiquette?

5. Does speech etiquette have national specifics?

6. What groups are the speech etiquette formulas divided into?

Section 5. Organization of verbal interaction. Non-verbal means

Communication. Spelling and spelling in Russian.

1. What determines the effectiveness of verbal communication?

2. Name and describe the main types of arguments?

3. What is meant by non-verbal means of communication?

4. What types of gestures are there and how do they differ?

5. Orthography. Alternation of vowels in the roots of words.

Section 6/7. Functional-semantic types of speech. The concept of monologue and dialogue. Spelling and spelling in Russian.

1. Functional-semantic types of speech and their main features.

2. Specify the basic rules for constructing reasoning.

3. Define dialogue and monologue as a form of oral speech.

4. Specify the main types of dialogue.

5. Indicate the three main types of monologue speech and give a brief description of them.

6. Spelling b to indicate the softness of consonants in writing.

Section 8. Functional styles of speech of the Russian language. Formal business writing. Document types. Spelling and spelling in Russian.

1. Name and describe the main functional styles of the Russian language.

2. In what area of ​​social activity does the scientific style function? What are its main features?

3. What are the main features of an official business speech?

4. Define the concept of the culture of official correspondence.

5. Business etiquette and rules of business etiquette.

6. Name the main types of service documents of business letters. Describe them.

7. Spelling of prefixes and suffixes in parts of speech.

Mini test.

1. Test task:

S: Spelled without ь:

-: vegetable( )

-: sterech( )

-: birth( )

-: cut( ) those

2. Test task:

S: Error in the formation of a grammatical form:

- on both sides of the street

- wash with shampoo

- put on a coat

- graduate from university

3. Test task:

S: Word with alternating o-a at the root:

-: talk

-: split

-: mow

4. Test task:

S: Point out the words that are stressed incorrectly.

-: dialogue

-: cruelly

-: spoil

-: rubber

-: malice of the burnt man

5. Test task:

S: Who is a communicator?

-: Person receiving speech signals

-: Person sending speech signals

-: Person broadcasting speech signals

6. Test task:

S: The same view on the issue under discussion is expressed during:

-: Conversations,

-: spore

-: Discussions

6. Test task:

S: Choose your behavior in a dispute with a demagogue:

-: make a compliment,

- tactfully stop

-remind the boundaries of the dispute,

- pull sharply

7. Test task:

S: The meaning of which word is defined incorrectly

-: Elevator - a large room where grain is cleaned, dried and stored

-: Nimble - dexterous in movements, fast, agile

-: Lomovoy - assertive, stubborn

-: Intuition - flair, subtle understanding, penetration into the very essence of something

8. Test task:

S: Which of the following words does not include the characteristic "changes in cases and numbers"

-: milk

-: gold

-: coat

-: cloth

9. Test task:

S: Mark the word with the prefix pre-

-: pr ... sing

-: pr… cum

-: pr ... quilt

-: pr ... elevate

10. Test task:

S: Which word has the suffix -sk

-: cut ... cue

-: French ... cue

-: German

-: laborer ... cue

11. Test task:

S: In which row are all nouns feminine?

-: stranded, pain, zero, salt

-: moth, tulle, goal, salt

-: mole, salt, goal, stranded

-: moth, stranded, true story, tulle

12. Test task:

S: Indicate the grammatical meaning of the gender of the underlined noun

Since the beginning of this school year, we have a new headman in the group

-: female

-: average

-: general

-: male

Essay essay.

Essay topics.

1. The speech culture of a person is a mirror of his spiritual culture.

2. Ethical norms and speech etiquette.

3. Oral public speech.

4. Monologue speech.

5. My future profession.

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

Oral response

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

Creative task

*Essay*is a small written work that combines free, subjective reasoning on a particular topic with elements of scientific analysis. The text should be easy to read, but deliberately colloquial style, slang, and formulaic phrases should be avoided. The volume of the essay is approximately 2 - 2.5 pages 12 in single-spaced font (excluding the title page).

*Evaluation criteria*- the assessment takes into account the observance of the genre specifics of the essay, the presence of a logical structure for constructing the text, the presence of the author's position, its scientific nature and connection with the modern understanding of the issue, the adequacy of the arguments, the style of presentation, the design of the work. It should be remembered that direct borrowing (without quoting) of text from the Internet or an electronic library is unacceptable.

The mark "excellent" is given in the case when it is determined: the presence of a logical structure for the construction of the text (introduction with a statement of the problem; the main part, divided according to the main ideas; conclusion with conclusions obtained as a result of reasoning); the presence of a clearly defined personal position on the topic of the essay; the adequacy of the arguments in substantiating a personal position, the style of presentation.

The “good” rating is given when, on the whole, it is determined: the presence of a logical structure for constructing a text (introduction with a problem statement; the main part, divided according to the main ideas; conclusion with conclusions obtained as a result of reasoning); but there is no clearly defined personal position on the topic of the essay; not enough arguments to justify a personal position

The “satisfactory” rating is given when, on the whole, it is determined: the presence of a logical structure for constructing the text (introduction with a problem statement; the main part, divided by main ideas; conclusion). But clear conclusions are not traced, the style of presentation is violated

An "unsatisfactory" rating is given if none of the requirements are met.

Cases (situations and tasks with given conditions)

The student should be able to highlight the main provisions from the text of the problem that require analysis and serve as conditions for the solution. Based on the question posed in the problem, try to define the problem as accurately as possible and solve it accordingly.

Problems can be solved orally and/or in writing. When solving problems, it is also important to correctly formulate and write down questions, starting with more general and ending with particular ones.

*Evaluation criteria*- the assessment takes into account the methods and means used in solving a situational, problematic task.

The mark "excellent" is given in the case when the student completed the task (solved the problem), using in full the theoretical knowledge and practical skills gained in the learning process.

The mark "good" is given if the student as a whole fulfilled all the requirements, but the reliance on the theoretical provisions set forth in the scientific literature on this issue is not clearly defined.

The grade "satisfactory" is given if the student showed positive results in the process of solving the problem.

The mark "unsatisfactory" is given if the student has not fulfilled all the requirements.

business game

It is necessary to break into several teams, which must alternately express their opinion on each of the questions asked. The opinion of the speaking team is counted if the opposite team does not refute it with counterarguments. The team whose opinion is counted as correct (did not receive convincing counterarguments from opposing teams) receives one point. The team that refuted the opinion of the opposing team with its counterarguments also receives one point. The team with the maximum number of points wins.

A role-playing game usually has a plot (situation, incident), roles are distributed, preparation is carried out 2-3 weeks before the game.

*Evaluation criteria -*the actions of all group members are evaluated. Understanding the problem, statements and actions are fully consistent with the set goals. Correspondence to the reality of the decisions developed during the game. Proficiency in terminology, demonstration of mastery of educational material on the topic of the game, possession of argumentation methods, ability to work in a group (listening skills, constructive conversation, persuasion, time management, conflict-free communication), achievement of game goals, (role-matching - in role-playing game). Clarity and style of presentation.

An “excellent” rating is given if all criteria are met.

The grade "good" is given if the students as a whole demonstrate an understanding of the problem, statements and actions are fully consistent with the set goals. The decisions developed during the game are fully consistent with reality. But some explanations are not entirely reasoned, the norms of communication are violated, the time frame is violated, the style of presentation is violated.

The grade “satisfactory” is given if the students as a whole demonstrate an understanding of the problem, statements and actions generally correspond to the set goals. However, the solutions developed during the game do not quite correspond to reality. Some explanations are not entirely reasoned, time frames are violated, the style of presentation is violated.

The mark "unsatisfactory" is given if the students do not understand the problem, their statements do not correspond to the set goals.

Research project (abstract)

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

Information project (report with presentation)

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

Debate Procedures

*Round table, discussion, controversy, dispute, debate, mini-conferences*are means to include students in the process of discussing a controversial issue, problems and assess their ability to argue their own point of view. The task is given in advance, the range of issues for discussion, the group of participants in this discussion is determined.

Discussion procedures can be used to ensure that students:

- better understood the material being digested against the background of various positions and opinions, not necessarily reaching a common opinion;

- were able to comprehend the meaning of the material being studied, which is sometimes felt intuitively, but they cannot express it verbally, clearly and clearly, or construct a new meaning, a new position;

– were able to agree on their position or actions on the issue under discussion.

*Evaluation criteria -*the actions of all group members are evaluated. Understanding the problem, statements and actions are fully consistent with the set goals. Correspondence to the reality of the decisions developed during the game. Proficiency in terminology, demonstration of mastery of educational material on the topic of the game, possession of argumentation methods, ability to work in a group (listening skills, constructive conversation, persuasion, time management, conflict-free communication), achievement of game goals, (role-matching - in role-playing game). Clarity and style of presentation.

An “excellent” rating is given when all requirements are met in full.

The grade "good" is given if the students as a whole demonstrate an understanding of the problem, statements and actions are fully consistent with the set goals. The decisions developed during the game are fully consistent with reality. But some explanations are not entirely reasoned, the norms of communication are violated, the time frame is violated, the style of presentation is violated.

The grade “satisfactory” is given if the students as a whole demonstrate an understanding of the problem, statements and actions generally correspond to the set goals. However, the solutions developed during the game do not quite correspond to reality. Some explanations are not entirely reasoned, time frames are violated, the style of presentation is violated.

The mark "unsatisfactory" is given if the students do not understand the problem, their statements do not correspond to the set goals.

Testing

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

Test

Not only the depth of knowledge of the questions posed is evaluated, but also the ability to state in writing.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of various points of view, independent generalization of the material. Presentation of material without factual errors.

An "excellent" rating is given when all criteria are met.

The “good” mark is given if the student knows the material well, presents it competently and to the point, knows the practical base, but makes minor errors.

The grade "satisfactory" is given if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows a lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)

* 1. Educational literature

1. Golub I.B. Russian rhetoric and culture of speech: textbook / Golub I.B., Neklyudov V.D. - M.: Logos, 2012. 328- p.<http://www.iprbookshop.ru/9074>

2. Mikhailova O.Yu. Russian language and culture of speech: textbook / Mikhailova O.Yu.-K.: Southern Institute of Management, 2012. 99— p. http://www.iprbookshop.ru/1

3. Abrashina E.N. Rhetoric. Culture of the speaker [Electronic resource]: study guide / E.N. Abrashin. - Electron. text data. - M. : Moscow City Pedagogical University, 2011. - 186 p. - 2227-8397. - Access mode:http://www.iprbookshop.ru/26584.html.

1. Modern professional databases and information reference systems

1.[FEB: "Dictionary of the Russian Language (MAS)"](http://feb-web.ru/feb/mas/mas-abc/)

2. Portal dedicated to the culture of writing www.gramma.ru

3. Access mode: http://www.iprbookshop.ru/24808.- ELS "IPRbooks", by password

4. Art of the word: the author's method of teaching the Russian language.http://www.gimn13.tl.ru/rus/.

5. Electronic library; access:<http://library.knigafund.ru/>, IPR books<http://www.iprbookshop.ru/586>

* 1. Software Composition

1.Microsoft Windows

2. Web browsers

3.Microsoft Office Tools:

Microsoft Office Word - text editor;

Microsoft Office PowerPoint is a presentation preparation program.

4.Antivirus.

1. Equipment and technical training aids

- interactive board

* laptop;
* multimedia equipment;

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal state budget educational

institution of higher education

"CHECHEN STATE UNIVERSITY

NAMED AFTER A.A. KADIROVA

FACULTY OF PHILOLOGY

Department of Chechen Philology

**WORKING PROGRAMM**

**DISCIPLINES**

**"Chechen language"**

|  |  |
| --- | --- |
| Direction of training | Biology |
| Code of direction of training | 06.03.01 |
| Profile | Microbiology |
| Graduate Qualification | Bachelor |
| Form of study | Part-time |

Grozny 2021

1.**The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Universal | Communication | **UK-4** |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| **UK-4** | **UK -4.3** Fluently perceives, analyzes and critically evaluates oral and written business information in Russian, native and foreign language(s) | |

**3. Scope of discipline**

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of education full-time*** | | | |
| ***Total*** | ***1s.*** |  |  |
| **General labor intensity**: credits/hours | | **2/72** | **2/72** |  |  |
| **contact work**: | | 34 | 34 |  |  |
|  | Lecture-type classes | - |  |  |  |
| Seminar type classes | 34 | 34 |  |  |
| Intermediate certification: credit / credit with grade / exam \* | offset | offset |  |  |
| **Independent work**(SRS) | | **38** | **38** |  |  |
| Of which for course work (course project) | | - | - |  |  |

**4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

* 1. Distribution of hours by sections/topics and types of work

**4.1.1 Full-time study (1 semester)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Phonetics | - | - | 6 | - | - | - | 8 |
| 2. | Lexicologists | - | - | 8 | - | - | - | 10 |
| 3. | Morphologists | - | - | 10 | - | - | - | 8 |
| 4. | Syntax | - | - | 10 | - | - | - | 12 |
| **Total** | | **-** | **-** | **34** | **-** | **-** | **-** | **38** |

* + 1. **Part-time education (1 semester)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Phonetics | - | - | 6 | - | - | - | 8 |
| 2. | Lexicologists | - | - | 8 | - | - | - | 10 |
| 3. | Morphologists | - | - | 10 | - | - | - | 8 |
| 4. | Syntax | - | - | 10 | - | - | - | 12 |
| **Total** | | **-** | **-** | **34** | **-** | **-** | **-** | **38** |

* 1. **Course program structured by topics/sections**

4.2.1. The content of the lecture course is not provided

4.2.2 Content of practical exercises

| **No.**  **p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| --- | --- | --- |
| 1 | Phonetics | Nokhchiin mettan phonetics Tallaran history, phonetikin ma1na, 1alasho. Khjark, elp, az, tseran kastoran nekash a. Nokhchiin mettan mukachu azniyn system. Nokhchiin mettan mukazchu azniyn system.Nokhchiin mettan lexicologists, lexicologist ma'na. Deshnyn ma'1nash (lexically a, grammatically a; niysa a, t1edeana a). Deshniyn taipanash a, tseran ma'1nash a, kholladalaran nekash a. (Omonimash, synonymymash, antonymash, taboo a, euphemism a, terminash). |
| 2 | Lexicology | Nokhchiin mettan kerla deshnash (neologismash), tseran kholladalaran nekash a. Shirdella deshnash a (archaismash, historicism), tseran shirdalaran nekash a. Deshnein Kalkanash. Dialectismmash.Phraseologists, idiom taipanash (dozarsh, tsalallash, khyanakhetarsh). |
| 3 | Morphology | Nokhchiin mettan morphology (yukara khetam). Grammatically categorical. Nokhchiin mettan deshniyn is morphologically x1ottam. Kamelan dakoin yukara ma'na. Ts1erdosh, t1erdeshn, grammatically categorical, syntactically functional. Bilgaldosh, bilgaldshyn grammatically categorical a, syntactically functional a. Terakhdosh, terakhdeshnyn taipanash a, morphologically bashhallash a, syntactically functional a. Ts1ermetdosh, ts1ermetdeshnijn taipanash a.  Khandosh, khandeshnyn grammatically categoresh a, khandeshan formanash a (lattaman, hattaran formanash, masdar). Participles a, participles a.  Kutsdosh, kutsdeshnijn taipanash, syntactically functional. G1ullakhan kamelan dak'osh: hutturgash, dak'algash, desht'akhienash. Aydardosh. |
| 4 | Syntax | Syntax.Suggestion court a, courttaza a mezhenash.  Tskhalkhechu offers taipanash. Tskhalkhe a, cholkhe a you offer, tseran taipanash. Tseran syntactically tallam |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| No. p / p | **Controlled sections (topics)** | Name  evaluation tool |
|  | Nokhchiin mettan phonetics. | compiling a summary,  paperwork,  oral survey,  homework |
|  | Lexicologists. | oral questioning,  paperwork,  homework |
|  | Morphologists | oral questioning,  paperwork,  colloquium,  homework |
|  | Syntax. | oral questioning,  paperwork |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

**Sample test tasks:**

I. Маса элп ду нохчийн алфавитехь

-: 45

-: 33

-: 47

+: 49

2.Нохчийн маттахь къамелан дакъа ду

-: (9)

-: (6)

+: (10)

-: (12)

3.Нохчийн маттахь коьрта къамелан дакъа ду

-: (7)

-: (5)

-: (4)

+: (6)

4. Нохчийн маттахь г1уллакхан къамелан дакъа ду

+: (3)

-: (2)

-: (4)

-: (6)

5.Коьрта къамелан дакъа ду

-: хуттург

-: дакъалг

+: куцдош

-: айдардош

6.Коьрта къамелан дакъа ду

-: т1ехула

-: йисте

+: юкъ

-: юккъе

7. Г1уллакхан къамелан дакъа ду

-: ц1ердош

-: куцдош

-: айдардош

+: дешт1аьхье

8. Г1уллакхан къамелан дакъа ду

-: йист

-: дехьара

-: ирча

+: т1ехь

9. Ша лела къамелан дакъа ду

-: хуттург

+: айдардош

-: хандош

-: терахьдош

10. Ц1ердош – иза ду

-: ша лела къамелан дакъа

+: къамелан коьрта дакъа

-: г1уллакхан къамелан дакъа

-:дакъалг

11.Ц1ердош – иза

-: х1уманан билгало гойту къамелан дакъа

+: х1ума билгалъеш долу къамелан дакъа ду

-: дар я хилар гойтуш долу къамелан дакъа ду

-:хан гойтуш

12.Ц1ердашо гойту

-: мухалла

-: масалла

+: х1ума

-: рог1алла

13.Ц1ердош къастаде

-: лекха

-: лоха

+: г1иллакх

-: итт

14.Юкъара ц1ердош къастаде

-: Аслан

-: Султан

+: юрт

-: 1алха

15.Долахь ц1ердош къастаде

-: эвла

-: пондарча

+: Казбек

-: ларма

16.Х1уманан билгало гойту ц1ердош ду

-: стигал

-: марха

+: шоралла

-: дечиг

17. Адаман амал гойту ц1ердош ду

-: лекхалла

-: лохалла

+: дикалла

-: синтем

18. Вахар гойту ц1ердош ду

-: сихалла

-: куралла

+: ц1а

-: ткъес

19. Мухаллин билгалдешнаш хуьлу

-: шаьш лелаш

+: лааме а, лаамаза а

-: къаьстина лелаш

-: кхечу къамелан дакъойх дозуш

20. Лааме билгалдош къастаде

-: ц1ийнан бух

+: ц1ийнаниг

-: юьртара стаг

-: арара к1ант

21.Лаамаза билгалдош къастаде

-: йистера кор

+: хазаниг

-: сингаттаме суьйре

-: ирчаниг

22.Лаамаза мухаллин билгалдешнаш предложенехь

-: кхачам хуьлий лела

+: къастам хуьлий лела

-: сказуеми хуьлий лела

-: подлежащи хуьлий лела

23.Билгалдешнийн хийцадалар хила тарло

-: спряженешца, легаршца

+: дожаршца, терахьашца

-: классашца, саттамашца

-: коьчалца

24. Билгалдош – иза

-: г1уллакхан къамелан дакъа ду

-: ша лела къамелан дакъа ду

+: коьрта къамелан дакъа ду

-: коьртаза къамелан дакъа ду

25. Билгалдашо гойту

-: х1ума

+: билгало

-: масалла

-: рог1алла

26. Билгалдешан дустаран дарж ду

-: ( 1)

-: (5)

+: (3)

-: ( 4)

27. Дустаран дарж хуьлу

-: юкъаметтигаллин билгалдешнийн

+: мухаллин билгалдешнийн

-: доладерзоран билгалдешнийн

-:лаамаза билгалдешнаш

28.Юьхьанцарчу даржехь долу билгалдош гайта

-: лекхо лам

-: мерзо 1аж

+: лекха йо1

-: ч1ог1а муьста хьач

29.Дустаран даржехь долу билгалдош гайта

-: оьзда к1ант

-: лекха лам

-: хаза г1иллакх

+: можо к1ади

30.Т1ехдаларан даржехь долу билгалдош гайта

-: хазо коч

-: 1аьржо буьйса

+: лилула-сийна бос

-: оьзда йо1

31. Билгалдош декъало

-: (4) тайпане

-: (5) тайпане

+: (3) тайпане

-: (2) тайпане

32.Мухаллин билгалдешнаша гойту

-: масалла

-: рог1алла

-: хан

+: чам

33.1алам гойту ц1ердош ду

-: ц1енкъа

-: амал

+: мох

-: хьал

34. Мухалла гойту ц1ердош ду

-: собар

-: хьехар

+: дикалла

-: лелар

35. Дар билгалдоккху ц1ердош ду

-: соьналла

-: хьогалла

+: хьажар

-: тоам

36. Адамийн классашна юкъара довлуш долу дешнаш ду

-: к1ант, йо1, баба

-: ваша, йиша, шича

+: нускал, бобер, адам

-: да, марда, деваша

37.Доланиг дожарехь долу дош къастаде

-: тешам

-: лаамца

+: дот1аг1чуьн

-: толамах

38. Нохчийн маттахь дожарийн форманаш

-: итт ю

-: кхойтта ю

+: барх1 ю

-: ткъа ю

39. Нохчийн маттахь дожарийн форманаш яц

-: дешт1аьхьенийн, масдарийн

-: причастийн, куцдешнийн

+: хуттургийн, дакъалгийн

-: айдардешнийн, терахьдешнийн

40.Лург дожарехь долу дош къастаде

-: эшам

-: лаамца

+: зезагна

-: вешица

41.Мухаллин билгалдош къастаде

-: селханлера де

-: стохкалера шо

+: мерза 1аж

-: г1алара хьаша

42.«Можа зезаг» билгалдош ду

-: юкъаметтигаллин

-: доладерзоран

+: мухаллин

-:дерзоран

43.«Оьг1азе» билгалдашо гойту

+: мухалла

-: чам

-: бос

-: меттиг

44.Нохчийн маттахь ц1ерниг дожар вукху дожарех къаьста

-: суффикс цахиларца

+: флекси цахиларца

-: аффикс хиларца

-:суффикс хиларца

45.Дийриг дожарехь долу дош къастаде

-: йиша

-: Даймахке

-: корах

+: дешархочо

46.Дийриг дожаран аффикс (а) – с хила йиш яц

-: х1ума билгалъечу ц1ердешнийн бен

-: хилам билгалбечу ц1ердешнийн бен

+: адамаш билгалдечу ц1ердешнийн бен

-:лаам билгалъечу ц1ердешнийн бен

47. Коьчалниг дожарехь долу дош къастаде

-: нене

-: бецах

-: вешел

+: толамца

48. Хотталург дожарехь долу дош къастаде

-: да

-: тешамал

+: безамах

-: йозанца

49.Меттигниг дожар гойту дош билгалдаккха

-: г1ала

-: вахархо

+: хьехархочуьнга

-: дешархочул

50.Дустург дожарехь долу дош къастаде

-: дикалла

-: лаамца

-: дешархочуьнга

+: паччахьал

51.Ц1ерниг дожарехь долу дош къастаде

-: докъарца

-: эшаре

+: дозалла

-: г1ентал

52. Нохчийн маттахь легар къастадо

-: ц1ерниг дожарехь

+: коьчалниг дожарехь

-: лург дожарехь

-: дустург дожарехь

53. Нохчийн маттахь ц1ердешан легар ду

-: (3)

-: (5)

+: (4)

-: (6)

54. Хьалхарчу легаран чаккхенаш ю

-: (-нца, -арца)

+: (-ца, -аца)

-: (-ица)

-: (-чуьнца)

55.Шолг1ачу легаран чаккхенаш ю

-: (-ах, -ал)

-: (-ица)

+: (-нца, -арца)

-: (-чуьнца)

56.Кхоалг1ачу легаран чаккхе ю

-: (-ан, -ал)

-: (-нца)

+: (-ица)

-: (-ца, -аца)

57.Доьалг1ачу легаран чаккхе ю

-: (-е, -а)

-: (-ица)

+: (-чуьнца)

-: (-ца, -аца)

58. Ц1ердешнийн терахьан категорино юьйцучу х1уманан

-: билгало гойту

-: башхалла гойту

+: масала гойту

-: дикалла гойту

59.Ц1ердош нохчийн маттахь лела терахьехь

+: (2)

-: (1)

-: (3)

-: (4)

60.Дукхаллин терахьера ц1ердош къастаде

+: дитташ

-: бахам

-: жайна

-: не1

**Creative task in the form of an essay:**

Brief report:

1. Куцдош. Куцдешнийн тайпанаш, синтаксически г1уллакх.
2. Ц1ерметдош. Ц1ерметдешнийн тайпанаш, церан кхолладалар, легадаларан башхаллаш.
3. Хандош. Хандешан грамматически категореш.
4. Ц1ердешнийн грамматически классийн категори.
5. Терахьдош. Масаллин терахьдешнаш, лааме а, лаамаза масаллин терахьдешнаш, церан легадалар
6. Муха къаьста элп, аз, фонема?
7. Мукъачу аьзнийн система, х1ун башхалла ю цу системин?
8. Юьхьаьнцара а, схьадевлла а мукъа аьзнаш, муха къаьста уьш?
9. Муха кхоллало дифтонгаш, муьлха тайпана хуьлу уьш?
10. Кхолладаларан меттиге хьажжина мукъа аьзнаш муьлхачу тайпанашка декъало.
11. Мукъазчу аьзнийн тайпанашка декъадалар муха хуьлу?
12. Абруптиваш муха кхоллало?
13. Муха кхоллало шала мукъаза аьзнаш?
14. Дешнийн муьлха тайпанаш къастадо, х1ора тайпана масалш даладе?
15. Муха кхоллало синонимаш, омонимаш?
16. Дешний т1едеана (тардина) маь1на муьхачу кепара хуьлу?
17. Дешнаш лексически а, грамматически а маь1нийн аг1онгахьара муха къаьста?
18. Керла дешнаш, муха кхоллало уьш?
19. Дешнийн ширдаларан некъаш муха билгалдоху?
20. Фразеологизмаш, фразеологизнийн тайпанаш муха къаьста?
21. Кальканаш, церан тайпанаш. Муха кхоллало уьш?
22. Даладе нохчийн маттахь табу а, эвфемизмаш, х1ун бахьана ду уьш маттахь кхолладаларан?
23. Грамматикин маь1на а, чулацам а. Дешан х1оттам муха къаьста нохчийн маттахь?
24. Муха къаьста коьрта а, г1уллакхан а къамелан меженаш?
25. Ц1ердош. Ц1ердешан муьлха грамматически категореш ю?
26. Юкъара а, долахь а ц1ердешнаш муха кхоллало?
27. Морфологин юкъара маь1на. Муха билгалдоху къамелан дакъош? Нохчийн меттан грамматически категореш муха къаьста?
28. Стенах олу билгалдош? Билгалдешнийн х1ун тайпанаш къастадо?
29. Муха кхоллало билгалдешнийн даржаш? Лааме а, лаамаза а форманаш муха кхоллало билгалдешнийн?
30. Х1ун къамелан дакъа ду ц1ердешош, билгалъяха цуьнан грамматически категореш?
31. Х1ун къамелан дакъа ду хандош, хандешан грамматически категореш билгалъяха?
32. Хандешнийн хенан форманаш муха кхоллало?
33. Нохчийн меттан коьрта а, коьртаза а меженаш муьлха ю?
34. Цхьалхечу предложенийн х1ун тайпанаш хуьлу?
35. Мукъазчу аьзнийн классификаци, мукъазчу аьзнийн системин башхалла.

**Questions for oral survey:**

**Approximate topics of abstracts:**

1. Билгалдешнийн тайпанаш, легарш а.
2. Г1оьнан къамелан дакъош.
3. Г1уллакхан къамелан дакъош.
4. Куцдош, куцдешнийн тайпанаш, синтаксически г1уллакх.
5. Масдар. Масдаран кхолладалар, грамматически класс.
6. Морфологи, цуьнан маь1на а (къамелан дакъош, грамматически категореш).
7. Нохчийн меттан мукъа а, мукъаза а аьзнаш.
8. Нохчийн меттан мукъазчу аьзнийн х1оттам.
9. Нохчийн меттан мукъачу аьзнийн х1оттам.
10. Нохчийн меттан ц1ердешнийн легарш.
11. Предложенин коьрта меженаш
12. Предложенин коьртаза меженаш
13. Терахьдешнийн морфологически х1оттам, церан синтаксически г1уллакх.
14. Терахьдешнийн тайпанаш а, кхолладалар а.
15. Хандешан латтаман кепаш, церан кхоллаяларан некъ.
16. Хандешнийн саттамаш, церан кхолладалар.
17. Хандош. Хандешан грамматически категореш.
18. Ц1ерметдешнийн тайпанаш, церан легадалар.
19. Цхьалхечу предложенин кепаш.
20. Яххьийн ц1ерметдешнаш, церан легадалар.

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The “good” mark is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, makes minor errors.

Grade *"satisfactorily"* it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (abstract)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*-atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

1. **List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**
2. Timaev A.D. X1incalera nokhchiyn mott. Lexicologists. Phonetics. Morphologists. (Modern Chechen language. Lexicology. Phonetics. Morphology.). Grozny, 2011.
3. Timaev A.D. Chechen language. Phonetics. Grozny, 2011.
4. Edilov S.E. Nokhchiin mettan workshop. Solzha-g1ala, 2011.
5. Edilov S.E. Nokhchiin mettan syntaxan workshop. Solzha-g1ala, 2012.
6. Timaev A.D., Ireziev S-Kh.S-E., Abubakarov A.Kh. Nokhchiin mettan morphologin is practically a course. Grozny, 2012.
7. Grammar of the Chechen language. T.1 “Introduction to grammar. Phonetics. Morphemics. Word formation". Grozny, 2013.

**6.1Periodicals**

1. Journal "Problems of Linguistics"

2. Interuniversity journal "Lingua-universum"

3. Interuniversity journal "Reflection"

4. Scientific and analytical journal "Vestnik ChSU"

5. Bulletin of Moscow State University "Philology" and "Linguistics"

6. Journal "Russian language in scientific coverage"

7. Magazine "Orga"

**7. Modern professional databases and information reference systems**

Federal Institute for Pedagogical Measurements.................................fipi.ru

Federal Portal “Russian Education” ............................................. www.edu.ru

Encyclopedias, dictionaries, reference books.......................www.enciklopedia.by.ru

Encyclopedia "Circumnavigation"....................................................... .........www.krugosvet.ru

Russian State Library (RSL)…………….E-mail: post@rsl.ru

Library of the Russian Academy of Sciences (BAN)…..E-mail: ban@info.rasl.spb.ru .

Scientific Library of Moscow State University M.V. Lomonosov…………http: //www.lib.msu.su

Electronic library system ……………………..….www.iprbookshop.ru

**8.Composition of software**

1.Microsoft Office Word

2.Microsoft PowerPoint

3.PDF

4.Adobe Reader

**9. Equipment and teaching aids**

1. Computer
2. Multimedia projector
3. Interactive whiteboard (screen)

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**FACULTY OF PHILOLOGY**

**Department of Pedagogy and Psychology**

Work program of the discipline

**"Psychology and social pedagogy"**

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1. List of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| Competence group | Category of competencies | Code |
| Universal |  | UC-3.1; UC-3.2; UC-3.3; UC-3.4; UC-3.5; UC-6.1; UC-6.2; UC-6.3; UC-6.4; UC-9.1; UC-9.2; UC-9.3 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| UC-3  UC-6  UC-9 | Able to carry out social interaction and realize their role in the team | Knows:  - basic principles of distribution and differentiation of roles in a team;  - basic principles of distribution and differentiation of roles in a team  Can:  - to build a social dialogue, taking into account the main patterns of interpersonal interaction;  - is able to prevent conflicts in the process of social interaction;  - show readiness to perform various roles in the team to achieve maximum team effectiveness  Proficient in: techniques for establishing interpersonal and professional contacts, developing professional communication, including in international teams |
| Able to manage his time, build and implement the trajectory of self-development based on the principles of education throughout life | Can:  - evaluate personal resources to achieve the goals of managing your time for the successful completion of assigned work and self-development;  - critically assess the efficiency of time use in solving the tasks, as well as regarding the result obtained;  - show interest in self-development and use the opportunities provided to acquire new knowledge and skills, based on the concept of continuity of education throughout life;  Owned by:  - various technologies of self-improvement and self-development, methods of achieving personal effectiveness |
| Able to use basic defectological knowledge in social and professional areas | Knows:  - psychophysical features of the development of children with mental and (or) physical disabilities, the patterns of their education and upbringing, features of the application of basic defectological knowledge in social and professional spheres  Can:  - plan and carry out professional activities based on the application of basic defectological knowledge with various contingents  Owned by:  - skills of interaction in the social and professional spheres with persons with various psychophysical characteristics, mental and (or) physical disabilities, based on the application of basic defectological knowledge |

**3. Volume of discipline**

FULL-TIME EDUCATION

**4.1Structure of the discipline**

The total labor intensity of the discipline for full-time and part-time education is 3 credit units.

|  |  |  |
| --- | --- | --- |
| Form of work of students / Types of training sessions | Labor intensity, hours | |
| FTE | PTE |
| 5th semester | 7th semester |
| Contact classroom work of students with the teacher: | 34 | 34 |
| Lectures (L) | 17 | 17 |
| Practical exercises (PE) | 17 | 17 |
| Laboratory studies (LS) |  |  |
| Independent work (IW): | 74 | 74 |
| Course project (CP), course work (CW) |  |  |
| Intermediate certification | offset | offset |

Testing and crediting with assessment for full-time and part-time forms of education is carried out within the framework of seminar-type classes, hours are not allocated in the curriculum. The hours allocated for intermediate certification in the “control” column of the curriculum include: contact classroom work (its volume is established by the order “On the standards for calculating the volume of the annual workload of the teaching staff for the HE program”) and independent work.

**4.2 The content of the sections of the discipline**

|  |  |  |  |
| --- | --- | --- | --- |
| section number | Section name | Section content | Current control form |
| 1 | 2 | 3 | 4 |
| 1 | Psychology as a science and subject | 1. Psychology and pedagogy: purpose and content of the course. The subject and tasks of psychological science. 2. The structure of psychological science. The main directions of psychological knowledge. 3. Methodology and methods of psychology | HT  Survey |
| 2 | Psychology of Personality | 1. Personality as a psychological category. 2. Driving forces of personal development. The main stages of personality development. Criteria of the formed personality.   3. Mechanisms of personality development.  4. Individual psychological characteristics of the personality: abilities,  temperament, character, activity | HT  Survey |
| 3 | Mind and consciousness | 1. Brain and psyche. The structure of the psyche. 2. Consciousness as the highest form of mental reflection | HT  T |
| 4 | Psychic Phenomena | 1. Feeling and perception. 2. Memory as a mental process. 3. Thinking and speech. 4. Imagination. 5. Attention and its properties | HT  T |
| 5 | Interpersonal and intergroup relations | 1.Communication.  2. Perception.  3. Attraction.  4.Communication and speech.  5. Groups and their characteristics.  6.Collective.  7. Interpersonal relations in the team and groups | HT  T |
| 6 | Introduction to Pedagogy | 1. Subject, object, tasks, main categories of pedagogy. 2. Education as a sociocultural phenomenon.   1. Modern world educational space, its properties and trends.  2. Education system of Russia | HT  T |
| 7 | Pedagogical process | 1. Essence, patterns and principles of the pedagogical process. 2. Essence, structure, functions and teaching methods. 3. Essence, goals, principles and methods of education | HT  Survey |
| 8 | Family as a subject of education and personality development | 1. Family as a small group.  2. Family education.  3. Relationships between parents and children.  4.Problems of family education | HT  Survey |

FULL-TIME EDUCATION

**4.3 Sections of the discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Total | classroom  Job | | | Out-  room  Job  IW |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Psychology as a science and subject | 4 | 2 | 2 |  |  |
| 2 | Psychology of Personality | 18 | 2 | 2 |  | 14 |
| 3 | Mind and consciousness | 18 | 2 | 2 |  | 14 |
| 4 | Psychic Phenomena | 4 | 2 | 2 |  |  |
| 5 | Interpersonal and intergroup relations | 19 | 3 | 2 |  | 14 |
| 6 | Introduction to Pedagogy | 20 | 2 | 2 |  | 16 |
| 7 | Pedagogical process | 21 | 2 | 3 |  | 16 |
| 8 | Family as a subject of education and personality development | 4 | 2 | 2 |  |  |
|  | Total | 108 | 17 | 17 |  | 74 |

**4.4 Independent study of sections of the discipline**

|  |  |  |
| --- | --- | --- |
| No.  section | Questions submitted for independent study | Number of hours |
| 2 | The development of the psyche in phylogenesis and ontogenesis.  Consciousness as the highest form of mental reflection | 14 |
| 3 | Memory as a mental process.  Attention and its properties.  Imagination | 14 |
| 5 | The structure of personality.  Personal orientation.  Driving forces of personal development. The main stages of personality development. Criteria of the formed personality.  Factors of personality formation.   1. Two stages and two criteria for a formed personality. 2. Self-concept and its structure.   Mechanisms of personality development.   1. The mechanism of shifting the motive to the goal. 2. identification mechanism. 3. The mechanism of mastering social roles | 14 |
| 6 | Characteristics of temperament types.  Character and personality.  Character types. Accentuated characters.  Knowledge, skills, abilities. The concept of abilities. Abilities and talents. Ability types | 16 |
| 7 | Pedagogical process: characteristics and structure.  Education is a component of the pedagogical process.  Forms of education.  Teaching methods.  Learning assessment.  Pedagogical technologies.  Education is a component of the pedagogical process | 16 |
|  | Total | 74 |

**4.5 Labs**

Laboratory classes are not included in the curriculum.

**4.6 Practical exercises**

|  |  |  |  |
| --- | --- | --- | --- |
| No.  classes | No.  section | Subject | Number of hours |
| 1 | 2 | 3 | 4 |
| 1 | 1 | Psychology as a science and subject | 2 |
| 2 | 2 | Psychology of Personality | 2 |
| 3 | 3 | Mind and consciousness | 2 |
| 4 | 4 | Psychic Phenomena | 2 |
| 5 | 5 | Interpersonal and intergroup relations | 2 |
| 6 | 6 | Introduction to Pedagogy | 2 |
| 7 | 7 | Pedagogical process | 3 |
| 8 | 8 | Family as a subject of education and personality development | 2 |
|  |  | Total | 17 |

**4.7 Course project (term paper)**

The course project (term paper) is not provided for by the curriculum.

CORRESPONDENCE FORM OF TRAINING

**4.3 Sections of the discipline**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| No.  once-  affairs | Section names | Number of hours | | | | |
| Total | classroom  Job | | | Out-  room  Job  IW |
| L | PZ | LR |
| 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 1 | Psychology as a science and subject | 4 | 2 | 2 |  |  |
| 2 | Psychology of Personality | 18 | 2 | 2 |  | 14 |
| 3 | Mind and consciousness | 18 | 2 | 2 |  | 14 |
| 4 | Psychic Phenomena | 4 | 2 | 2 |  |  |
| 5 | Interpersonal and intergroup relations | 19 | 3 | 2 |  | 14 |
| 6 | Introduction to Pedagogy | 20 | 2 | 2 |  | 16 |
| 7 | Pedagogical process | 21 | 2 | 3 |  | 16 |
| 8 | Family as a subject of education and personality development | 4 | 2 | 2 |  |  |
|  | Total | 108 | 17 | 17 |  | 74 |

**4.4 Independent study of sections of the discipline**

|  |  |  |
| --- | --- | --- |
| No.  section | Questions submitted for independent study | Number of hours |
| 2 | The development of the psyche in phylogenesis and ontogenesis.  Consciousness as the highest form of mental reflection | 14 |
| 3 | Memory as a mental process.  Attention and its properties.  Imagination | 14 |
| 5 | The structure of personality.  Personal orientation.  Driving forces of personal development. The main stages of personality development. Criteria of the formed personality.  Factors of personality formation.   1. Two stages and two criteria for a formed personality. 2. Self-concept and its structure.   Mechanisms of personality development.   1. The mechanism of shifting the motive to the goal. 2. identification mechanism. 3. The mechanism of mastering social roles | 14 |
| 6 | Characteristics of temperament types.  Character and personality.  Character types. Accentuated characters.  Knowledge, skills, abilities. The concept of abilities. Abilities and talents. Ability types | 16 |
| 7 | Pedagogical process: characteristics and structure.  Education is a component of the pedagogical process.  Forms of education.  Teaching methods.  Learning assessment.  Pedagogical technologies.  Education is a component of the pedagogical process | 16 |
|  | Total | 74 |

**4.5 Labs**

Laboratory classes are not included in the curriculum.

**4.6. Practical lessons**

|  |  |  |  |
| --- | --- | --- | --- |
| No.  classes | No.  section | Subject | Number of hours |
| 1 | 2 | 3 | 4 |
| 1 | 1 | Psychology as a science and subject | 2 |
| 2 | 2 | Psychology of Personality | 2 |
| 3 | 3 | Mind and consciousness | 2 |
| 4 | 4 | Psychic Phenomena | 2 |
| 5 | 5 | Interpersonal and intergroup relations | 2 |
| 6 | 6 | Introduction to Pedagogy | 2 |
| 7 | 7 | Pedagogical process | 3 |
| 8 | 8 | Family as a subject of education and personality development | 2 |
|  |  | Total | 17 |

**4.7 Course project (term paper)**

The course project (term paper) is not provided for by the curriculum.

**4.LIST OF EDUCATIONAL AND METHODOLOGICAL SUPPORT FOR INDEPENDENT WORK OF STUDENTS IN THE DISCIPLINE**

In accordance with the requirements of the Federal State Educational Standard of Higher Education in the direction of training (specialty) 06.03.01"Biology" implementation of the competency-based approach provides for the widespread use of active and interactive forms of conducting classes in the educational process.

When studying an academic discipline, it is recommended to use active teaching methods that encourage students to active mental activity. As part of the implementation of this program, the following educational technologies are provided: educational technology "Problem lecture", business and role-playing games, analysis of specific psychological and pedagogical situations, lecture-presentation.

**5.1 Interactive educational technologies used in the classroom**

When studying an academic discipline, it is recommended to use educational technologies "Problem lecture", "Brainstorm", "Training technologies”, “Lecture-presentation”, “Business game”.

|  |  |  |  |
| --- | --- | --- | --- |
| Semester | Class type  (L, PR, LR) | Used interactive educational technologies | Quantity  hours |
| 5/7 | L | Problem lecture, lecture-presentation, training technologies, role-playing situations | 12 |
| ETC |  |  |
| Total | |  | 12 |

**5. LIST OF BASIC AND ADDITIONAL LITERATURE REQUIRED FOR MASTERING THE DISCIPLINE**

**6.1 Main literature**

1. Akimenko G.V. Psychology and pedagogy [Electronic resource]: guidelines for students of the correspondence department of the faculty "Economics and management at enterprises" / Akimenko G.V., Mikhailova T.M. - Electron. text data. - Kemerovo: Kemerovo State Medical Academy, 2006. - 20 p. - Access mode: http://www.iprbookshop.ru/6202.html. - EBS "IPRbooks"

**6.2 Further reading**

1. Ermakov V.A. Psychology and Pedagogy [Electronic resource]: textbook / Ermakov V.A.— Electron. text data. - M.: Eurasian Open Institute, 2011. - 302 p. - Access mode: http://www.iprbookshop.ru/11095.html. — EBS «IPRbooks»
2. Ermakov V.A. Psychology and Pedagogy [Electronic resource]: textbook / Ermakov V.A.— Electron. text data. - M.: Eurasian Open Institute, 2011. - 302 p. - Access mode: http://www.iprbookshop.ru/11095.html. — EBS «IPRbooks»

**6.3 Periodicals**

1. Journal "World of Psychology".
2. Journal "Questions of Psychology".
3. "Psychological Journal".

**6.LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" (hereinafter referred to as the "INTERNET" NETWORK) NECESSARY FOR MASTERING THE DISCIPLINE**

http://psylib.myword.   
<http://scitylibrary.h11/Library.htm>  
<http://www.psycatalog.ru>  
<http://karpowww.narod.ru>  
[www.iu.ru/biblio/default.aspx](http://www.i-u.ru/biblio/default.aspx)  
<http://www.psycheya.ru>  
<http://www.psychology.ru/Library>  
<http://scitylibrary.h11/Library.htm>  
<http://www.psycatalog.ru>  
<http://karpowww.narod.ru>

**7.METHODOLOGICAL INSTRUCTIONS FOR STUDENTS PABOUT MASTERING THE DISCIPLINE**

The work program of the discipline "Psychology and Pedagogy" provides for independent work of students in the amount of 36 hours.

Independent work of students is the most important component of classes in psychology and pedagogy, necessary for the full assimilation of the programcourse.

The purpose of independent work is to consolidate and deepen the lessons received by students in lectures, preparation for current seminars, intermediate forms of knowledge control(testing) and to offset.

Independent work contributes to the formation of students' skills in working with psychological and pedagogical literature, the development of a culture of mental work and the search for new knowledge.Independent work includes those sections of the course of psychology and pedagogy that did not receive sufficient coverage in lectures due to the limited lecture time and the large amount of material studied. All the time (36 hours) is allocated for independent work of students, which is provided by the curriculum for the study of psychology and pedagogy by students. It follows from this that it is impossible to obtain the required psychological and pedagogical training without serious systematic independent work. Mastering the program of the course of psychology and pedagogy suggests that for independent study of these disciplines, the student must provide an average of two hours a week throughout the semester.

**8.LIST OF INFORMATION TECHNOLOGIES USED IN THE EDUCATIONAL PROCESS ON THE DISCIPLINE, INCLUDING THE LIST OF SOFTWARE AND INFORMATION REFERENCE SYSTEMS**

The use of interactive technologies and methods of active socio-psychological learning is possible if the standard Microsoft Office package is installed on working computers, in particular Microsoft Office, PowerPoint 2003.

**9..DESCRIPTION OF THE MATERIAL AND TECHNICAL BASE NECESSARY FOR THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS ON THE DISCIPLINE**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;
* rooms for independent work with Internet access.

For effective work on the assimilation of knowledge by students within the framework of the taught discipline, the classroom must be equipped with multimedia means of demonstration;teaching and visual aids: textbooks, teaching aids, workshops.

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION**

**Federal State Budgetary Educational Institution**

**higher education**

**"Chechen State University"**

**FACULTY OF LAW**

Department of Theory and History of State and Law

**WORKING PROGRAMM**

**EDUCATIONAL DISCIPLINE**

**"Jurisprudence»**

Code and name of the field of study: Biology-06.03.01

Name of focus: "General biology"

Graduate Qualification Level: Bachelor

Full-time form of education

RPD adapted for individuals

disabled

health and disability

Grozny 2021

The work program of the discipline "Jurisprudence"

Compiled by:

Art. teacher M.S. Jamaldinova

APPROVED

Minutes of the meeting of the department "Theory and history of state and law"

No. 10/15 dated June 20, 2021

**TABLE OF CONTENTS**

1. Explanatory note

1.1 The purpose and objectives of the discipline "Jurisprudence"

1.2. The list of planned learning outcomes in the discipline "Jurisprudence", correlated with indicators of achievement of competencies

1.3. The place of discipline in the structure of the educational program

2. The structure of the discipline "Jurisprudence"

3. The content of the discipline "Jurisprudence"

4. Educational technologies

5. Evaluation of planned learning outcomes

5.1. Grading system

5.2. Grading Criteria

5.3. Evaluation tools (materials) for current monitoring of progress, intermediate certification of students in the discipline "Jurisprudence"

6. Educational, methodological and information support of the discipline

6.1. List of sources and literature

6.2. List of resources of the information and telecommunications network "Internet"

7. Logistics support of the discipline "Jurisprudence"

8. Ensuring the educational process for people with disabilities and people with disabilities

**Applications**

Annex 1. List of changes

**1. Explanatory note**

**1.1. Goals and objectives of mastering the discipline**

**The goals of mastering the discipline**: the academic discipline "Jurisprudence" aims to give students a scientific understanding of law and the state, the assimilation and practical application by students of the main provisions of the general theory of law, as well as Russian public and private law. Within the framework of the discipline, the foundations of such branches of public law as constitutional (state) law, administrative and criminal law are studied. From the private law branches, civil, family and labor law are covered. And also the discipline gives a generalized concept of international relations and international law.

**Tasksmastering the discipline**:

- to study the methodological foundations of the scientific understanding of the state and law, state-legal phenomena; patterns of historical movement and functioning of the state and law; the relationship of the state, law and other spheres of society and human life;

- to form the conceptual and categorical apparatus of the theory of state and law;

- to study the evolution and correlation of modern state and legal systems, to know the main problems of the modern understanding of the state and law;

- to study the general characteristics of modern political and legal doctrines.

**2. The list of planned learning outcomes in the discipline, correlated with the planned results of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competency Code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| GC-4 | OK-4 Ability to use the basics of legal knowledge in various spheres of life. | **Own**: skills of working with legislative and other regulatory legal acts (documents) related to the professional activities of a social worker.  **Be able to**: analyze and evaluate regulatory information.  **Know:**legal concepts, the structure of Russian legislation, types of legal branches and features of their regulation, essence, nature and interaction |
| GPC-13 | GPC-13 Willingness to use the legal norms of research robots and copyright, as well as the legislation of the Russian Federation in the field of nature protection and nature management. | **Own**: the legal basis for the protection of the natural environment, nature management, environmental safety; the skills of analysis and application of the main theoretical provisions in the field of environmental and resource legislation, observing copyright law.  **Be able to:**operate with the main terms in the field of nature management and environmental protection, apply legal norms and documents to regulate the relations of nature management and environmental protection; basic views, concepts in the designated area; apply the acquired knowledge about law, legal norms for environmental protection and nature management, constitutional provisions, ensure compliance with legislation in this area; use basic knowledge to solve research and professional problems; comply with information security requirements  **Know:**legal norms of research works and copyright, the main regulatory requirements of environmental legislation and nature management of the Russian Federation; fundamentals of state policy in the field of nature management and environmental protection, basic concepts in the field of nature management and environmental protection, including the legal regime for the use and protection of land, water, forests, subsoil, wildlife and atmospheric air, objects of international legal protection |

**3. The content of the discipline, structured by topics (sections) indicating the number of academic or astronomical hours allocated to them and types of training sessions**

**3.1 Structure of the discipline**

The total labor intensity of the discipline in full-time education is 2 credit units (72 academic hours)

|  |  |  |
| --- | --- | --- |
| Forms of work of students /  Types of training sessions | Labor intensity, hours | |
| No. Semester 3 | Total |
| Contact classroom work of students with the teacher: | 16 | 16 |
| *Lectures* | 16 | 16 |
| *Practical classes (PC)* |  |  |
| *Laboratory work (LW)* |  |  |
| Independent work: | 56 | 56 |
| Abstract (R) |  |  |
| Report (R) |  |  |
| Test (T) |  |  |
| Pass/exam | offset | offset |

**3.2 The content of the sections of the discipline**

|  |  |  |  |
| --- | --- | --- | --- |
| *No. p / p* | *Name of the discipline section* | *Section content* | *Current control form* |
| 1 | 2 | 3 | 4 |
|  | Fundamentals of the theory of state and law | Origin of the State. The concept and features of the state. State functions. Forms of state government. form of government. Political regime. The main features of the rule of law. The concept and signs of law. Law system. The concept and types of sources of law. Law and regulations. | Survey, control of self-training |
|  | Fundamentals of the constitutional law of the Russian Federation | The concept and subject of constitutional law. Sources of constitutional law. The constitution is the fundamental law of the state. Fundamentals of the constitutional system. Rights and freedoms of man and citizen. Subjects and norms of constitutional law. constitutional relations. | Survey, control of self-training |
|  | Fundamentals of Administrative Law of the Russian Federation | Concept, system and principles of administrative law. The system of executive authorities. administrative coercion. Administrative offense and administrative responsibility. The concept of municipal law. The concept, functions and principles of local self-government. | Survey, control of self-training |
|  | Fundamentals of civil law of the Russian Federation | The concept of civil law. civil law system. Sources of civil law. The concept of civil law relations. Subjects of civil legal relations. Objects of civil law. Subjective civil law. Subjective civil legal obligation. The concept and forms of transactions. | Survey, control of self-training |
|  | Basics of family law in the Russian Federation | The concept and principles of family law. Family Code of the Russian Federation. The concept of marriage and family. The procedure for concluding and dissolving a marriage. Rights and obligations of spouses. Rights and obligations of parents and children. Alimony obligations. Forms of education of children left without parental care. Protection of family rights. | Survey, control of self-training |
|  | Fundamentals of criminal law of the Russian Federation | Concept and tasks of criminal law. The concept and composition of the crime. The concept and purpose of punishment. Types of criminal penalties. Responsibility of minors. Circumstances excluding the criminality of the act. | Survey, control of self-training |
|  | Fundamentals of environmental law of the Russian Federation | Ecology and ecological system of the country. The concept and system of environmental law. Environmental offenses and liability for their commission. | Survey, control of self-training |
|  | Fundamentals of international law | The emergence and essence of international law. International public and international private law. Basic principles of international law. The main institutions of international law. Responsibility in international law. Peaceful settlement of international disputes. | Survey, control of self-training |

**FULL-TIME EDUCATION**

* 1. **Sections of the discipline studied in \_3\_ semester**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| *section number* | *Section name*  *disciplines* | Number of hours | | | | |
| Contact work of students | | | | |
| Total | Classroom work | | | Out-  room  Job |
| *L* | *PC* | *LW* |
| *1* | Fundamentals of the theory of state and law | 10 | 2 |  | - | 8 |
| *2* | Fundamentals of the constitutional law of the Russian Federation | 8 | 2 |  | - | 6 |
| *3* | Fundamentals of Administrative Law of the Russian Federation | 8 | 2 |  | - | 6 |
| *4* | Fundamentals of civil law of the Russian Federation | 10 | 2 |  | - | 8 |
| *5* | Basics of family law in the Russian Federation | 8 | 2 |  | - | 6 |
| *6* | Fundamentals of criminal law of the Russian Federation | 10 | 2 |  | - | 8 |
| *7* | Fundamentals of environmental law of the Russian Federation | 8 | 2 |  | - | 6 |
| *8* | Fundamentals of international law | 10 | 2 |  | - | 8 |
| Total | | 72 | 16 |  | - | 56 |

**3.4. Independent work of students**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of the topic, discipline or section | Type of independent extracurricular work of students, incl. DAC | Estimator | Number of hours | Code  Competencies  (th) |
| Fundamentals of the theory of state and law | abstracts | Poll, evaluation of performances. | 7 | GC-4, GPC-13 |
| Fundamentals of the constitutional law of the Russian Federation | abstracts | Poll, evaluation of performances. | 6 | GC-4, GPC-13 |
| Fundamentals of Administrative Law of the Russian Federation | abstracts | Poll, assessment of performances | 6 | GC-4, GPC-13 |
| Fundamentals of civil law of the Russian Federation | abstracts | Poll, assessment of performances | 8 | GC-4, GPC-13 |
| Basics of family law in the Russian Federation | abstracts | Poll, assessment of performances | 6 | GC-4, GPC-13 |
| Fundamentals of criminal law of the Russian Federation | abstracts | Poll, assessment of performances | 8 | GC-4, GPC-13 |
| Fundamentals of environmental law of the Russian Federation | abstracts | Poll, assessment of performances | 7 | GC-4, GPC-13 |
| Fundamentals of international law | abstracts | Poll, assessment of performances | 8 | GC-4, GPC-13 |
| **Total hours** | | | **56** |  |

**The list of educational and methodological support for independent work of students in the discipline.**

The importance of independent work of students in the intersessional period is growing. Therefore, the study of the course "Jurisprudence" provides for work with the main specialized literature, additional review nature, as well as doing homework.

Independent work of students should contribute to a deeper assimilation of the course being studied, form research skills and orient students to the ability to apply theoretical knowledge in practice.

Tasks for independent work, their content and form of control are given in the form of a table.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Name of topics | Content of independent work | form of control | | educational literature |
| Fundamentals of the theory of state and law | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, , | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019. -253p. | |
| Fundamentals of the Constitutional Law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019. -253p. | |
| Fundamentals of Administrative Law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Fundamentals of State and Law: Textbook / Ed. S.A. Komarov. - St. Petersburg: Peter, 2014. | |
| Basics of family law in the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019. -253p. | |
| Fundamentals of civil law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Fundamentals of State and Law: Textbook / Ed. S.A. Komarov. - St. Petersburg: Peter, 2014. | |
| Fundamentals of criminal law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019.-253p. | |
| Fundamentals of labor law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Fundamentals of State and Law: Textbook / Ed. S.A. Komarov. - St. Petersburg: Peter, 2014. | |
| Fundamentals of environmental law of the Russian Federation | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019.-253p. | |
| Essence of international law | - study of educational material (according to lecture notes of educational and scientific literature) and preparation of reports at seminars and practical classes, for participation in thematic discussions and business games;  - work with normative documents and legislative base;  -search and review of scientific publications and electronic sources of information, preparation of an opinion on the review; | Poll, evaluation of performances, | Jurisprudence (full course): Textbook for non-legal universities and faculties / ed. prof. Smolensky M.B. 4th edition, rev. and additional – Rostov n\D. Publishing Center "March" 2019.-253p. | |

**3.5. Laboratory work**

Laboratory work is not included in the curriculum

**3.6. Practical exercises**

Practical exercises are not included in the curriculum

**4. List of basic and additional educational literature required for mastering the discipline**

* 1. **Basic literature**

1. Boshno S. V. Pravovedenie: osnovy gosudarstva i prava: uchebnik dlya akademicheskogo baccalaureata [Jurisprudence: fundamentals of the State and law: textbook for academic bachelor's degree].
2. Balashov A. I., Rudakov G. P. Pravovedenie [Legal Studies], Moscow: Piter Publ., 2018, 464 p.
3. Dinaev I. Z. Pravovedenie: Uchebnoe posobie [Legal studies: A Textbook]. Grozny Publ., 2015, 288 p. (in Russian)
4. Belyakov V. G. Pravo dlya ekonomistov i managerov [Law for Economists and Managers]. Textbook and practice / V. G. Belyakov, Moscow: Yurayt Publ., 2016, 396 p.
5. Malko A.V. Legal studies. Elementary course. Textbook / A.V. Malko. - Moscow: KnoRus, 2016. - 914 p.

**4.2 Additional literature**

1. Komarova V. V., Varlen M. V., Lebedev V. A., Taeva N.E. Constitutional Law of Russia. Textbook, Moscow: KnoRus Publ., 2019, 280 p .

2. Constitutional law. The general part. Uchebno-metodicheskoe posobie [Educational and methodical manual]. Bogdanova N. A. Moscow: Zertsalo Publ., 2019, 372 p.

3. Byalt V. S. Pravovedenie: ucheb. manual for universities / V. S. Byalt. - 2nd ed., ispr. and dop. - Moscow: Yurayt Publishing House, 2018. - 302 p.

**4.3. Periodicals:**

1. Bulletin of the Chechen State University.

2. Law and Law Magazine.

3. Journal "State and Law".

4. "Archival Bulletin" of the Archive Department of the Government of the Chechen Republic.

5. Bulletin of the Academy of Sciences of the Chechen Republic.

**5. List of resources of the information and telecommunications network " Internet "(hereinafter referred to as the "Internet" network) required for mastering the discipline**

1. Dictionaries. http://slovari-online.ru
2. World Digital Library http://www.openspace.ru/
3. Russian State Public Library http://elibrary.rsl.ru/
4. State Public Historical Library of Russia http://www.shpl.ru/

**6. Guidelines for students on mastering the discipline**

Comprehensive study of the academic discipline "Law" offered to students involves mastering the materials of lectures, textbooks, creative work of students during practical classes, as well as systematic implementation of test and other tasks for independent work of students.

Mastering the discipline will help students get up-to-date ideas on the problems of management system development both at the macro level and at the level of an economic entity.

The study of the discipline is reduced to the training of specialists who have the knowledge necessary to perform their professional activities, and, above all, knowledge of management, as well as the essence and content of the management system, its role. Based on the system analysis methodology, management is considered as a complex socio-economic system. Technologies, organizations and support of the management system are studied.

During the lectures, the main issues in the framework of the topic­under consideration are revealed, the most complex and interesting provisions of the studied material are emphasized,­which should be taken into account by students. Lecture materials are the basis for preparing students for practical classes.

**7. List of information technologies used in the implementation of the educational process in the discipline, including a list of software for information reference systems**

When giving lectures, computer equipment is used to demonstrate multimedia presentation materials. In practical classes, students present presentations that they have prepared during their independent work hours.

Information technologies:

1. Technical means: a set of multimedia projection equipment: screen, projector, laptop;

2. Teaching methods using information technologies (computer testing, demonstration of multimedia materials);

3. List of Internet services and electronic resources (search engines "Consultant plus", e-mail);

4. List of information reference systems (Information system for automating the educational process "UComplex", Automated library and information systems-" IPRbooks"," Student's Consultant", LLC"IVIS").

**8. Material and technical base necessary for the implementation of the educational process in the discipline.**

For the implementation of the educational process in the discipline, there is the following material and technical base:

1. auditoriums for conducting lecture-type classes, seminar-type classes, course design, group and individual consultations, ongoing monitoring and intermediate certification, as well as rooms for independent work and rooms for storing and preventive maintenance of educational equipment. Special rooms are equipped with specialized furniture and technical training facilities that serve to present educational information to a large audience.

2. for conducting lecture-type classes, there are sets of demonstration equipment and educational and visual aids that provide thematic illustrations.

3. premises for independent work of students are equipped with computer equipment with the ability to connect to the Internet and provide access to the electronic information and educational environment of the organization.

4. library, reading room, access to library collections with scientific literature; access to the electronic library.

5. A licensed software package that includes the Microsoft Office application software package.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

Chechen State University

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Working program of the discipline

**"**METHODS OF TEACHING BIOLOGY**"**

|  |  |
| --- | --- |
| ***Training area*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.List ofcompetencies formed by the discipline in the process of implementingthe educational program**

|  |  |  |
| --- | --- | --- |
| **Group of competencies** | **Category of competencies** | **Code** |
| professional | Professional skills | PC-4.1;  PC-4.2 |

**2. Competencies, indicators of their achievement and results of training in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competence** | **code Code and name of the competence indicator** | **Results of training**  **in the discipline** |
| PC-4 | Is able to carry out pedagogical activities in the field of preschool, primary, basic and secondary general education and in additional programs in accordance with the obtained qualification | Knows the principles of organizing students ' activities aimed at mastering biological disciplines and additional general education programs  Owns teaching methods and monitoring and evaluation mastering the program material |

**3. Scope of the discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of academic work*** | | ***Forms of study*** | | |
| ***Full*** | ***-time Part-*** | ***time Correspondence*** |
| **Total labor** intensity: credits / hours | | 144/4 | 144/4 |  |
| **Contact work**: | | 45 | 34 |  |
|  | Lecture-type | classes 15 | 15 |  |
| Seminar-type | classes 30 | 30 |  |
| Intermediate certification: credit / credit with assessment / exam\* |  |  |  |
| **Independent work** (SRS) | | 63 | 63 |  |
| of them are for completing coursework (course project) | |  |  |  |

\* - select what you need in bold italics

Notes:

1. credit and credit with assessment in full-time education is conducted within the framework of seminar-type classes. Hours are not allocated in the curriculum.

***4. The content of the discipline (module), structured by topics / sections with an indication of the number of academic hours allocated to them and the types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **n /** | **a Section / topic** | **Types of academic work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type** | | **classes Seminar-type** | | | |
| *classes Lectures* | *Other training sessions* | *Practical classes* | *Seminars* | *Laboratory work.* | *Other activities* |
| 1. | Section 1. Subject, goals and objectives of the course. History of MOBILE development | 2 |  |  |  | 3 |  | 7 |
| 2. | Section 2. Types of biology training. | 2 |  |  |  | 3 |  | 7 |
| 3. | Section 3. Methods of teaching biology. | 2 |  |  |  | 3 |  | 7 |
| 4. | Section 4. The system of forms of teaching biology. | 2 |  |  |  | 2 |  | 7 |
| 5. | Section 5. Methodology for the development of concepts, skills and abilities in MOB. | 2 |  |  |  | 3 |  | 7 |
| 6. | Section 6. Methods of conducting excursions in biology. | 2 |  |  |  | 4 |  | 7 |
| 7. | Section 7. Extracurricular biology classes. Education in the learning process. | 2 |  |  |  | 4 |  | 7 |
| 8. | Section 8. Traditional and innovative teaching technologies in higher education. | 1 |  |  |  | 4 |  | 7 |
| 9. | Section 9. Full-time and part-time education.  Fundamentals of pedagogical control in higher education institutions. | 1 |  |  |  | 4 |  | 7 |

* + 1. Full-time and part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **n /** | **a Section / topic** | **Types of academic work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type** | | **classes Seminar-type** | | | |
| *classes Lectures* | *Other educationalclasses* | *Practicalclasses* | *Seminars bunks* | *Laboratorywork.* | *Other preoccupationsI'm busy with* |
| 1. | Section 1. Subject, goals and objectives of the course. History of MOBILE development | 2 |  |  |  | 3 |  | 7 |
| 2. | Section 2. Types of biology training. | 2 |  |  |  | 3 |  | 7 |
| 3. | Section 3. Methods of teaching biology. | 2 |  |  |  | 3 |  | 7 |
| 4. | Section 4. The system of forms of teaching biology. | 2 |  |  |  | 2 |  | 7 |
| 5. | Section 5. Methodology for the development of concepts, skills and abilities in MOB. | 2 |  |  |  | 3 |  | 7 |
| 6. | Section 6. Methods of conducting excursions in biology. | 2 |  |  |  | 4 |  | 7 |
| 7. | Section 7. Extracurricular biology classes. Education in the learning process. | 2 |  |  |  | 4 |  | 7 |
| 8. | Section 8. Traditional and innovative teaching technologies in higher education. | 1 |  |  |  | 4 |  | 7 |
| 9. | Section 9. Full-time and part-time education.  Fundamentals of pedagogical control in higher education institutions. | 1 |  |  |  | 4 |  | 7 |

* 1. Program of the discipline, structured by topics / sections

4.2.1. Content of the lecture course

|  |  |  |
| --- | --- | --- |
| **n /** | **a Name of the topic (section) of the discipline** | **Content of the lecture session** |
|  | Section 1. Subject, goals and objectives of the course. | Methods of teaching biology as a science and an academic subject:  - functions of biology as a science  -the peculiarity of biology as an academic subject.  - structure of the content of biology training.  - general and private methods.  History of the development of school biological education in Russia.  - public education reforms in Russia in the XVIII-XIX centuries  . - changes in the teaching of natural science in the post-revolutionary period.  - subjects of the natural science cycle of the mid-XX century.  Goals and objectives of biology teaching methods at the present stage:  - goals and objectives of the MOB.  - regularities (external and internal) and principles (general biological, specific, methodological) of biological education. |
|  | Section 2 Types of biology training. | Planning features.  Types of biology training:  - Socratic, dogmatic, developmental, explanatory and illustrative;  - problem-based, programmed, modular, informatized, multimedia training.  Problems of biological education at the present stage:  - the main goals of biological education;  - development of an educational and methodical complex (work program) in biology. |
|  | Section 3. Methods of teaching biology. | Methods of teaching biology (educational, verbal, practical and visual, working with a book, working with a text); methodological techniques and their choice (logical, organizational and technical). |
|  | Section 4  System of forms of teaching biology. | Prokaryotes. General information about the eukaryotic system of forms of biology teaching (lesson, extracurricular work, extracurricular activities).  Thematic (calendar-thematic) planning (CTP), its main meaning, scheme (variations) and after-school planning of biology lessons (general rules and organization, lesson construction, detailed outline plan, laboratory and practical work). |
|  | Section 5  Methodology for the development of concepts, skills and abilities in MOB. | Methods of developing concepts (simple and complex, special and general biological), skills and abilities in biology lessons. |
|  | Section 6  Methods of conducting excursions in biology. | Methods of conducting excursions in biology (educational excursion, methodological recommendations for conducting an academic excursion, instilling love for the native land in biology lessons: national and regional component, organization and conduct of phenological observations in biology lessons). |
|  | Section 7  Extracurricular biology classes. Education in the learning process. | Extracurricular biology classes (school and extracurricular); types of extracurricular activities, group extracurricular activities, individual extracurricular activities.  Education in the process of teaching biology (educational tasks of the biology course). |
|  | Section 8  Traditional and innovative technologies of higher education | Material base for teaching biology (biology room, wildlife corner, training and experimental area).  Biology teaching tools (real or natural objects, symbolic or pictorial substitutes for real objects and processes, verbal or verbal teaching tools). |
|  | Section 9  Full-time and part-time education.  Fundamentals of pedagogical control in higher education institutions. | Teaching biology in evening and correspondence schools (methodology, educational value of teaching methods, methodological recommendations).  Control of students ' knowledge and skills (tasks of testing knowledge and skills, teacher's abilities based on the results of testing). Thematic tests. |

* + 1. Content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **n /** | **a Name of the topic (section) of the discipline** | ***Content of laboratory classes*** |
|  | Section 1. Subject and objectives of the course. | No. 1. Methods of teaching biology as a science and an academic subject:  - the functions of biology as a science  -the peculiarity of biology as an academic subject.  - structure of the content of biology training.  - general and private methods.  No. 2. Goals and objectives of biology teaching methods at the present stage:  - goals and objectives of the MOB.  - regularities (external and internal) and principles (general biological, specific, methodological) of biological education. |
|  | Section 2. Types of biology training. | # 3. Types of biology training: Socratic, dogmatic, developmental, explanatory and illustrative, problem-based, programmed, modular, computer-based, multimedia training.  No. 4. Problems of biological education at the present stage: the main goals of biological education, development of an educational and methodological complex in biology.  No. 5. Connection of the methodology of teaching biology  with other sciences: connection of the methodology of teaching biology with pedagogy, psychology, with the science of "Biology", philosophy, etc  . No. 6. Requirements for the professional and pedagogical activity  of a biologist teacher: functions, an essential feature in professional pedagogical  activity in modern conditions, the task of training a future teacher, the main tasks of the future teacher's training. features of professional  and pedagogical training of a modern biology teacher. |
|  | Section 3. Methods of teaching biology. | No. 7. Methods of teaching biology (educational, verbal, practical and visual, working with a book, working with a text).  No. 8. Methodological techniques and their choice (logical, organizational, and technical). |
|  | Section 4.  System of forms of teaching biology. | No. 9. The system of forms of teaching biology (lesson, extracurricular work, extracurricular activities).  № 10. Thematic (calendar-thematic) planning (CTP), its main meaning, scheme (variations) and after-school planning of biology lessons (general rules and organization, lesson construction, detailed outline plan, laboratory and practical work). |
|  | Section 5.  Methodology for the development of concepts, skills and abilities in mobs. | № 11. Methods of developing concepts (simple and complex, special and general biological), skills and abilities in biology lessons. № 12. Methods of conducting excursions in biology (educational excursion, methodological recommendations for conducting an academic excursion, instilling love for the native land in biology lessons: national and regional component, organization and conduct of phenological observations in biology lessons). |
|  | Section 6.  Methods of conducting excursions in biology. | № 12. Methods of conducting excursions in biology (educational excursion, methodological recommendations for conducting an academic excursion, instilling love for the native land in biology lessons: national and regional component, organization and conduct of phenological observations in biology lessons). |
|  | Section 7.  Extracurricular biology classes. Education in the learning process. | № 13. Extracurricular biology classes (school and extracurricular); types of extracurricular activities, group extracurricular activities, individual extracurricular activities.  № 14. Education in the process of teaching biology (educational tasks of the biology course). |
|  | Section 8.  Traditional and innovative teaching technologies in higher school | No. 15. Material base for teaching biology (biology room, wildlife corner, training and experimental area).  № 16. Biology teaching tools (real or natural objects, symbolic or pictorial substitutes for real objects and processes, verbal or verbal teaching tools). |
|  | Section 9.  Full-time and part-time training.  Fundamentals of pedagogical control in higher education institution | No. 17. Teaching biology in evening and correspondence schools (methodology, educational value of teaching methods, methodological recommendations).  № 18. Control of students ' knowledge and skills (tasks of testing knowledge and skills, teacher's abilities based on the results of testing). Thematic tests. |

**5. Fund of assessment funds for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- current performance monitoring

- intermediate certification of students in the discipline

The fund of assessment funds for conducting intermediate certification of students in the discipline is issued in the appendix to the work program of the discipline.

5.1 Passport of the assessment fund for conducting current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **n /** | **a Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Subject, goals and objectives of the course. History of mobile development. | OR, P, T, LR |
| 2. | Section 2. Types of biology training. | OR, P, T, LR |
| 3. | Section 3. Methods of teaching biology. | OR, P, T, LR |
| 4. | Section 4. The system of forms of teaching biology. | OR, P, T, LR |
| 5. | Section 5. Methodology for the development of concepts, skills and abilities in mobs. | OR, P, T, LR |
| 6. | Section 6. Methods of conducting excursions in biology. | OR, P, T, LR |
| 7. | Section 7. Extracurricular biology classes. Education in the learning process. | OR, P, T, LR |
| 8. | Section 8. Traditional and innovative technologies of higher education. | OR, P, T, LR |
| 9. | Section 9. Full-time and part-time education.  Fundamentals of pedagogical control in higher education institutions. | OR, P, T, LR |

5.2 Standard control tasks or other materials necessary for assessing knowledge, skills, and /or experience**in the current monitoring process**нтроля

5.3 Methodological materials defining procedures for assessing knowledge, skills, abilities and (or) work experience

**Oral response**

Assessment of knowledge involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of basic concepts and categories in the discipline. In addition, it evaluates not only the depth of knowledge of the questions asked, but also the ability to use practical material in the answer. Speech culture and public speaking skills are evaluated.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of various points of view, independent generalization of the material, use of professional terms, speech culture, oratory skills. Presentation of the material without factual errors.

The *"excellent*" rating is given when the material is presented exhaustively, consistently, competently and logically in a coherent manner, while revealing not only the basic concepts, but also analyzing the points of view of various authors. The student does not find it difficult to answer, observes the culture of speech.

A grade *of "good"* is given if the student knows the material well, presents it correctly and to the point, knows the practical basis, but makes minor errors when answering the question.

Оценка *A "satisfactory" rating* is given if the student has mastered only the main material, but does not know individual details, makes inaccuracies, does not have the correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, or shows the lack of proper connection between analysis, argumentation, and conclusions.

The grade *"unsatisfactory"* is given if the student does not answer the questions asked.

**Research project (abstract)**

Research project –a project whose structure is close to the format of scientific research and contains proof of the relevance of the chosen topic, definition of the scientific problem, subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are presented in the form of an abstract.

*Evaluation criteria* - since the structure of the research project is as close as possible to the format of scientific research, the evaluation takes into account proof of the relevance of the research topic, definition of the scientific problem, object and subject of research, goals and objectives, sources, research methods, hypotheses, generalization of results and formulation of conclusions, designation of prospects for further research.

The *"excellent*o" rating is given when the student demonstrates a complete understanding of the problem, and all the requirements for the task are met.

Оценка *A "good" rating* is given if the student demonstrates a significant understanding of the problem and all the requirements for the task are met.

Оценка *A "satisfactory" rating* is given if the student demonstrates partial understanding of the problem, and most of the requirements for the task are met

Оценка *The "unsatisfactory" rating* is given if the student demonstrates a lack of understanding of the problem, and many of the requirements for the task are not met.

**Testing**

It is one of the means of monitoring students ' knowledge in the discipline.

*Evaluation criteria –* correct answer to the question

The *"excellent*o" rating is given if 90-100% of tasks are completed correctly

Оценка *A "good" rating* is given if 70-89% of tasks are completed correctly

Оценка *A "satisfactory" rating* is given if 50-69% of tasks are completed correctly

The rating *"unsatisfactory"* is given if less than 50% of tasks are completed correctly

**6. List of basic and additional educational literature, periodicals required for mastering the discipline (module)**

6.1. Basic literature

Andreeva N. D., Azizova I. Yu., Malinovskaya N. V. Metodika obucheniya biologii v sovremennoi shkole [Methodology of teaching biology in a modern school]. - 2nd ed., ispr. and add. - Moscow: Yurayt, 2017. - Access mode:http://www.biblio-online.ru. – Stub from the screen.

Andreeva N. D., Azizova I. Yu., Malinovskaya N. V. Metodika obucheniya biologii v sovremennoi shkole [Methods of teaching biology in a modern school: textbook and practical course for bachelor and master students]. Yurayt Publ., 2017, 294 p. (in Russian)

6.2. Additional literature

Modern educational technologies: a textbook / N. V. Bordovskaya [et al.]; edited by N. V. Bordovskaya. – Moscow: KNORUS, 2010. - 432 p.

Andreeva N. D. Metodika obucheniya biologii [Methods of teaching biology]. Andreeva N. D., Malinovskaya N. V., Solomin V. P. Istoriya stanovleniya i razvitiya [History of formation and development].- 2nd ed., ispr. and additional – Access mode: http://www.biblio-online.ru. – Stub from the screen

* 1. Periodicals

Educational technologies,

Higher education in Russia,

Journal of General Biology,

Ecology.

**7. Modern professional databases and information reference systems**

1. In the course of lectures and laboratory classes, the following software is used:
2. Programs that provide access to the Internet and email (for example, "Google chrome", "Internet Explorer").
3. Programs for demonstrating and creating presentations (for example, "Microsoft Power-Point").
4. Офисные программыMicrosoft Word and Microsoft Access office programs.
5. Microsoft Office Excel, BIOSTAT, Statistica 8 portable

**8. Software composition**

1. Organization of interaction with bachelors via e-mail (solving organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting classes is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. Anti-plagiarism program for checking texts for originality

4. For intermediate certification (exam), a computer - based form of verification of written works

**9. Equipment and technical means of training**

The minimum list of material and technical support required for the implementation of the discipline includes:

* classroom for conducting lecture-type, seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

1. Organization of interaction with bachelors via e-mail (solving organizational issues and consulting via e-mail).

2. For conducting classes, an interactive form of conducting classes is used using a multimedia projector for slide presentations, a laptop, a screen, as well as a number of educational technologies

3. Anti-plagiarism program for checking texts for originality

4. For intermediate certification (exam), a computer - based form of verification of written works

Electronic lectures, electronic bank of tests, multimedia tools for conducting classes, personal computers, laboratory microscope.

Use of classrooms and equipped laboratories for students to perform educational and research work provided for in the laboratory workshop**.**

Characteristics of the existing instrument base of the laboratory.

Laboratory classes:

A teacher's workplace equipped with a computer.

students ' workplaces equipped with the equipment necessary for performing practical exercises.

Technical training tools:

1. Multimedia installation.

2. Computer and software.

3. Video and DVD movies.

4. Interactive whiteboard.

5. Lecture notes on electronic media.

6. Guidelines for students and teachers for practical classes and lecture notes on electronic media.

MINISTRY OF SCIENCE AND HIGHER EDUCATION

RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Genetics of microorganisms"**

|  |  |
| --- | --- |
| *Direction of preparation* | **Biology** |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.** **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | ~~-~~ | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning outcomes by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Provides sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

1. **The volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Extramural*** |
| **Total workload:** credits/hours | | 108/3 | 108/3 |  |
| **Contact work:** | | 48 | 45 |  |
|  | Lecture-type classes | 16 | 15 |  |
| Seminar type classes | 32 | 30 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work (IWS)** | | 60 | 63 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

1. credit and credit with full-time assessment is carried out within the framework of seminar-type classes.

The curriculum does not include hours.

1. ***The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

2.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ п/п** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training lessons* | *Practical lessons* | *Seminars* | *laboratory works.* | *Other activities* |
| 1. | The subject and methodology of genetics of microorganisms | 2 |  |  |  |  |  |  |
| 2. | Cytological bases of heredity and variability of microorganisms | 2 |  |  |  |  |  |  |
| 3. | Sexual differentiation and life cycle | 2 |  |  |  |  |  |  |
| 4. | Types of genetic recombination in prokaryotes | 2 |  |  |  |  |  |  |
| 5. | DNA replication | 2 |  |  |  |  |  |  |
| 6. | Gene conversion | 2 |  |  |  |  |  |  |
| 7. | Expression of genetic material | 2 |  |  |  |  |  |  |
| 8. | Mutational variability | 2 |  |  |  |  |  |  |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ п/п** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **Contact work** | | | | | | **Independent work** |
| **Lecture-type classes** | | **Lecture-type classes** | | | |
| *Lectures* | *Other training lessons* | *Practical lessons* | *Seminars* | *laboratory works.* | *Other activities* |
| 1. | The subject and methodology of genetics of microorganisms | 2 |  |  |  |  |  |  |
| 2. | Cytological bases of heredity and variability of microorganisms | 2 |  |  |  |  |  |  |
| 3. | Sexual differentiation and life cycle | 2 |  |  |  |  |  |  |
| 4. | Types of genetic recombination in prokaryotes | 2 |  |  |  |  |  |  |
| 5. | DNA replication | 2 |  |  |  |  |  |  |
| 6. | Gene conversion | 2 |  |  |  |  |  |  |
| 7. | Expression of genetic material | 2 |  |  |  |  |  |  |
| 8. | Mutational variability | 1 |  |  |  |  |  |  |

4.2 The program of the discipline, structured by topics / sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **№ п/п** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | **The subject and methodology of genetics of microorganisms.** | Introduction. Genetics of microorganisms - as a private section of genetics. The contribution of the genetics of microorganisms to the doctrine of heredity and variability, to microbiology and other sciences. General properties and advantages of microorganisms as an object of genetic research. Methods of genetic analysis developed by formal genetics: mutational, hybridological, functional test for allelism to study the structure and functioning of the genetic material of higher organisms. Modern methods for studying the genome of microorganisms. The main stages of the historical development of the genetics of microorganisms.  Model objects of genetics of microorganisms.  Fields of application of genetics of microorganisms. |
| 2 | **Cytological bases of heredity and variability of microorganisms.** | Organization of the genetic apparatus and life cycles of microorganisms. eukaryotic microorganisms. General ideas about the structure of the cell and the nuclear apparatus. Life cycles of classical objects of genetic research: fungi (yeast, aspergillus, neurospores) and green algae (chlamydomonas). Prokaryotes. The structure of the cell and the organization of the genetic apparatus. Replication and organization of bacterial chromosomes. Organization of genes on a chromosome. Linear chromosomes of bacteria. Regulation of gene activity in microorganisms. The concept of an operon. Features of cell organization and the life cycle of actinomycetes. Bacteriophages. virulent bacteriophages. Their structure and life cycle on the example of T-even bacteriophages. Diversity of structure and life cycles of virulent bacteriophages. Moderate bacteriophages (on the example of bacteriophage λ). Diversity of the structure and features of the life cycle (on the example of bacteriophage Mu and factor GTA). |
| 3 | **Sexual differentiation and life cycle.** | **Lwer eukaryotes.** Features in lower eukaryotes. Types of mating and types of incompatibility in fungi on the example of S. cerevisiae, N. crassa, etc. Anisogamy and isogamy in fungi. Cytogamy and karyogamy. Heterokaryons. Tetrad analysis. Types of notebooks. Mapping functions in terad analysis.  Parasexual cycle in fungi: fusion of vegetative hyphae and heterokaryosis, nuclear fusion and diploidization, mitotic crossing over and haploidization. |
| 4 | **Types of genetic recombination in prokaryotes.** | Types of genetic recombination in prokaryotes. E. coli conjugation (J. Lederberg and E. Tatum). Characteristics of the sexual process in bacteria. Bacteria F+ and F- - type. Recombination in crosses F + x F-: analysis of the results: haploidy of the cross products, F-factor infectivity, transfer polarity, transfer direction. F' elements and merozygotes. Hfr factor. Rec proteins and recombination in bacteria. Plasmids and episomes. Bacterial plasmids, their classification and phenotypic features. Plasmid replication. Interaction of plasmid replicons in a bacterial cell: entry exclusion and incompatibility, recombination. Integration of plasmids into the chromosome. The use of plasmids in genetic analysis in bacteria. Methods for genetic analysis of plasmid DNA. Transformation of plasmid DNA. The biological significance of plasmids, their role in the evolution of bacteria. Plasmids of actinomycetes. Plasmids of yeast-saccharomycetes: two-micron and three-micron DNA. Mycelial fungus plasmids.  Deletion method, mapping of the polar region.  Insertion sequences (IS) and transposons (Tn) of bacteria. Classification and structure. Transposition mechanisms. Genetic effects caused by the introduction of migrating elements into the genome: regulatory role and mutation induction, genomic rearrangements. Integrons. conjugative transposons. Possible mechanisms for the occurrence of Tn. Migratory elements and natural selection. The role of Tn in the evolution of bacteria.  bacteriophage Mu. Virion and genome structure, phage packaging. development cycle. Mechanism of integration into the bacterial genome. Consequences of Mu integration into the bacterial genome: mutagenesis, genomic rearrangements, transposition with Mu chromosomal genes and plasmids. Possibilities of using Mu in genetic experiments.  Migratory elements of yeast. TuI element, its structure and method of insertion into the target DNA. Genetic effects caused by the introduction of Tu I into the genome: regulatory role and mutation induction, genomic rearrangements. Transformation and linked genes. Transformation in nature and experiment in different types of bacteria. Transduction. Zinder-Lederberg experiment. General or nonspecific transduction. Specific or prophage-linked transduction on the example of bacteriophage λ. Abortive and complete - as special cases of generalized transduction. transduction mapping.  Intergene recombination and mapping in bacteriophages. |
| 5 | **DNA replication.** | Semi-conservative mode of replication. Meselson-Stal experiment (1958). DNA replication in microorganisms. DNA polymerase I (A. Kornberg 1957). DNA polymerases ΙΙ and ΙΙΙ. Replication in vitro. Spiral unwinding. Initiation of replication The concept of replicon (F. Jacob and J. Monod) and replisomes (B.Alberts). Leading and lagging strands of DNA. Fragments of the Okazaki. Checking and correcting errors during replication.  DNA synthesis in eukaryotes. Comparison of DNA replication in pro- and eukaryotes. Different accuracy of replication. |
| 6 | **Gene conversion.** | Gene conversion. The phenomenon of conversion in yeast (K. Lindrengen) and neurospores (M. Mitchell). Conversion characterization: molecular accuracy, site conversion, correlation of conversion and reciprocal recombination. The ratio of conversion and coconversion and reciprocal recombination in short sections. Resolution of the "high negative interference" paradox. Copy-by-selection hypothesis explaining reciprocal recombination products in bacteriophages.  Site-specific recombination in bacteriophage. The structure of the phage genome and its cyclization in the cell. Sticky ends. Infectious cycle and lysogeny. The role of plasmids in recombination. The structure of the att site in the genomes of bacteria and phages. Recombination - integration and excision. The concept of a prophage. Similar processes during inversions in the μ bacteriophage genome and 2 μm yeast plasmid, variations in flagellar antigens in Salmonella typhimurium, etc. |
| 7 | **Expression of genetic material.** | **Transcription.** RNA polymerase. Promoters, DNA template binding and σ-subunit. Transcription initiation and mRNA elongation. mRNA lifetime, structure. Transcription in eukaryotes.  **Broadcast**. Components required for translation. Ribosome structure. tRNA structure. The role of tRNA and the rules for the interaction of codons and anticodons. Translation initiation and termination signals. Broadcast initiation. Creation of an initiating complex. elongation of the polypeptide chain. Translation termination. Polysomes. Genetic control of transcription and translation. |
| 8 | **Mutational variability.** | Laws of heredity and variability of microorganisms. mutational analysis. Evolution of views on the variability of microorganisms. Experimental evidence of the mutational nature of bacterial variability. Modern concepts of mutation and modification variability of microorganisms. The concepts of "phenotype" and "genotype" in microorganisms. Clone as a unit of accounting for heredity and variability in microorganisms. Differences between the concepts "clone", "strain", "pure culture" and "cell population". Signs of a cell and a clone, their classification. The concept of genetic markers. Mutant and mutation. Mutations of microorganisms used in genetic research. Mutant isolation methods. Mutations of fungi, algae and bacteria: morphological, resistance to inhibitors, sensitivity to mutagenic factors, auxotrophic, conditionally lethal. Mutations of bacteriophages: changing the morphology of the negative colony or host range, conditionally lethal. Back mutations. Differences in the frequencies of different types of mutations and their causes. The concept of mutational systems and mutational analysis. Spontaneous mutation process. Mutant frequency and mutation frequency, methods for their determination. Requirements for setting up experiments on induced mutagenesis. Quantitative methods for accounting for mutational variability and methods for expressing the effects of mutagens. Molecular mechanisms of gene mutations. The concept of reparation and its mechanisms.  Population variability of bacteria. Population changes in relatively constant and changing environmental conditions: on solid and liquid media. Population pressure and factors affecting the rate of population change. Population changes in pathogenic bacteria in vivo. Population variability due to modifications. |

**4.3 Content of laboratory classes**

|  |  |  |
| --- | --- | --- |
| № п/п | Name of the topic (section) of the discipline | The content of the laboratory lesson |
| 1 | Sexual differentiation and life cycle | Detection of biochemical and physiological mutants of microorganisms using selective media and the replica method. trait inheritance. |
| 2 | Sexual differentiation and life cycle | Method for obtaining recombinants by co-cultivation of microorganisms. |
| 3 | Types of genetic recombination in prokaryotes | Tetrad analysis |
| 4 | Gene conversion | Protoplast fusion method |
| 5 | Expression of genetic material | Anaphase and metaphase analysis of chromosome aberrations. |
| 6 | Regulation of gene expression | Evaluation of the mutagenic effect of environmental factors. |
| 7 | Mutational variability | Detection of biochemical and physiological mutants of microorganisms using selective media and the replica method. trait inheritance |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **№ п/п** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | The subject and methodology of genetics of microorganisms |  |
| 2. | Cytological bases of heredity and variability of microorganisms |  |
| 3. | Sexual differentiation and life cycle |  |
| 4. | Types of genetic recombination in prokaryotes |  |
| 5. | DNA replication |  |
| 6. | Gene conversion |  |
| 7. | Expression of genetic material |  |
| 8. | Mutational variability |  |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) experience

**Устный ответ**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria: consistency,* completeness, consistency of presentation, analysis of various points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark *"excellent"* is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The mark *“good”* is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

The mark *"satisfactory"* is given if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows a lack of proper connection between analysis, argumentation and conclusions.

The mark *"unsatisfactory"* is given if the student does not answer the questions.

**Research project (repor)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of a report.

*Evaluation criteria -* since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions are taken into account when setting, designation of prospects for further research.

The mark *"excellent"* is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark *"good"* is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The mark *"satisfactory"* is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task,fulfilled

An *“unsatisfactory”* mark is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not fulfilled.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation**.**

*Evaluation criteria -* when grading, an independent search, selection and systematization of information, disclosure of a question (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to audience questions with examples are taken into account.

The mark *"excellent*" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark *"good"* is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The mark *"satisfactory"* is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An *“unsatisfactory*” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

Evaluation criteria - the correct answer to the question

The grade *"excellent*" is given if 90-100% of the tasks are correctly completed

The grade *"good"* is given if 70-89% of the tasks are correctly completed

The mark *"satisfactory"* is given if 50-69% of the tasks are correctly completed

The mark *"unsatisfactory"* is given if less than 50% of the tasks are correctly completed

**Control work**

Not only the depth of knowledge of the questions posed is evaluated, but also the ability to state in writing.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material. Presentation of material without factual errors.

*An "excellent"* rating is given when all criteria are met.

*The “good”* mark is given if the student knows the material well, presents it competently and to the point, knows the practical base, but makes minor errors.

The mark *"satisfactory"* is given if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows a lack of proper connection between analysis, argumentation and conclusions.

The mark *"unsatisfactory"* is given if the student does not answer the questions.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic educational literature

1. Stepanov V.M. Molecular biology. Structure and function of proteins [Electronic resource]: textbook / Stepanov V.M. - Electron. text data.— М.: Moscow State University named after M.V. Lomonosov, 2005.— 336 c.— Access mode: http://www.iprbookshop.ru/13144.html.— EBS «IPRbooks»

2. Zhimulev I.F. General and molecular genetics [Electronic resource]: textbook for universities / Zhimulev I.F. — Electron. text data.— Novosibirsk:

Siberian University Publishing House, 2007.— 480 c.— Режим доступа: http://www.iprbookshop.ru/65279.html.— EBS «IPRbooks»

6.2 Additional educational literature:

1. Collection of problems in molecular biology and medical genetics with solutions [Electronic resource]: textbook / - Electron. text data.— Samara:

REAVIZ, 2012 .— 168 c.— Access mode: http://www.iprbookshop.ru/18421.html.— EBS «IPRbooks»

2. Setubal J. Introduction to Computational Molecular Biology [Electronic resource]/ Setubal J., Meidanis J.— Electron. text data.— Moscow, Izhevsk: Regular and Chaotic Dynamics, Izhevsk Institute for Computer Research,2007.— 420 c.— Access mode: http://www.iprbookshop.ru/16497.html.— EBS «IPRbooks»

6.3 Periodicals

1. Biotechnology, Moscow. Journal of GosNIIgenetika.

2. Genetics, Moscow, 1965. Journal of the Russian Academy of Sciences.

3. Genetics. Cytology. Abstract journal VINITI

4. Molecular genetics, microbiology and virology

5. Cytogenetics and Genome Research, previously published under the title Cytogenetics (1962 - 1972) и Cytogenetics and Cell Genetics (1973 - 2001).

6. Gene, 1976

7. Genetics, USA, 1916

8. Genome Research, USA

9. Genomics, USA, 1987

10. Hereditas, since 1920 published by the society Mendelska sällskapet i Lund (Mendelian Society of Lund).

**7.** **Modern professional databases and information reference systems**

http://www.ncbi.nlm.nih.gov/

http://www.msu-genetics.ru/

**17. Composition of the software**

Office suite, email client, Internet browser

**8. Equipment and teaching aids**

Equipped classrooms and laboratories

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution

higher education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Cytology of microorganisms"**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

The work program of the discipline "Cytology of microorganisms"

Compiled by:

Candidate of Biological Sciences, Associate Professor Dokhtukaeva A.M.

APPROVED

Minutes of the meeting of the department "Cell biology, morphology and microbiology"

No. 1 dated September 08, 202

**1.** **List of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | ~~-~~ | PC-2.1  PC-2.3 |

**2.** **Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Provides sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

**3.** **The volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| Full-time | Part-time | extramural |
| **General labor intensity**: credits/hours | | 4/144 | 4/144 |  |
| **Contact work**: | | 51 | 30 |  |
|  | Lecture-type classes | 17 | 15 |  |
| Seminar type classes | 34 | 30 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work (IWS)** | | 57 | 78 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4.*** **The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions**

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ п/п** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training session* | *Practical lessonsя* | *Seminars* | *Lab work* | *Other activities* |
| 1. | Introduction. | 2 |  |  |  | 4 |  | 6 |
| 2. | Methods for studying microorganism cells. | 2 |  |  |  | 6 |  | 8 |
| 3. | The structure of microorganism cells. | 2 |  |  |  | 6 |  | 8 |
| 4. | Surface structures. | 4 |  |  |  | 6 |  | 8 |
| 5. | Membrane device. | 4 |  |  |  | 6 |  | 8 |
| 6. | Cell division and development cycles of bacteria. | 2 |  |  |  | 6 |  | 9 |
| 7. | Degradation and pathology of bacterial cells. | 1 |  |  |  |  |  | 10 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **№ п/п** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training session* | *Practical lessonsя* | *Seminars* | *Lab work* | *Other activities* |
| 1. | Introduction. | 2 |  |  |  |  |  | 8 |
| 6 | Methods for studying microorganism cells. | 2 |  |  |  | 6 |  | 10 |
| 3. | The structure of microorganism cells. | 2 |  |  |  | 4 |  | 10 |
| 4. | Surface structures. | 4 |  |  |  | 3 |  | 10 |
| 5. | Membrane device. | 3 |  |  |  | 2 |  | 10 |
| 6. | Cell division and development cycles of bacteria. | 1 |  |  |  |  |  | 15 |
| 7. | Degradation and pathology of bacterial cells. | 1 |  |  |  |  |  | 15 |

* 1. The program of the discipline, structured by topics / sections
     1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **№ п/п** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | The subject and tasks of cytology of microorganisms. The history of the development of cytology of microorganisms. | Cytology of microorganisms is the science of the structure, functions, metabolism, development, interaction of cells with each other and with the environment. The study of a prokaryotic cell is the specificity of the cytology of microorganisms. The objects of cytology of microorganisms are prokaryotes (bacteria) as the main objects of microbiology, as well as microscopic fungi, algae, and protozoa. Methods for studying microorganism cells  The study of microorganism cells at different levels of organization: from intact cells in populations to macromolecular complexes.  The main periods of development of the cytology of microorganisms. The place of cytology of microorganisms among other microbiological disciplines. |
| 2 | Intravital observation of cells. | Research using "crushed drop" preparations. Dark field method. Phase contrast microscopy. Luminescence microscopy. Visualization of specific macromolecular complexes using genetic engineering methods. Methods for intravital staining of microorganism cells. |
| 3 | The study of fixed cells. | The concept of fixation. Choosing an adequate fixation method. Methods for coloring fixed objects. Qualitative cytochemical research methods. Cytophotometry. Immunofluorescence method |
| 4 | Electron microscopy methods. | Transmission and scanning electron microscopes. Advantages and disadvantages of various methods. negative contrast. Methods of shading, freezing-cleaving, freezing-etching. Ultrathin section method. Methodological features of the study of the ultrastructure of prokaryotes. Freeze-replacement method and other methods of low-temperature fixation. Ultrastructural cytochemistry, immunocytochemistry and autoradiography. Morphometry. Obtaining fractions of cellular components for cytochemical and biochemical analysis. |
| 5 | Eukaryotic microorganisms. | General principles and differences in the organization of eukaryotic and prokaryotic cells. eukaryotic microorganisms. Brief description of the structure of microscopic fungi, algae and protozoa. Features of the organization of some cell organelles of eukaryotic microorganisms. Cell walls of fungi and algae. Photosynthetic apparatus of various algae. |
| 6 | Prokaryotic microorganisms. | Morphological, ultrastructural and macromolecular organization of prokaryotic cells. Morphological diversity of bacteria. Unicellular and multicellular forms. Morphologically peculiar groups of bacteria: prostecobacteria, spirilla, spirochetes, simonsiella, karyophanon, actinomycetes, cyanobacteria. Structural and functional heterogeneity of bacterial cells in populations of natural habitats and laboratory cultures. Fundamental structural differences between gram-positive and gram-negative bacteria and archaea. |
| 7 | The structure of the bacterial cell wall. | The structure and functions of the cell walls of Gram-negative bacteria. outer membrane. Features of its chemical composition and macromolecular organization. Asymmetry of the outer membrane. The functional significance of the unique components of the outer membrane - lipopolysaccharide and lipoprotein. Physical properties of the outer membrane, permeability. The pores of the outer membrane complex protein complexes. Peptidoglycan (murein) layer. Properties of peptidoglycan due to its chemical nature (rigidity, permeability) and their functional significance. Gel concept. Features of the organization of the cell wall of gram-positive bacteria. Peptidoglycan of Gram-positive bacteria. Teichoic acids and their functional significance. Synthesis of bacterial peptidoglycan. Differences in the mechanisms of its synthesis during cell growth in length and during the formation of a septum. The concept of periplasmic space. Its role and significance as a special multifunctional compartment of a bacterial cell. Additional surface layers consisting of protein subunits (S-layers), their protective function. |
| 8 | Surface structures of bacterial cells (continued). | Features of the organization of surface structures of various representatives of bacteria: cyanobacteria, spirochetes, chlamydia, planctomycetes. Archaeal cell walls: heteropolysaccharide, pseudomurein, glycoprotein and protein. Archaea without cell walls. Mucous surface structures: clicocalyx, capsules, sheaths. Chemical nature and related properties. The significance of mucous surface structures in the interaction of prokaryotic cells with the environment and with each other. Intercellular matrix. Pili (fimbria). Sex and adhesive saws. Bacterial lectins. Cellular outgrowths: hyphae, prostheca, attachment poles. Spikes, tubular outgrowths. Antigenic properties of surface structures of prokaryotes. Structural bases of bacterial cell motility. Flagella. The fundamental difference between the structure of the bacterial flagellum and the flagellum of eukaryotes. Axial fibrils of spirochetes. Gliding and creeping mobility of some bacteria and its mechanisms. Chemo-, photo-, and magnetotaxis. Molecular mechanism of chemotaxis. |
| 9 | Membrane structures of a bacterial cell. | Cytoplasmic membrane, features of its composition, structure and function in bacteria. Archaeal membranes. The concept of the cytoplasmic membrane of prokaryotes as a multifunctional system. Features of the transport of substances in bacteria and mechanisms that ensure the exchange of substances with the environment. Localization of the electron transport chain. Intracytoplasmic membrane structures of bacteria. Photosynthetic membrane apparatus. Thylakoids of cyanobacteria and chloroxybacteria. Chromatophores of purple bacteria: different morphological types. Rhodopsin - containing membrane structures of halobacteria. Membrane structures of methylotrophic and nitrifying bacteria. Mesosomes. The problem of artifact formation of these structures during fixation of a bacterial cell. The cytoplasm of a bacterial cell. Cytosol. Ribosomes of bacteria and archaea: composition, structure and functions. Differences between pro- and eukaryotic ribosomes. Intracytoplasmic inclusions of reserve substances: polyphosphates (volutin), glycogen, poly-B-hydroxybutyric acid granules, protein crystals, elemental sulfur, cyanophycin granules. Inclusions (structures) of functional and adaptive significance: gas vacuoles, magnetosomes, carboxysomes, chlorosomes of green bacteria, phycobilisomecyanobacteria. The structure and functions of these structures. Protein membranes of bacterial inclusions are a special type of cell membranes inherent only in prokaryotes. Nucleoid. Nucleoid structure according to light and electron microscopy data. Spatial model of nucleoid organization. bacterial chromosomes. Histone-like proteins of bacteria and archaea. Binding of the nucleoid to the cytoplasmic membrane. |
| 10 | Reproduction of bacteria. Resting cells. | Methods of division of prokaryotes. DNA replication. Nucleoid segregation and septal formation during cell division. Participation in these processes of proteins similar to the proteins of the acto-myosin complex and the mitotic spindle of eukaryotes. Features of the division of streptococci and staphylococci. Budding bacteria. Monomorphic, dimorphic and polymorphic cell cycles. Cell cycles of Escherichia coli, bacilli, prostecobacteria, myxobacteria. Specialization and cooperation of prokaryotic cells in a developing population. Cell dissociation.  Cell differentiation in the ontogenetic development of bacteria. Types of differentiation. The formation of resting cells. Endospores, exospores, cysts, myxospores, akinetes. Formation of other specialized cells. Cyanobacteria heterocysts. Structural and functional rearrangements (modifications) of bacterial cells under the influence of environmental factors. Surface structure modifications. heteromorphic growth. Formation of L-forms of bacteria, spheroplasts and protoplasts. L- transformation of pathogenic bacteria. Formation of specialized cells and life cycles of symbiotic and parasitic bacteria as a result of adaptation to interstitial existence. Rhizobia, rickettsia, chlamydia. Light-dependent ultrastructural rearrangements of the photosynthetic apparatus of phototrophic bacteria. Changes in the structure of the nucleoid. Quantitative changes in intracytoplasmic inclusions. |
| 11 | Degradation and pathology of bacterial cells. | Influence of damaging factors on cell structure. Irreversible changes in cellular structures. Various causes and types of cell lysis. |

4.2.2 **Content of the laboratory work**

|  |  |  |
| --- | --- | --- |
| **№ п/п** | **Name of the discipline section** | **The content of the laboratory lesson** |
| 1 | Introduction. | Rules of work in the microbiological laboratory. microscope device. Microscope rules. The main varieties of the method of light microscopy. Microscope immersion system. Rules for working with immersion microscopy. |
| 2 | Methods for studying microorganism cells. | Preparation of preparations of live microorganisms and acquaintance with their morphology. |
| 3 | Methods for studying microorganism cells. | Preparation of fixed preparations of microorganisms and familiarization with their morphology. |
| 4 | The structure of microorganism cells. | Carrying out a simple staining method. |
| 5 | surface structures. | Gram stain. |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

* 1. Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **№ п/п** | **Controlled Sections** | **Name of the evaluation tool** |
| 1. | Introduction. | OR. Р, P,Т |
| 2. | Methods for studying microorganism cells. | OR. Р, P,Т |
| 3. | The structure of microorganism cells. | OR. Р, P,Т |
| 4. | surface structures. | OR. Р, P,Т |
| 5. | Membrane apparatus. | OR. Р, P,Т |
| 6. | Cell division and development cycles of bacteria. | OR. Р, P,Т |
| 7. | Degradation and pathology of bacterial cells. | OR. Р, P,Т |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria: consistency*, completeness, consistency of presentation, analysis of various points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors*.*

The mark *"excellent*" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The mark “*good”* is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors. The mark *"satisfactory"* is given if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows a lack of proper connection between analysis, argumentation and conclusions.

The mark *"unsatisfactory"* is given if the student does not answer the questions.

**Research project (report)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an abstract.

*Evaluation criteria* - since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions are taken into account when setting, designation of prospects for further research.

The mark *"excellent"* is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark *"good"* is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The mark *"satisfactory"* is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An *“unsatisfactory”* mark is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria* - the correct answer to the question

The mark *"excellent"* is given if 90-100% of the tasks are correctly completed

The mark *"good"* is given if 70-89% of the tasks are correctly completed

The mark *"satisfactory"* is given if 50-69% of the tasks are correctly completed

The mark *"unsatisfactory"* is given if less than 50% of the tasks are correctly completed

6.1. Basic educational literature

1. 1. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook / Tyumentseva E.Yu.— Electron. text data.— Omsk: Omsk State Institute of Service, Omsk State Technical University, 2015.— 123 c.— Access mode: http://www.iprbookshop.ru/32788.html.— EBS «IPRbooks»
2. 2. General biology and microbiology [Electronic resource]: textbook / A.Yu. Prosekov [et al.]. Electron. text data. - St. Petersburg: Prospekt Nauki, 2017. - 320 s.— Access mode:: http://www.iprbookshop.ru/35796.html.— EBS «IPRbooks»
3. 3. Krasnikova L.V. Microbiology [Electronic resource]: textbook / Krasnikova L.V.— Electron. text data.— St. Petersburg: Trinity Bridge, 2015.— 294 c.— Access mode: http://www.iprbookshop.ru/40872.html.— EBS «IPRbooks»
   1. Additional educational literature:

1. Sakovich G.S. Microbiology. Part I [Electronic resource]: teaching aid / Sakovich G.S., Bezmaternykh M.A..— Electron. text data.— Yekaterinburg: Ural Federal University, EBS DIA, 2013.— 88 c.— Access mode: http://www.iprbookshop.ru/68350.html.— EBS «IPRbooks»

2. Sakovich G.S. Microbiology. Part II [Electronic resource]: teaching aid / Sakovich G.S., Bezmaternykh M.A. - Electron. text data.— Yekaterinburg: Ural Federal University, EBS DIA, 2013.— 92 c.— Access mode: http://www.iprbookshop.ru/68258.html.— EBS «IPRbooks»

1. **Modern professional databases and information reference systems**

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

The unified information system UComplex provides:

access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;

1. http://www.ncbi.nlm.nih.gov/

2. http://www.msu-genetics.ru/

3. Sage (STM&HSS)- Journals on the natural sciences and the humanities

4. Scientific monographs

5. Book series (BookSeries)

6. Electronic reference books (E-References)

7. Electronic library system IPRbooks - a resource that includes an electronic library system, printed and electronic books (<http://www.iprbookshop.ru/>).

**8.Composition of software**

**-** independent search for additional educational and scientific material, using search engines and Internet sites;

- the use of social networks and e-mail of the teacher and students for mailing, correspondence and discussion of the educational problems that have arisen.

**9.Equipment and teaching aids**

Classes in Cytology of microorganisms are held in a specialized laboratory. As a demonstration, computer programs and videos with materials on the discipline can be used.

Equipment:

Multimedia projector, laptop, Overhard projector;

set of microbiological laboratory, Biolam microscopes, screw eyepiece-micrometer MOV 1-15, phase-contrast device KF-4, dark-field condenser, thermostat ТСМ-51, built-in boxes, electronic scales СAS 120; set of biochemical laboratory, TV-151 drying cabinet, T-80 thermostat, CAS 300 electronic scales, electric stove, KFK-77 colorimeter; steam sterilizer VK-75, fume hood.

Materials:

Collections of pure cultures of saprophytic eubacteria, actinomycetes, micromycetes. Chemical reagents and substrates for the preparation of nutrient media. Tables, illustrative material, presentations.

**MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION**

**FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION OF HIGHER EDUCATION**

**«Kadyrov Chechen State University»**

**Faculty of Biology and Chemistry**

**Department «Cell Biology, Morphology and Microbiology»**

**Working program of the discipline**

**«Physiology and Biochemistry of microorganisms»**

|  |  |
| --- | --- |
| Training direction | Biology |
| Training direction code | 06.03.01 |
| Training Profile (focus) | Microbiology |

1.**The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Group of Competences** | **Competence Categories** | **Code** |
| Professional | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention.  Provides sanitary and hygienic requirements when performing microbiological work; technical support of microbiological works; preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms. | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and the discipline learning outcomes**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the competence indicator** | **Tthe discipline mastering outcomes** |
| PC-2.1 | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention. | **Know:** knows the features of the physiology of microorganism growth; patterns of growth of microorganisms in various cultivation conditions and to master the basics of mathematical modeling of these processes in laboratory and production conditions; basics of microbial metabolism regulation; mechanisms of homeostatic regulation  **Be able to:** use modern methods of studying the physiology of microbial growth for scientific and industrial purposes; keep a quantitative account of microorganisms, investigate the physiological and biochemical properties;  to give a kinetic characteristic of a population of microorganisms; apply the knowledge gained during the study of the special course on the structural and functional organization of biological objects; use physiological methods of studying metabolism and methods of its regulation for scientific and industrial purposes  **Own:** methods of obtaining, cultivating and using microorganisms for professional activities: the main physiological methods for analyzing and assessing the state of living systems in professional activities |
| PC-2.3 | Provides sanitary and hygienic requirements when performing microbiological work; technical support of microbiological works; preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms. | **Know:** patterns of growth of microorganisms in different conditions; study the kinetic characteristics of the population as a whole;consider the general principles of regulation of the metabolism of microorganisms; study the regulatory mechanisms of various microorganisms.  **Be able to:**apply the knowledge gained during the study of the special course on the structural and functional organization of biological objects; use physiological methods of studying metabolism and methods of its regulation for scientific and industrial purposes  **Own:**methods of obtaining, cultivating and using microorganisms for professional activities: the main physiological methods for analyzing and assessing the state of living systems in professional activities |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of academic work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credit units/hours | | 8/288 | 8/288 |  |
| **contact work**: | | 102 | 90 |  |
|  | Lecture type classes | 34 | 30 |  |
| Seminar type classes | 68 (lab) | 60 (lab) |  |
| Intermediate attestation: credit/credit with mark / exam \* | 36 | 54 |  |
| **Independent work** (SIW) | | 150 | 144 |  |
| Of which for course work (course thesis) | |  |  |  |

\* - highlight in bold italics

***4. The content of the discipline (module), structured by topics / units, indicating the number of academic hours allocated to them and types of training sessions***

4.1 Distribution of hours by units/topics and types of work

**4.1.1 Full-time education**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Unit/topic** | **Types of academic work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical classes* | *Seminars* | *Laboratories* | *Other activities* |
| 1. | Introduction.Subject and tasks of the special course. | 2 |  |  |  | 2 |  | 4 |
| 2. | Growth and reproduction of microorganisms. | 2 |  |  |  | 4 |  | 14 |
| 3. | Growth parameters of microorganisms. | 2 |  |  |  | 6 |  | 13 |
| 4. | Bacterial enzymes. | 2 |  |  |  | 4 |  | 10 |
| 5. | Suppression of growth and death of microorganisms under the action of various agents. | 4 |  |  |  | 6 |  | 10 |
| 6. | The effect of physical factors for microorganisms | 2 |  |  |  | 4 |  | 13 |
| 7. | The effect of biological factors on microorganisms | 2 |  |  |  | 4 |  | 13 |
| 8. | The effect of chemical factors on microorganisms | 2 |  |  |  | 6 |  | 13 |
| 9. | Introduction. Fundamentals of metabolism. Metabolism of microorganisms. Anabolism and catabolism. Bacterial enzymes. | 2 |  |  |  | 10 |  | 4 |
| 10 | Breath. Aerobic respiration. Anaerobic respiration. Glycolysis | 2 |  |  |  | 6 |  | 5 |
| 11 | Anaerobic respiration. Glycolysis | 2 |  |  |  |  |  | 5 |
| 12 | General characteristics of fermentation processes. Energy processes of fermentation. | 2 |  |  |  | 12 |  | 10 |
| 13 | The main monomers of biosynthesis: amino acids, organic acids. | 2 |  |  |  | 2 |  | 8 |
| 14 | The main monomers of the biosynthesis of carbohydrates, lipids. | 2 |  |  |  | 2 |  | 8 |
| 15 | Assimilation of carbon dioxide. protein biosynthesis. | 2 |  |  |  |  |  | 10 |
| 16 | Regulation of metabolism. Biochemical bases and levels of regulation of metabolism. | 2 |  |  |  |  |  | 10 |

**4.1.1 Part-time education**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p / p** | **Unit/topic** | **Types of academic work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical classes* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the special course. | 2 |  |  |  | 2 |  | 8 |
| 2. | Growth and reproduction of microorganisms. | 2 |  |  |  | 6 |  | 16 |
| 3. | Growth parameters of microorganisms. | 2 |  |  |  | 8 |  | 15 |
| 4. | Bacterial enzymes. | 2 |  |  |  | 2 |  | 14 |
| 5. | Suppression of growth and death of microorganisms under the action of various agents. | 2 |  |  |  | 4 |  | 14 |
| 6. | The effect of physical factors for microorganisms | 2 |  |  |  | 6 |  | 16 |
| 7. | The effect of biological and chemical on microorganisms. | 3 |  |  |  | 2 |  | 16 |
| 8. | Introduction. Fundamentals of metabolism. Metabolism of microorganisms. Anabolism and catabolism. Bacterial enzymes | 2 |  |  |  | 8 |  | 7 |
| 9. | Breath. Aerobic respiration. Anaerobic respiration. glycolysis | 2 |  |  |  | 6 |  | 8 |
| 10. | General characteristics of processes  fermentation. Energy processes of fermentation. | 2 |  |  |  | 8 |  | 8 |
| 11. | The main monomers of protein biosynthesis: amino acids, organic acids. | 2 |  |  |  | 4 |  | 6 |
| 12 | The main monomers of the biosynthesis of carbohydrates, lipids. | 2 |  |  |  | 4 |  | 6 |
| 13 | Assimilation of carbon dioxide. protein biosynthesis. | 2 |  |  |  |  |  | 5 |
| 14 | Regulation of metabolism. Biochemical bases and levels of regulation of metabolism. | 3 |  |  |  |  |  | 5 |

4.2 The program of the discipline, structured by topics / units

4.2.1. The content of lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (unit) of the discipline** | **The content of lectures** |
| 1 | Introduction. Subject and tasks of the special course. | Growth of individual microorganisms and populations (cultures). Balanced and unbalanced growth. Possible reasons for unbalanced growth. Main crop growth parameters: generation time, specific growth rate, biomass yield, economic factor. |
| 2 | Growth and reproduction of microorganisms. | Growth curve, features of individual phases. Characterization of the phases of the bacterial culture growth curve. Growth curve parameters (yield, growth rate, lag-phase duration). Flow culture. |
| 3 | Growth parameters of microorganisms. | Principles of operation of a chemostat, turbidostat. Characterization of growth in a chemostat. Difference between periodic and continuous cultures. Synchronization of cell division. Synchronized cultures. |
| 4 | Bacterial enzymes. | Enzymes. Enzyme poisons. The mechanism of action of sulfonamides, antibiotics (chloramphenicol, penicillin, streptomycin). |
| 5 | Suppression of growth and death of microorganisms under the action of various agents. | Bacteriostatic and bactericidal action of various agents. Action on the surface structures of the cell (ethanol, detergents, etc.). Disinfection. Radiation, the nature of its action on microorganisms. Resistance of microorganisms to ultraviolet rays and ionizing radiation. Photoreactivation |
| 6 | The effect of physical factors for microorganisms | Growth of microorganisms depending on temperature. Psychrophiles, mesophiles and thermophiles. Use of high temperatures for sterilization. The effect of low temperatures on the survival of microorganisms. Influence of hydrostatic pressure. Growth of microorganisms depending on water activity. Resistance of microorganisms to drying. Lyophization. osmotic pressure. Features of osmophiles. Halophiles. Methods of osmoregulation in different microorganisms. |
| 7 | The effect of biological factors on microorganisms | The action of biological on microorganisms: symbiotic and antibiotic relationships. |
| 8 | The effect of chemical factors on microorganisms | The action of chemical factors on microorganisms: carbon dioxide, oxygen, salts of heavy metals, chemical dyes. |
| 9 | Introduction. Fundamentals of metabolism. Metabolism of microorganisms. Anabolism and catabolism. bacterial enzymes. | The concept of metabolism. Features of metabolism and nutrition of microorganisms. Autotrophs. Heterotrophs. Saprophytes. Parasites. Assimilation and dissimilation as the basis of metabolism. Power mechanisms. simple diffusion. Facilitated diffusion. active transport. Translocation. Chemical nature and mechanism of action, classification, localization. Endoenzymes and exoenzymes. Constitutive and inducible enzymes. The role of enzymes |
| 10 | Breath. Aerobic respiration. Anaerobic respiration. glycolysis | complete oxidation. Chemistry. Incomplete oxidation of organic substrates. Formed products. The use of these processes in practical human activities. Significance of glycolysis as the most common and phylogenetically ancient process. Essence of glycolysis. Ways to use PVC. Stages of glycolysis |
| 11 | General characteristics of fermentation processes. Energy processes of fermentation. | Fermentation. Chemistry and energy. The main types of fermentation. Similarities and differences between respiration and fermentation. The practical significance of fermentation. |
| 12 | The main monomers of biosynthesis: amino acids, organic acids, carbohydrates, lipids. | The main monomers of amino acid biosynthesis, organic acids, carbohydrates, lipids. Anabolism and constructive processes. The value of biosynthesis. |
| 13 | Assimilation of carbon dioxide. protein biosynthesis. | The role of various chemical compounds. Assimilation of carbon dioxide by autotrophs and heterotrophs |
| 14 | Regulation of metabolism. Biochemical bases and levels of metabolism regulation. | regulation of metabolism. Biochemical bases and levels of regulation of metabolism. |

4.2.2 The content of the laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Name of the topic (unit) of the discipline** | ***The content of laboratory classes*** |
| 1 | Rules of work and safety precautions in the microbiological laboratory. | Safety briefing in the laboratory, familiarization with the rules of work. |
| 2 | Growth of microorganisms depending on temperature. | Conducting laboratory work in accordance with the development on this topic. |
| 3 | Effect of osmotic pressure on bacterial growth. | Conducting laboratory work in accordance with the development on this topic. |
| 4 | Effect of acidity on the growth of microorganisms. | Conducting laboratory work in accordance with the development on this topic. |
| 5 | Obtaining a storage substrate. | Conducting laboratory work in accordance with the development on this topic. |
| 6 | The effect of ultraviolet rays on the growth of microorganisms. | Conducting laboratory work in accordance with the development on this topic. |
| 7 | Growth of microorganisms depending on water activity. | Conducting laboratory work in accordance with the development on this topic. |
| 8 | Growth of bacteria in batch culture. | Conducting laboratory work in accordance with the development on this topic. |
| 9 | Growth suppression and death of microorganisms. Bacteriostatic and bactericidal action of various agents. | Conducting laboratory work in accordance with the development on this topic. |
| 10 | Rules of work and safety precautions in the microbiological laboratory. Determination of enzymes. amylolytic activity. | Safety briefing in the laboratory, familiarization with the rules of work. Conducting laboratory work in accordance with the development on this topic. |
| 11 | Determination of enzymes. proteolytic activity. | Conducting laboratory work in accordance with the development on this topic. |
| 12 | Aerobes and anaerobes. Influence of light on the development of bacteria. | Conducting laboratory work in accordance with the development on this topic. |
| 13 | Lactic acid fermentation. | Conducting laboratory work in accordance with the development on this topic. |
| 14 | Alcoholic fermentation. | Conducting laboratory work in accordance with the development on this topic. |
| 15 | Butyric fermentation | Conducting laboratory work in accordance with the development on this topic. |
| 16 | Acetic fermentation | Conducting laboratory work in accordance with the development on this topic. |
| 17 | Physiological and biochemical characteristics of microorganisms. Attitude to sources of carbon and nitrogen. | Conducting laboratory work in accordance with the development on this topic. |

**5.Fund of assessment tools for the attestation of students in the discipline (module)**

The following types of quality control for mastering the particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the discipline work program.

5.1 Passport of the fund of evaluation tools for the current attestation in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / p** | **Controlled units (topics)** | **Name of the assessment tool** |
| 1. | Growth parameters of microorganisms. | UO, LR, |
| 2. | Action of physical factors on microorganisms | MA, LR, IP (report with presentation) |
| 3. | Bacterial enzymes. | MA, LR, IP (report with presentation) |
| 4. | Breath. Aerobic respiration. Anaerobic respiration. glycolysis | UO, LR, T |
| 5. | Assimilation of carbon dioxide. Protein biosynthesis. | MA, LR, IP (report with presentation) |

5.2. Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control.

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience.

**Oral answer**

Knowledge assessment involves a differentiated approach to the student, taking into account his/her individual abilities, the degree of mastering and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark *"excellent"* is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The mark *“good”* is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, makes minor errors.

The mark *"satisfactorily"* is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The mark *"unsatisfactory"* is given if the student does not answer the questions.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria* – in assessing takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The mark "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected manner, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers with examples to questions from the audience.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers to questions from the audience.

The mark "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” mark is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, he/she makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of knowledge controlling of students in the discipline.

*Evaluation criteria -* correct answer to the question.

The mark "excellent" is given if 90-100% of the tasks are correctly completed.

The mark "good" is given if 70-89% of the tasks are correctly completed.

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed.

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**6.1** **Basic educational literature:**

1. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook/ Tyumentseva E.Yu.— Electron. text material — Omsk: Omsk State Service Institute, Omsk State Technical University, 2015.— 123 pp. — Access mode: http://www.iprbookshop.ru/32788.html.— ELS “IPR books”
2. General biology and microbiology [Electronic resource]: study guide / A.Yu. Prosekov [et al.]. Electron. text material. — St. Petersburg: Prospekt Nauki, 2017.— 320 p.— Access mode: http://www.iprbookshop.ru/35796.html.— ELS “IPR books”
3. Krasnikova L.V. Microbiology [Electronic resource]: textbook / Krasnikova L.V.— Electron. text material. — St. Petersburg: Troitsky Most, 2015.— 294 p.— Access mode: http://www.iprbookshop.ru/40872.html.— ELS “IPR books”

**6.2 Additional educational literature:**

1. Aleshina E.S. Cultivation of microorganisms as the basis of the biotechnological process [Electronic resource]: textbook / Aleshina E.S., Drozdova E.A., Romanenko N.A.— Electron. text material.— Orenburg: Orenburg State University, EBS DIA, 2017.— 192 pp.— Access mode: http://www.iprbookshop.ru/71282.html.— ELS

2. Bukhar M. Popular about microbiology [Electronic resource] / Bukhar M. - Electron. text material. — M.: Alpina Publisher, Alpina non-fiction, 2016.— 218 p.— Access mode: http://www.iprbookshop.ru/48576.html.— ELS “IPRbooks”

3. Lykov I.N. Microorganisms. Biology and ecology [Electronic resource] / Lykov I.N., Shestakova G.A. - Electron. text material. Kaluga: Publisher Zakharov S.I. (“Serna”), 2014.— 400 pp.— Access mode: http://www.iprbookshop.ru/32840.html.— ELS “IPRbooks”

4. Kovalev N.A. The World of Microorganisms in the Biosphere [Electronic resource]/ Kovalev N.A., Krasochko P.A., Litvinov V.F.— Electron. text material. — Minsk: Belarusian Science, 2014.— 532 pp.— Access mode: http://www.iprbookshop.ru/29476.html.— ELS

**6.3. Periodicals**

1. "Biological membranes"

2. "Biochemistry"

3. "Biophysics"

4. "Biotechnology"

5. “Proceedings of the Russian Academy of Sciences. Biological series”

6. "Microbiology",

7. "Molecular Biology"

8. Applied Biochemistry and Microbiology.

**7.Modern professional databases and information reference systems**

1. ELS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. ELS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. ELS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. ELS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

1. <http://www.protein.bio.msu.ru/biokhimiya/index.htm>- Internet version of the international journal on biochemistry and biochemical aspects of molecular biology, bioorganic chemistry, microbiology, immunology, physiology and biomedical research. Articles in pdf-format.
2. <http://dmb.biophys.msu.ru>- The information system "Dynamic Models in Biology", designed for a wide range of users, includes hypertext documents and relational databases and provides unified access to a variety of information on this subject area. The reference section contains information about scientific organizations and universities in Russia that work on mathematical modeling in biology, personal information about Russian scientists working in this field and their works, an annotated list of international and Russian journals publishing articles on modeling in biology. The library contains bibliographic, annotated and full-text information on mathematical modeling of biological processes,

**3.**<http://tusearch.blogspot.com>- Search for electronic books, publications, laws, GOSTs on the websites of scientific electronic libraries. The best libraries are selected in the search engine, in most of which you can download materials in full without registration. The list includes libraries of foreign universities and scientific organizations.

4.<http://yanko.lib.ru/books/biolog/nagl_biochem/index.htm>-KolmanYa., Remmm E. Visual biochemistry. - M. Mir, 2000. - 496 p.

5.<http://elibrary.ru/defaultx.asp>- Scientific electronic library, the largest Russian information portal in the field of science, technology, medicine and education, containing abstracts and full texts of more than 12 million scientific articles and publications.

**8. Software Composition**

Office suite, email client, Internet browser.

**9.Equipment and teaching aids**

The material and technical base necessary for the implementation of the educational process in the discipline (module):

* classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);
* seminar type rooms, for group and individual consultations, current control and intermediate certification (4-03 for practical and self-study - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive whiteboard-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1)

- rooms for independent work with Internet access (classroom board, educational furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces ) (for independent work) (room No. 07 of the CUC);

- educational laboratory in microbiology and virology (4-15)

**Equipment:**

1.Steam sterilizer BES-15L-LED-Nautomatic

2. Drying cabinet ShS-40 (40l. 180C)

3. Shaker medical series S:S -3. 02LA20

5.Irradiator-recycler of air ultraviolet

6.Laboratory medical centrifuge

7. Biological microscope Mikromed S-11 with accessories

8. Scales Mass-1

9. Electric water distiller

10. Stand for test tubes ShPU Kront

11. Senco water bath, W-2- 1003 p

12. Electric stove Irit IR-8201 1- burner with thermostat

13.Measuring technology

14. Laboratory savochek

15. Porcelain cups of different sizes

16. Small plastic petri dishes

17. Large plastic Petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

FEDERAL STATE BUDGETARY EDUCATIONAL INSTITUTION

OF HIGHER EDUCATION

"KADYROV CHECHEN STATE UNIVERSITY"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

**Working program of the discipline**

***"Medical Microbiology"***

|  |  |
| --- | --- |
| *Direction of training* | Biology |
| *Training Code* | 06.03.01 |
| *Training profile* | Microbiology |
|  |  |

**1.The group of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Group of Competences** | **Competence Categories** | **Code** |
| Professional | ~~-~~ | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the competence indicator** | **Discipline Learning Outcomes** |
| PC-2.1  PC-2.3 | The ability to use knowledge of certain sections of microbiology in professional activities, to use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of biological material analysis | **Knows:** basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  **Provides:** sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of academiv work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | |
| **General labor intensity**: credits/hours | | 7/252 | 7/252 | |
| **contact work**: | | 108 | 90 | |
|  | Lecture-type classes | 46 | 30 | |
| Seminar type classes | 62 | 60 | |
| Intermediate certification: credit / credit with mark / exam \* |  |  | |
| **Independent work** (SIW) | | 144 | 126 | |
| Of which for course work (course thesis) | |  |  |  |

\* - highlight in bold italics

Notes: credit and credit with mark for full-time students is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / units, indicating the number of academic hours allocated to them and types of training sessions***

**4. Distribution of hours by units/topics and types of work**

**4.1.1 Full-time education**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. u /t** | **Chapter** | **Types of academic work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| **5 semester** | | | | | | | | |
| 1. | Unit 1. Introduction to medical microbiology. Principles of systematization of microorganisms. | 4 |  |  |  | 20 |  |  |
| 2. | Unit 2. Fundamentals of infectology  and epidemiology |  |  |  |  | 12 |  |  |
| 3 | Topic 2.1 The doctrine of the infectious process | 2 |  |  |  |  |  |  |
| 3 | Topic 2.2  Characteristics of microorganisms.  Characteristic signs of infectious diseases.  Periods of infectious disease | 2 |  |  |  |  |  |  |
| 4 | Topic 2.3 The doctrine of the epidemic process. Organization of preventive and anti-epidemic measures | 2 |  |  |  |  |  | 10 |
| 5. | Fundamentals of Immunology |  |  |  |  |  |  |  |
| 6 | Subject. 3.1 The doctrine of immunity | 2 |  |  |  |  |  | 10 |
| 7 | Topic.3.2 The immune system of the body | 1 |  |  |  |  |  | 10 |
| 8 | Topic 3.3 Chemistry of antigens. Antibody Chemistry | 1 |  |  |  |  |  | 10 |
| 9 | Topic 3.4 Immune status. Pathology of the immune system. Immunotherapy and Immunoprophylaxis | 1 |  |  |  |  |  | 10 |
| 10 | Topic 3.5 Chemical bases of immunity reactions | 1 |  |  |  |  |  | 10 |
| **6 semester** | | | | | | | | |
| 1. | Unit 4. Private microbiology |  |  |  |  |  |  |  |
| 2. | Topic 4.1 Causative agents of intestinal infectious diseases | 10 |  |  |  | 10 |  | 28 |
|  | Topic 4.2 Causative agents of infectious diseases of the respiratory tract | 10 |  |  |  | 10 |  | 28 |
| 3. | Topic 4.3 Vector-borne disease agents | 10 |  |  |  | 10 |  | 28 |
|  |  |  |  |  |  |  |  |  |

**4.1.2 Part-time education**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. u /t** | **Unit** | **Types of academic work (in hours)** | | | | | | |
| **Contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical classes* | *Semi nars* | *Laboratory works* | *Other activities* |
| **5 semester** | | | | | | | | |
| 1. | Unit 1. Introduction to medical microbiology. Principles of systematization of microorganisms. | 4 |  |  |  | 20 |  | 8 |
| 2. | Unit 2. Fundamentals of infectology  and epidemiology |  |  |  |  | 10 |  | 5 |
|  | Topic 2.1 The doctrine of the infectious process | 2 |  |  |  |  |  |  |
|  | Topic 2.2  Characteristics of microorganisms.  Characteristic signs of infectious diseases.  Periods of infectious disease | 2 |  |  |  |  |  |  |
|  | Topic 2.3 The doctrine of the epidemic process. Organization of preventive and anti-epidemic measures | 2 |  |  |  |  |  |  |
| 3. | Fundamentals of Immunology |  |  |  |  |  |  |  |
|  | Subject. 3.1 The doctrine of immunity | 1 |  |  |  |  |  | 10 |
|  | Topic.3.2 The immune system of the body | 1 |  |  |  |  |  | 10 |
|  | Topic 3.3 Chemistry of antigens. Antibody Chemistry | 1 |  |  |  |  |  | 10 |
|  | Topic 3.4 Immune status. Pathology of the immune system. Immunotherapy and Immunoprophylaxis | 1 |  |  |  |  |  | 10 |
|  | Topic 3.5 Chemical bases of immunity reactions | 1 |  |  |  |  |  | 10 |
| **6 semester** | | | | | | | | |
| 4. | Unit 4. Private microbiology |  |  |  |  |  |  |  |
| 5. | Topic 4.1 Causative agents of intestinal infectious diseases | 5 |  |  |  | 10 |  | 33 |
|  | Topic 4.2 Causative agents of infectious diseases of the respiratory tract | 5 |  |  |  | 10 |  | 33 |
|  | Topic 4.3 Vector-borne disease agents | 5 |  |  |  | 10 |  | 33 |
|  |  |  |  |  |  |  |  |  |

**4.2 The discipline program, structured by topics / units**

**4.2.1. The content of the lecture course**

|  |  |  |
| --- | --- | --- |
| **No. u/t** | **Name of the topic (unit) of the discipline** | **The content of the lectures** |
| 1 | Unit 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms. | Microbiology and immunology as a science. Subject and tasks of medical microbiology and immunology History of development of microbiology and immunology. The role of microorganisms in nature, human life and medicine.  Principles of systematization of microorganisms. Main taxonomic categories (genus, species, pure culture, strain, clone, variety). Binary nomenclature rules. Brief description of various groups of pathogens of infectious diseases: viruses, rickettsia, chlamydia, mycoplasmas, bacteria, actinomycetes, spirochetes, fungi, protozoa, their medical significance. Classification of microorganisms according to the degree of their biological hazard.  The concept of the ecology of microorganisms. Microbiocenosis as an ecosystem. The role of soil, water, air, food products in the spread of microorganisms.  Classification of environmental factors. Influence of abiotic factors on microorganisms on the example of physical (temperature, pressure, ionizing radiation, ultrasound, drying) and chemical factors. Characterization of biotic factors on the example of the relationship of micro- and macroorganisms: metabiosis, antagonism, parasitism, symbiosis. The value of environmental relationships for humans |
| 2 | Unit 2.  Fundamentals of infectology  and epidemiology. |  |
| 3 | Topic 2.1 The doctrine of the infectious process. | The concepts of "infection", "infectious process", "infectious disease". Factors affecting the occurrence, course and outcome of the infectious process: quantitative and qualitative characteristics of the microbe - pathogen, the state of the macroorganism, environmental factors. Stages of the infectious process |
| 4 | Topic 2.2  Characteristics of microorganisms.  Characteristic signs of infectious diseases.  Periods of infectious disease. | Characteristics of microorganisms - pathogens of infectious diseases: pathogenicity and virulence, infectious and lethal dose, adhesiveness, tropism, invasiveness, aggressiveness, toxicity and toxigenicity. Characteristic signs of infectious diseases: specificity, contagiousness, cyclicality, the presence of an immunization process. Periods of infectious disease |
| 5 | Topic 2.3 The doctrine of the epidemic process. Organization of preventive and anti-epidemic measures. | The concept of the epidemic process. Influence of social and natural factors on the course of the epidemic process. source of infection. Mechanisms of transmission of infectious agents, correspondence of the mechanism of transmission of the pathogen to its localization in the human body. Ways of transmission of infectious agents. Natural foci of infectious diseases. Community susceptibility to infection. Anti-epidemic measures (treatment, disinfection, disinsection, deratization, immunization). The intensity of the epidemic process. Ecological and epidemic classification of infectious diseases. Quarantine (conventional) and especially dangerous infections |
| 6 | Unit 3.  Fundamentals of Immunology. |  |
| 7 | Subject. 3.1 The doctrine of immunity. | The concept of immunity, its types. Nonspecific and specific factors of body defense.  Basic forms of immune response. Immunological studies, their significance. Immunological tolerance |
| 8 | Topic.3.2 The immune system of the body. | The structure of the immune system: central and peripheral organs. Major cells of the immune system.  Factors of antibacterial and antitoxic immunity, provoking the chronic course of the disease and allergization of the body |
| 9 | Topic 3.3 Chemistry of antigens. Antibody Chemistry. | The concept of antibodies. Tolerogenic activity of antigens. Specificity of antigens. Antigens are inducers of the immune response. Flagellar H-antigens. Capsular K-antigens. Cell wall antigens. Intracellular antigens. Bacterial protein antigens. Virus antigens. Structure of immunoglobulin G, structure of immunoglobulin A, structure of immunoglobulin M, structure of immunoglobulin D, structure of immunoglobulin E |
| 10 | Topic 3.4 Immune status. Pathology of the immune system. Immunotherapy and Immunoprophylaxis. | immune status. Pathology of the immune system. Skin allergy tests. Medical immunobiological preparations: their composition, properties, purpose.  Congenital and acquired immunodeficiencies. Immunotherapy and immunoprophylaxis. Vaccines. Anatoxins |
| 11 | Topic 3.5 Chemical bases of immunity reactions. | Immunochemical reactions of antigen-antibody interaction. Neutralization reactions. immobilization reactions. Agglutination reactions. precipitation reactions. Reactions of lysis and binding of a complement. The phenomenon of immunocellular adhesion. Immunofluorescence and immunoferritin methods for the detection of antigens and antibodies. Immunoenzymatic method. Radioimmunoassay (RIA). Reactions between antigens and antibodies in allergy |
| 12 | Unit 4. Private microbiology. |  |
| 13 | Topic 4.1 Causative agents of intestinal infectious diseases. | Causative agents of intestinal infectious diseases: causative agents of escherichiosis, causative agents of dysentery, causative agents of typhoid and paratyphoid fever, causative agents of salmonellosis, causative agent of intestinal yersiniosis, causative agent, causative agent of cholera, causative agent of brucellosis, causative agent of leptospirosis, causative agents of campylobacteriosis, causative agent of botulism, causative agent of listeriosis  Enteroviruses: poliomyelitis viruses, coxsackieviruses, ECHO and enterovirus types 68-71 |
| 14 | Topic 4.2 Causative agents of infectious diseases of the respiratory tract | Diphtheria pathogens, whooping cough pathogen, meningococcal pathogen, tuberculosis pathogens, legionella pathogens, ornithosis pathogens, mycoplasmosis pathogen. Influenza viruses, parainfluenza viruses, RS virus, rhinoviruses, coronaviruses, reoviruses, adenoviruses |
| 15 | Topic 4.3. Vector-borne disease agents | The causative agent of plague, the causative agent of tularemia, the causative agent of epidemic relapsing fever, the causative agent of endemic typhus, the causative agent of tick-borne typhus, the Marseilles fever virus, the causative agent of tsutsugamushi. Human immunodeficiency virus, hepatitis B, D, C and G viruses. Arboviruses |

4.2.2 Content of the lab

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | ***The content of the laboratory lesson*** |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Microscopic examination method: morphology and structure of bacteria, preparation of fixed preparations, simple and complex staining methods |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Microscopic research method: morphology and structure of bacteria, complex staining methods |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Microscopic research method: morphology of cellular forms of microorganisms |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Cultivation of microorganisms: culture media and methods of sterilization |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Bacteriological research method: isolation of pure bacterial cultures |
|  | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | Bacteriological research method: study of the biochemical properties of bacteria |
|  | Section 2  Fundamentals of infectology  and epidemiology | Bacteriological research method: study of the biochemical properties of bacteria / end /. The effect of external factors on microorganisms. Antibiotics |
|  | Section 2  Fundamentals of infectology  and epidemiology | Distribution of microbes in nature and their detection. Microflora of the human body |

**5. Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Section 1. Introduction to microbiology and immunology. Classification and taxonomy of microorganisms | OR, P, P, R |
| 2. | Section 2  Fundamentals of infectology  and epidemiology | OR, P, P, R |
| 3. | Topic 2.1 The doctrine of the infectious process | OR, P, P, R |
| 4. | Topic 2.2  Characteristics of microorganisms.  Characteristic signs of infectious diseases.  Periods of infectious disease | OR, P, P, R |
| 5. | Topic 2.3 The doctrine of the epidemic process. Organization of preventive and anti-epidemic measures | OR, P, P, R |
| 6. | Section 3  Fundamentals of Immunology | OR, P, P, R |
| 7. | Subject. 3.1 The doctrine of immunity | OR, P, P, R |
| 8. | Topic.3.2 The immune system of the body | OR, P, P, R |
| 9. | Topic 3.3 Chemistry of antigens. Antibody Chemistry | OR, P, P, R |
| 10. | Topic 3.4 Immune status. Pathology of the immune system. Immunotherapy and Immunoprophylaxis | OR, P, P, R |
| eleven. | Topic 3.5 Chemical bases of immunity reactions | OR, P, P, R |
| 12. | Section 4. Private microbiology | OR, P, P, R |
| 13. | Topic 4.1 Causative agents of intestinal infectious diseases | OR, P, P, R |
| 14. | Topic 4.2 Causative agents of infectious diseases of the respiratory tract | OR, P, P, R |
| 15. | Topic 4.3 Vector-borne disease agents | OR, P, P, R |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- at grading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark *"good"* is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade *"satisfactory*" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An *“unsatisfactory*” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Debate Procedures**

*Round table, discussion, controversy, dispute, debate, mini-conferences* are means to include students in the process of discussing a controversial issue, problems and assess their ability to argue their own point of view. The task is given in advance, the range of issues for discussion, the group of participants in this discussion is determined.

Discussion procedures can be used to ensure that students:

- better understood the material being digested against the background of various positions and opinions, not necessarily reaching a common opinion;

- were able to comprehend the meaning of the material being studied, which is sometimes felt intuitively, but they cannot express it verbally, clearly and clearly, or construct a new meaning, a new position;

– were able to agree on their position or actions on the issue under discussion.

*Evaluation criteria -*the actions of all group members are evaluated. Understanding the problem, statements and actions are fully consistent with the set goals. Correspondence to the reality of the decisions developed during the game. Proficiency in terminology, demonstration of mastery of educational material on the topic of the game, possession of argumentation methods, ability to work in a group (listening skills, constructive conversation, persuasion, time management, conflict-free communication), achievement of game goals, (role-matching - in role-playing game). Clarity and style of presentation.

An “*excellent”* rating is given when all requirements are met in full.

The grade *"good"* is given if the students as a whole demonstrate an understanding of the problem, statements and actions are fully consistent with the set goals. The decisions developed during the game are fully consistent with reality. But some explanations are not entirely reasoned, the norms of communication are violated, the time frame is violated, the style of presentation is violated.

The grade *“satisfactory*” is given if the students as a whole demonstrate an understanding of the problem, statements and actions generally correspond to the set goals. However, the solutions developed during the game do not quite correspond to reality. Some explanations are not entirely reasoned, time frames are violated, the style of presentation is violated.

The mark *"unsatisfactory"* is given if the students do not understand the problem, their statements do not correspond to the set goals.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade *"excellent"* is given if 90-100% of the tasks are correctly completed

The grade *"good"* is given if 70-89% of the tasks are correctly completed

The mark *"satisfactory"* is given if 50-69% of the tasks are correctly completed

The mark *"unsatisfactory"* is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic educational literature

Korotyaev A.I. Medical microbiology, immunology and virology [Electronic resource] / Korotyaev A.I., Babichev S.A. — Electron. text data. - St. Petersburg: SpecLit, 2012. - 760 p. - Access mode:<http://www.iprbookshop.ru/45694.html>. — EBS «IPRbooks»

6.2 Additional educational literature:

Pavlovich S.A. Microbiology with virology and immunology [Electronic resource]: textbook / Pavlovich S.A. — Electron. text data. - Minsk: Higher School, 2013. - 800 p. — Access mode: http://www.iprbookshop.ru/24067.html. — EBS «IPRbooks»

6.3Periodicals

1. Biological diversity of the Caucasus "(Grozny, Chechen State University, October 27-29, 2011) Publishing House of the ChGU, 2011. - 388 p.

2. Actual problems of general parasitology: Studies of the scientific school of Academician K.I. Skryabin. - M.: Nauka, 2000

**7. Modern professional databases and information reference systems**

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru)

http://[www.rusbio.biz/en/nugm.shtml](http://www.rusbio.biz/ru/nugm.shtml)

http://[www.sibbio.ru](http://www.sibbio.ru)

http://elibrary.ru

**8.Composition of software**

Windows operating system

Electronic library system "IPRbooks"<http://www.iprbookshop.ru/index.ph>

Student consultant (http://www.studentlibrary.ru)

EBS "Lan" - services for inclusive education (https://e.lanbook.com)

Polpred.com-Internet resources

* [www.pubmed.com](http://www.pubmed.com)
* [www.medline.ru](http://www.medline.ru)
* [www.elibrary.ru](http://www.elibrary.ru)
* <http://biblioclub.ru>
* )<http://znanium.com/>
* <http://e.lanbook.com/>

**9. Equipment and technical training aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

In accordance with the Order of the Ministry of Education and Science of the Russian Federation dated October 4, 2010 No. 986 "On approval of federal requirements for educational institutions in terms of the minimum equipment of the educational process and equipment of classrooms", FSBEI HE "Chechen State University" has the necessary material and technical base, providing for all types of disciplinary and interdisciplinary training, including modern computer technology, integrated into a local area network, has access to global electronic communication networks. The educational process takes place in classrooms for lectures, practical classes, laboratory workshops. Premises for lectures,06.03.01. "Biology" equipped with specialized educational furniture, technical means that serve to present educational information to students.

For lectures and practical classes, the Faculty of Biology and Chemistry uses audiences 4-08, 4-13, 4-15, 4-16, where projection equipment is installed (multimedia projector, laptop) to demonstrate educational and visual aids, ensuring the implementation of thematic illustrations.

Classroom board, educational furniture (student tables, student chairs) for 34 seats, projector-1, interactive whiteboard-1, laptop-1(4-05)

Classroom board, educational furniture (student tables, student chairs) for 40 seats, projector-1, interactive whiteboard-1, laptop-(1 B 4-02)

The main equipment for the educational process:

1. Steam sterilizer BES -15L-LED-N automatic - 1 pc.

2. Drying cabinet ShS-40 (40l. 180C) - 2 pcs.

3. Bactericidal ultraviolet irradiator for local irradiation OUFb-04 "Sun" - 1 pc.

4. Shaker medical series S:S -3. 02L A20 -1 pc.

5. Ultraviolet air irradiator-recycler - 3 pcs.

6. Medical laboratory centrifuge - 2 pcs.

7. Steam sterilizer BES-22L-B-LCD 22 l., automatic - 1 pc.

8. Laboratory microscope LUM - 1 pc.

9. Biological microscope Mikromed S-11 with accessories - 2 pcs.

10. Biological microscope Micromed R-1 with accessories - 2 pcs.

11.ToupCam 5.1 MP video eyepiece - 4 pcs.

12. Scales Weight-1 - 4 pcs.

13. Electric water distiller - 1 pc.

14. Bi-distiller - 2 pcs.

15. Bactericidal lamp TUVC-15Vy G13 (China) – 1 pc.

16. Stand for test tubes ShPU Kront - 4 pcs.

17. Senco water bath, W-2- 1003 p - 1 pc.

18. MS-4-ZOOM LED microscope (trinocular) - 1 pc.

19. Microscope EUM - 7 pcs.

20. Medical centrifuge of the CM series, performed by CM-20 - 1 pc.

21. Electric stove Irit IR-8201 1 burner with thermostat - 2 pcs.

22. Illuminated magnifier - 1 pc.

23. Measuring equipment - 1 pc.

24. Laboratory savochek - 2 pcs.

25. Porcelain cups of different sizes - m6 pcs.

26. Porcelain spoons - 3 pcs.

27. Porcelain pestles - 4 pcs.

28. Bottles - 20 pcs.

29. Small plastic Petri dishes - 10 pcs.

30. Large plastic Petri dishes - 10 pcs.

31. Medical bactericidal irradiator "Azoe" PO T / 1 (without lamps)

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**Private microbiology and systematics of microorganisms**

|  |  |
| --- | --- |
| ***Direction of training*** | **Biology** |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | PC2.1  PC2.3 |

**2. Competences, indicators of their achievement and learning outcomes of the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Provides sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 7/252 | 8/288 |  |
| **contact work**: | |  |  |  |
|  | Lecture-type classes | 31 | thirty |  |
| Seminar type classes | 62(lab) | 60 (lab) |  |
| Intermediate certification: credit / credit with grade / exam \* | 36 | 60 |  |
| **Independent work**(IWS) | | 123 | 126 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Modern taxonomy of viruses | 2 |  |  |  |  |  | 4 |
| 2. | Prokaryotes. Modern taxonomy of prokaryotes | 4 |  |  |  |  |  | 10 |
| 3. | Serological methods in taxonomy. Diagnosticums. Diagnostic immune sera. | 4 |  |  |  |  |  | 10 |
| 4. | Numerical taxonomy. | 2 |  |  |  |  |  | 10 |
| 5. | Chemotaxonomy. | 1 |  |  |  |  |  | 10 |
| 6. | Determinants of bacteria. Principles of systematization of prokaryotes in the determinant of Bergey (Bergey, 1994). | 4 |  |  |  |  |  | 10 |
| 7. | Purple bacteria (order Rhodospirillales). Purple sulfur (family Chromatiaceae) and non-sulfur bacteria (family Rhodospirillaceae | 4 |  |  |  |  |  | 22 |
| 8. | Green bacteria (order Chlorobiales). Morphology. Organization of the photosynthetic apparatus. Features of the metabolism of green bacteria. | 4 |  |  |  |  |  | 22 |
| 9. | Systematics of mushrooms  The principle of constructing a modern mushroom system. | 6 |  |  |  |  |  | 25 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Modern taxonomy of viruses | 2 |  |  |  |  |  | 4 |
| 2. | Prokaryotes. Modern taxonomy of prokaryotes | 4 |  |  |  |  |  | 10 |
| 3. | Serological methods in taxonomy. Diagnosticums. Diagnostic immune sera. | 4 |  |  |  |  |  | 10 |
| 4 | Numerical taxonomy. | 2 |  |  |  |  |  | 8 |
| 5. | Chemotaxonomy. | 2 |  |  |  |  |  | 4 |
| 6. | Determinants of bacteria. Principles of systematization of prokaryotes in the determinant of Bergey (Bergey, 1994). | 4 |  |  |  |  |  | 10 |
| 7. | Purple bacteria (order Rhodospirillales). Purple sulfur (family Chromatiaceae) and non-sulfur bacteria (family Rhodospirillaceae | 4 |  |  |  |  |  | 25 |
| 8. | Green bacteria (order Chlorobiales). Morphology. Organization of the photosynthetic apparatus. Features of the metabolism of green bacteria. | 4 |  |  |  |  |  | 25 |
| 9. | Eukaryotes. Systematics of fungi  The principle of constructing a modern mushroom system. | 4 |  |  |  |  |  | thirty |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Modern systematics of viruses. | Modern taxonomy of viruses Position of viruses among other organisms. Virus classification system. International Committee on Taxonomy of Viruses (ICTV). Virus classification system adopted by ICTV. Taxa: order, family, subfamily, genus, species. Criteria for taxonomic classification. Homology of nucleic acids. Morphology, size and shape of viruses; the presence or absence of a shell; symmetry type of the nucleocapsid. Characteristics of nucleic acids: type of acid (DNA or RNA), polarity, number of chains in a molecule, or the presence of segments. The presence of enzymes. Classification of viruses by type of nucleic acids: deoxyriboviruses and riboviruses. Baltimore classification of viruses (Baltimoreclassification) - classification of viruses into groups depending on the type of genomic nucleic acid (DNA, RNA, single-stranded, double-stranded) and the method of its replication. The seven major groups of viruses around Baltimore |
| 23 | Prokaryotes. Modern taxonomy of prokaryotes | Modern taxonomy of prokaryotes  Systematics and taxonomy of prokaryotes. Taxonomy categories: kingdom, phylum, class, order, family, genus, species, subspecies, strain. The concept of species in prokaryotes. A variant is an infraspecific systematic category. Minimum standards for the description of bacterial taxa. Taxonomic status of uncultivated bacteria. International Code of Nomenclature for Bacteria. Approved list of bacteria names and its supplements.  Classification of prokaryotes. artificial classifications. Evolutionary systematics. Phylogenetic classification. The two main evolutionary lineages of prokaryotes are the Archaea domain and the Bacteria domain.  Progenot as a hypothetical ancestor of modern cell types. Concepts of prokaryotic evolution, the conversion hypothesis and the segregation hypothesis.  Classification by K. Woese. The concept of domains.  Genotypic characteristics and phylogenetic relationships of microorganisms. G+C DNA composition, genome size, DNA-DNA and DNA-rRNA homology; methods |
| 3 | Serological methods in taxonomy. Diagnosticums. Diagnostic immune sera. | Serological methods in taxonomy. Diagnosticums. Diagnostic immune sera. Mono- and polyvalent serums. Serological reactions (RA, RP). Specificity of antisera and monoclonal |
| 4 | Numerical taxonomy | Numerical taxonomy. General principles. Definitions of pairwise similarity, principles of clustering. Using Numerical Analysis in Taxonomy |
| 5 | Chemotaxonomy. | Features of the chemical composition of the cell walls of bacteria of various taxonomic groups. Diagnostic components of the cell wall. The structure of peptidoglycan and its analogues. Polysaccharides, teichoic acids. Features of the lipid composition of bacterial cells. Taxonomic specificity of whole cell fatty acid composition, phospholipids, glycolipids, respiratory chain isoprenoid quinones, mycolic acids, polyamines, pigments, etc. marker proteins. Methods for determining chemotaxonomic characteristics.  Protein profiles of microorganisms in classification and identification. Proteins of whole cells, cell membranes. Riboproteins. Enzymes. |
| 6 | Determinant of bacteria. Burgi (Bergey, 1994). | Determinants of bacteria. Principles of systematization of prokaryotes in the determinant of Bergey (Bergey, 1994). |
| 7 | Purple bacteria (order Rhodospirillales). Purple sulfur (family Chromatiaceae) and non-sulfur bacteria (family Rhodospirillaceae. | Anoxygenic phototrophic eubacteria  Purple bacteria (order Rhodospirillales). Purple sulfur bacteria (family Chromatiaceae) and non-sulfur bacteria (family Rhodospirillaceae). General characteristics, morphological diversity. Organization and functioning of the photosynthetic apparatus, photosynthetic pigments. Need for exogenous electron donors. Sources of carbon and nitrogen. relation to oxygen. Diversity of metabolic capabilities of purple bacteria. |
| 8 | Green bacteria (order Chlorobiales). Morphology. Organization of the photosynthetic apparatus. Features of the metabolism of green bacteria | Morphology. Organization of the photosynthetic apparatus. Features of the metabolism of green bacteria.  Heliobacteria are Gram-positive anoxygenic phototrophic bacteria. Photosynthetic pigments of heliobacteria and the organization of the photosynthetic apparatus. Metabolism. Erythrobacteria are obligately aerobic chemoorganoheterotrophs capable of photophosphorylation.  Ecology of anoxygenic phototrophic eubacteria.  Sulfate-reducing eubacteria  general characteristics |
| 9 | Eukaryotes. Systematics of mushrooms  The principle of constructing a modern mushroom system. | Systematics of mushrooms  The principle of constructing a modern mushroom system. Three main evolutionary lines: departments Myxomycota - slime molds, Heterocontae - multi-flagellated, Eumycota - true mushrooms. Basic taxonomic criteria. The structure of the mycelium (the presence of partitions) and the type of sexual process. Morphological features: the number of flagella in mobile stages, the nature of the formation of fruiting bodies, the shape of fruiting bodies, the morphology of asci and basidia, the morphology of ascospores and basidiospores, the structure of conidiophores and conidia, the presence of pigment, the formation of resting stages (sclerotia, chlamydospores).  Myxomycetes  Department of Myxomycota. General characteristics of the department. Plasmodium is the vegetative body of slime molds. Sporulation of myxomycetes. Cycles of development, types of nutrition of myxomycetes. Class Myxomycetes - true myxomycetes. Class Dictyosteliomycetes - cellular myxomycetes. The class Plasmodiophoromycetes are parasitic myxomycetes that develop as obligate intracellular parasites of higher plants.  Chytridiomycetes  Class Chytridiomycetes. General characteristics. Features of morphology. asexual reproduction; features of the structure of mobile stages. Sexual reproduction (isogamy, heterogamy, oogamy, hologamy). Cycle of development and change of nuclear phases. Classification of chytridiomycetes. Chytridia order (Chytridiales). Chytridia fungi as parasites of freshwater and marine algae, aquatic fungi, higher aquatic plants and animals. Parasites of higher land plants (fungi of the genera Olpidium and Synchytrium). The order is blastocladial (Blastocladiales) and monoblepharid (Monoblepharidales).  Oomycetes class. Features of the morphology of oomycetes. Sexual and asexual reproduction. The presence of mobile stages - zoospores. Saprolegnia order (Saprolegniales). Distribution in nature, saprophytic and parasitic saprolegnia fungi. The order of leptomites (Leptomitales) and lagenidiales (Lagenidiales): features of ecology. Peronosporal order (Peronosporales): genera Pythium, Phytophthora, Peronospora. Mechanism of ejection of zoospores from zoosporangia. Distribution of peronosporous fungi. Fungi of the genus Phytophthora as plant parasites.  Class Trichomycetes. The position of trichomycetes in the system of other organisms. Features of morphology and sexual reproduction. The confinement of trichomycetes to the host and part of the digestive tract. The main orders of Trichomycetes: Amoebidiales (Amoebidiales), Eccrine (Eccrinales), Harpellales (Harpellales).  Zygomycetes  Class Zygomycetes. Features of the morphology of zygomycetes. Asexual reproduction. Zygogamy is a special type of sexual sexual process. Order Mucorales. Asexual sporulation of mucor fungi. Spores of asexual reproduction of mucor fungi (sporangiospores, merosporangiospores, conidia). Sporangial (endogenous) and conidial (exogenous) types of asexual reproduction. Saprophytic and parasitic way of life of mucor fungi. The role of mucor fungi in the mineralization of organic matter in soils. Mucor fungi are the causative agents of human and animal mycoses (mucormycoses). Order endogonal (Endogonales): the formation of sporocarps. Fungi of the genus Endogone, which form mycorrhiza with plants. The Entomophthorales are obligate parasites of insects. Zoopagales order - obligate parasites of amoebas, nematodes, insects.  Ascomycetes  Ascomycetes class. General characteristics of ascomycetes. Sexual reproduction. Formation of bags and sexual spores. Asexual reproduction. Formation of conidia. Morphology of conidial sporulation. Reproduction cycle of ascomycetes. Order Endomycetales - yeast fungi. Saccharomycetes (family Saccharomycetaceae). Order taphrines (Taphrinales) - parasites of higher plants. The order Protomycetales are plant parasites. Ascospheric order (Ascosphaerales) - parasites of insects. Subclass of euascomycetes (Euascomycetidae). The formation of fruiting bodies by euascomycetes (cleistothecia, perithecia and apothecia). The most important orders of euascomycetes. The order Eurotsiae (Eurotiales). Onygen order (Onygenales). The order is microascals (Mickroascales). Order erizifovye (Erysiphales). Order of the Sphaeriales. Order Dioportales (Dioporthales). Order Hypocreales. Order ergot, or clavicepe (Clavicipitales). Ecology of euascomycetes, practical significance.  Basidiomycetes  Class Basidiomycetes. Basidiomycetes are higher fungi with multicellular mycelium. Development cycles of basidiomycetes. Sexual sporulation - basidiospores. Conidial sporulation. The formation of fruiting bodies. Microscopic basidiomycetes, and mushrooms with large fruiting bodies. Exobasidial order (Exobasidiales). Exobasidial fungi are parasites of flowering plants. A group of orders Hymenomycetes. Group of orders Gasteromycetes. Subclasses: heterobasidial fungi (Heterobasidiomycetidae) and teliosporomycetes (Theliosporomycetidae). Teliosporomyces. development cycle. Smut order (Ustilaginales). Smut fungi are microscopic fungi that cause plant diseases. "Smut": external signs of the disease, ways of infection. Rusty order (Uredinales). Development cycle of rust fungi. Rust fungi are parasites of higher vascular plants.  Deuteromycetes  Class Deuteromycetes. General characteristics of deuteromycetes. Diversity and variability of morphological characters. Specific position of deuteromycetes in the fungi system and their taxonomic status. Distribution, ecological groups, significance in nature, use in human economic activity. Deuteromycetes as producers of biologically active substances. Order Hyphomycetales. Moniliaceae family, Dematiaceae family, Stilbellaceae family, Tuberculariaceae family. Ecological groups of hyphomycetes: soil, xylophilic, plant parasites, predatory, aquatic, mycophilic, entomophilous, etc. Entomopathogenic deuteromycetes (genus Verticillium, Paecelomyces, Beauveria, Metarhizium). Fungi of the genus Trichoderma: entomophilic and antagonistic activity, their practical use in the fight against harmful insects and pathogens of plant diseases. Representatives of the genera Aspergillus and Penicillium, their distribution, role in nature and practical significance. Melanconial order (Melanconiales). Parasitic melanconial fungi are the causative agents of spotting and anthracnose. The order is spheropsidal (Cphaeropsidales). Spheropsidal fungi are parasites of higher plants, algae, lichens, and fungi. The genus Phoma are spheropsidal fungi that damage industrial materials. The order of sterile mycelium (Mycelia sterilla, or Agonomycetales). Features of the cycle of development of sterile mycelium. Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Representatives of the genera Aspergillus and Penicillium, their distribution, role in nature and practical significance. Melanconial order (Melanconiales). Parasitic melanconial fungi are the causative agents of spotting and anthracnose. The order is spheropsidal (Cphaeropsidales). Spheropsidal fungi are parasites of higher plants, algae, lichens, and fungi. The genus Phoma are spheropsidal fungi that damage industrial materials. The order of sterile mycelium (Mycelia sterilla, or Agonomycetales). Features of the cycle of development of sterile mycelium. Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Representatives of the genera Aspergillus and Penicillium, their distribution, role in nature and practical significance. Melanconial order (Melanconiales). Parasitic melanconial fungi are the causative agents of spotting and anthracnose. The order is spheropsidal (Cphaeropsidales). Spheropsidal fungi are parasites of higher plants, algae, lichens, and fungi. The genus Phoma are spheropsidal fungi that damage industrial materials. The order of sterile mycelium (Mycelia sterilla, or Agonomycetales). Features of the cycle of development of sterile mycelium. Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Parasitic melanconial fungi are the causative agents of spotting and anthracnose. The order is spheropsidal (Cphaeropsidales). Spheropsidal fungi are parasites of higher plants, algae, lichens, and fungi. The genus Phoma are spheropsidal fungi that damage industrial materials. The order of sterile mycelium (Mycelia sterilla, or Agonomycetales). Features of the cycle of development of sterile mycelium. Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Parasitic melanconial fungi are the causative agents of spotting and anthracnose. The order is spheropsidal (Cphaeropsidales). Spheropsidal fungi are parasites of higher plants, algae, lichens, and fungi. The genus Phoma are spheropsidal fungi that damage industrial materials. The order of sterile mycelium (Mycelia sterilla, or Agonomycetales). Features of the cycle of development of sterile mycelium. Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants Fungi of the genus Sclerotium are causative agents of plant tissue rot. Fungi of the genus Rhizoctonia - pathogens of cultivated and wild plants. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Modern systematics of viruses. | *oral questioning* |
| 2. | Prokaryotes. Modern taxonomy of prokaryotes. | *Information project (report*) |
| 3. | Serological methods in taxonomy. Diagnosticums. Diagnostic immune sera | *oral questioning* |
| 4. | Numerical taxonomy | *Research project (paper)* |
| 5. | Chemotaxonomy. | *oral questioning* |
| 6. | Determinant of bacteria. Burgi (Bergey, 1994). | *oral questioning* |
| 7. | Purple bacteria (order Rhodospirillales). Purple sulfur (family Chromatiaceae) and non-sulfur bacteria (family Rhodospirillaceae | *oral questioning*  *Research project (paper)* |
| 8. | Green bacteria (order Chlorobiales). Morphology. Organization of the photosynthetic apparatus. Features of the metabolism of green bacteria. | *oral questioning)*  *Research project (paper)* |
| 9. | Eukaryotes. Systematics of mushrooms  The principle of constructing a modern mushroom system. | *Research project t)*  *oral questioning)* |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:* consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade *"satisfactorily"* it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of a paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- at grading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**Main literature:**

1. Fundamentals of private microbiology. Textbook (book) / Volina E.G., Sarukhanova L.E. 2011, Peoples' Friendship University of Russia.

2. 2Kirkimbaeva Zh.S. Private microbiology [Electronic resource]: textbook/ Kirkimbaeva Zh.S.— Electron. text data. - Almaty: Nur-Print, 2014. - 274 p. - Access mode: http://www.iprbookshop.ru/67175.html. - EBS "IPRbooks".

3. 3Belyasova N.A. Microbiology [Electronic resource]: textbook / Belyasova N.A. - Electron. text data. - Minsk: Higher School, 2012. - 443 p. - Access mode: http://www.iprbookshop.ru/20229.html. — EBS «IPRbooks»

4. Lebedev V.N. Test tasks in microbiology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data. - St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014. - 60 p. - Access mode: http://www.iprbookshop.ru/22562.html. — EBS «IPRbooks»

5. Kuranova N.G. Microbiology. Part 1. Prokaryotic cell [Electronic resource]: textbook / Kuranova N.G., Kupatadze G.A.— Electron. text data. - M.: Prometheus, 2013. - 108 p. - Access mode: http://www.iprbookshop.ru/24002.html. — EBS «IPRbooks»

Additional literature:

1. Lebedev V.N. Test tasks in microbiology [Electronic resource]: a manual for students of biological specialties / Lebedev V.N. — Electron. text data. - St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014. - 60 p. - Access mode: http://www.iprbookshop.ru/22562.html. — EBS «IPRbooks»

2. Kovalev N.A. The world of microorganisms in the biosphere [Electronic resource] / Kovalev N.A., Krasochko P.A., Litvinov V.F. — Electron. text data. - Minsk: Belarusian Science, 2014. - 532 p. - Access mode: http://www.iprbookshop.ru/29476.html. — EBS «IPRbooks»

3. Shleykin A.G. Introduction to Biotechnology [Electronic resource]: textbook / Shleykin A.G., Zhilinskaya N.T. — Electron. text data. - St. Petersburg: ITMO University, Institute of Refrigeration and Biotechnology, 2013. - 92 p. - Access mode: http://www.iprbookshop.ru/65806.html. - EBS

Regulatory literature

* 1. Periodicals

1. "Biological membranes"
2. "Biochemistry", "Biophysics", "Biotechnology"
3. "Proceedings of the Russian Academy of Sciences. Biological Series»
4. "Microbiology, epidemiology, immunology",
5. "Molecular biology",
6. "Applied Biochemistry and Microbiology".

**7.Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

**8.Composition of software**

Office suite, email client, Internet browser

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

Classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

Seminar-type classroom, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive board-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1);

Rooms for independent work with Internet access (Classroom board, study furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces) ) (for independent work) (room No. 07 of the TsKP).

Educational Laboratory for Microbiology and Virology (4-15)

Equipment:

1. Sterilizer steam BES -15L-LED-N automatic
2. Drying cabinet ShS-40 (40l. 180C)
3. Shaker medical series S:S -3. 02LA20
4. Air irradiator-recycler ultraviolet
5. Medical laboratory centrifuge
6. Biological microscope Mikromed S-11 with accessories
7. Scales Mass-1
8. Electric water distiller
9. Support for test tubes ShPU Kront
10. Water bath Senco, W-2- 1003 p
11. Electric stove Irit IR-8201 1 burner with thermostat
12. Measuring technology
13. Savochek laboratory
14. Porcelain cups of various sizes
15. Small plastic petri dishes
16. Large plastic petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**FACULTY OF BIOLOGY AND CHEMISTRY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**Sanitary microbiology**

|  |  |
| --- | --- |
| ***Direction of training*** | **Biology** |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | PC-2.1  PC-2.3  PC-2.4 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Provides sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms  Able to participate in the work on microbiological control of the safety of food products and the habitat of organisms. |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 4/144 | 4/144 |  |
| **contact work**: | |  |  |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 32(lab) | 36 (lab) |  |
| Intermediate certification: credit / credit with grade / exam \* | 45 | 45 |  |
| **Independent work**(IWS) | | 51 | 45 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

4.2 Distribution of hours by sections/topics and types of work

* + 1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Subject and tasks of sanitary microbiology | 1 |  |  |  |  |  | 2 |
| 2. | Sanitary and microbiological examination of air | 2 |  |  |  |  |  | 6 |
| 3. | Sanitary and microbiological study of water | 2 |  |  |  |  |  | 6 |
| 4. | Sanitary and microbiological study of the soil | 2 |  |  |  |  |  | 6 |
| 5. | Sampling and pretreatment of soil samples for analysis | 1 |  |  |  |  |  | 2 |
| 6. | Sanitary and microbiological study of food products. | 2 |  |  |  |  |  | 8 |
| 7. | Sanitary and microbiological examination of milk and dairy products. | 2 |  |  |  |  |  | 7 |
| 8. | Sanitary and microbiological examination of meat and meat products | 2 |  |  |  |  |  | 6 |
| 9. | hospital infections. | 2 |  |  |  |  |  | 8 |

4.2.2 4.2.1 Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Subject and tasks of sanitary microbiology | 2 |  |  |  |  |  | 2 |
| 2. | Sanitary and microbiological examination of air | 2 |  |  |  |  |  | 5 |
| 3. | Sanitary and microbiological study of water | 2 |  |  |  |  |  | 5 |
| 4. | Sanitary and microbiological study of the soil | 2 |  |  |  |  |  | 5 |
| 5. | Sampling and pretreatment of soil samples for analysis | 2 |  |  |  |  |  | 5 |
| 6. | Sanitary and microbiological study of food products. | 2 |  |  |  |  |  | 6 |
| 7. | Sanitary and microbiological examination of milk and dairy products. | 2 |  |  |  |  |  | 5 |
| 8. | Sanitary and microbiological examination of meat and meat products. | 2 |  |  |  |  |  | 5 |
| 9. | hospital infections | 2 |  |  |  |  |  | 8 |

4.2 The program of the discipline, structured by topics / sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1 | Subject and tasks of sanitary microbiology. | General concepts of sanitary microbiology. Principles of sanitary-microbiological research. General characteristics of the methods of sanitary-microbiological research. Sanitary-indicative microorganisms. Distribution of microorganisms in nature, role in the cycle of substances. |
| 2 | Sanitary and microbiological examination of air | Air microflora. Sanitary and bacteriological examination of air: determination of the total content of microbes in1 m3air; determination of the content of Staphylococcus aureus in1 m3air. Air sampling methods and instruments. Determination of the microbial number of pathogenic microorganisms. Bacteriological examination for staphylococcus aureus. Criteria for assessing microbial contamination of air in surgical and obstetric hospitals |
| 3 | Sanitary and microbiological study of water | Sanitary-microbiological study of water. Water sampling. Safety of drinking water according to epidemiological indicators. Determination of coliform bacteria in water by the method of membrane filters. Determination of common and thermotolerant coliform bacteria by titration method. Definition of coliphages |
| 4 | Sanitary and microbiological study of the soil | Factors affecting the qualitative and quantitative composition of soil microorganisms. Soil as a factor in the spread of an infectious disease. The duration of the experience of pathogenic microflora in the soil. Processes of self-purification in the soil. Sanitary characteristics of soils. Assessment of the sanitary condition of the soil by microbiological indicators |
| 5 | Sampling and pretreatment of soil samples for analysis. | Sanitary inspection, selection of sampling points. Sanitary and bacteriological study of the soil. Sanitary inspection and drawing up a passport of the surveyed area with an accompanying coupon. Selection, preparation and processing of soil for analysis. Sanitary and bacteriological study of the soil. Determination of pathogenic bacteria and viruses in the soil. The main methods for determining microbiological indicators characterizing soil fecal contamination. |
| 6 | Sanitary and microbiological examination of food products | General characteristics of the microflora of food products. General principles of sanitary-microbiological research of food products. Food poisoning. Methods for laboratory diagnosis of food poisoning |
| 7 | Sanitary and microbiological examination of milk and dairy products. | Product selection. Determination of the total microbial number and coli-titer in milk. Method for determining the coli-titer of BGKP. Conducting an analysis |
| 8 | Sanitary and microbiological examination of meat and meat products | Sample selection. Methods of bacteriological examination of sausages and meat products. Canned research. Examination of canned food for aerobes and anaerobes. Scheme of analysis of canned food for industrial sterility. |
| 9 | Hospital infections. | Concept definition. Epidemiology of nosocomial infections. Reservoirs of hospital infections. Habitats of microorganisms commonly found in medical facilities. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Subject and tasks of sanitary microbiology | *oral questioning* |
| 2. | Sanitary and microbiological examination of air | *Information project (report* |
| 3. | Sanitary and microbiological researchwater | *oral questioning* |
| 4. | Sanitary and microbiological researchsoil | *Research project (paper)* |
| 5. | Sampling and pretreatment of soil samples for analysis | *oral questioning* |
| 6. | Sanitary and microbiological examination of food products | *oral questioning* |
| 7. | Sanitary and microbiological examination of milk and dairy products. | *oral questioning* |
| 8. | Sanitary and microbiological examination of meat and meat products. | *oral questioning)* |
| 9. | Hospital infections | *Research project (paper)* |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**Main literature:**

6.1Gosmanov R.G., Kolychev N.M., Kabirov G.F., Galiullin A.K. Sanitary Microbiology of Foods, EBS, Lan, 2015

2. Gosmanov R.G., Volkov A.Kh., Galiullin A.K., Ibragimova A.I. Sanitary microbiology, EBS, Lan, 2018

3. Gosmanov R.G., Ravilov R.Kh., Galiullin A.K., Volkov A.Kh., Nurgaliev F.M., Yusupova G.R., Andreeva A.V. Private veterinary and sanitary microbiology and virology , EBS, Lan, 2019

4. Ozheredova N.A., Dmitriev A.F., Morozov V.Yu., Svetlakova E.V., Verevkina M.N. Sanitary microbiology, EBS, Lan, 2020

6.2 Further reading:

1.Gosmanov R.G., Kolychev N.M., Barskov A.A., Workshop on veterinary microbiology and mycology, EBS, Lan 2014

2. Lelevich S.V., Volchkevich O.M., Sidorovich E.A. Clinical Microbiology, EBS, Lan, 2021

Regulatory literature

GOST 30 347-97 Interstate standard Milk and dairy products. Methods for determining Staphylococcus aureus. Interstate Council for Standardization, Metrology and Certification.

GOST 30425-97 Interstate standard. Canned food. Method for determining industrial sterility.

GOST 10444.15-94. Interstate standard. Food products. Methods for determining the number of msophilic aerobic and facultative anaerobic microorganisms. Interstate Council for Standardization, Metrology and Certification, Minsk.

GOST R50474-93. State standard of the Russian Federation. Food products. Methods for detection and determination of the number of bacteria of the group of Escherichia coli (coliform bacteria).

GOST 17.4.4.02-84. State standard of the USSR. Protection of Nature. Soils. Methods of sampling and preparation of samples for chemical, bacteriological, helminthological analysis. USSR State Committee for Standards.

GOST 9225-84. Milk and dairy products. Methods of microbiological analysis.

GOST 4288-76. Culinary products and semi-finished products from minced meat. Acceptance rules and test methods.

Т 42-21-2-85 "Sterilization and disinfection of medical devices".

6.3Periodicals

1. "Biological membranes"
2. "Biochemistry", "Biophysics", "Biotechnology"
3. "Proceedings of the Russian Academy of Sciences. Biological Series»
4. "Microbiology, epidemiology, immunology",
5. "Molecular biology",
6. "Applied Biochemistry and Microbiology".

**7.Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

**8.Composition of software**

Office suite, email client, Internet browser

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

Classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

Seminar-type classroom, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive board-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1);

Rooms for independent work with Internet access (Classroom board, study furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces) ) (for independent work) (room No. 07 of the TsKP).

Educational Laboratory for Microbiology and Virology (4-15)

Equipment:

1. Sterilizer steam BES -15L-LED-N automatic
2. Drying cabinet ShS-40 (40l. 180C)
3. Shaker medical series S:S -3. 02LA20
4. Air irradiator-recycler ultraviolet
5. Medical laboratory centrifuge
6. Biological microscope Mikromed S-11 with accessories
7. Scales Mass-1
8. Electric water distiller
9. Support for test tubes ShPU Kront
10. Water bath Senco, W-2- 1003 p
11. Electric stove Irit IR-8201 1 burner with thermostat
12. Measuring technology
13. Savochek laboratory
14. Porcelain cups of various sizes
15. Small plastic petri dishes
16. Large plastic petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

Veterinary microbiology

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes of the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Able to participate in the work on microbiological control of the safety of food products and the habitat of organisms. |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 4/144 | 4/144 |  |
| **contact work**: | | 48 | 54 |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 32(lab) | 36(lab) |  |
| Intermediate certification: credit / credit with grade / exam \* | 45 | 45 |  |
| **Independent work**(IWS) | | 51 | 45 |  |
| Of which for course work (course project) | |  |  |  |

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  | 2 |  | 6 |
| 2. | Causative agents of staphylococcus goat and streptococcosis | 2 |  |  |  | 4 |  | 6 |
| 3. | Causative agents of Escherichiosis and Serraciosis. | 2 |  |  |  | 4 |  | 6 |
| 4. | Causative agents of colibacillosis and salmonellosis. The causative agent of pasteurellosis | 2 |  |  |  | 4 |  | 6 |
| 5. | The causative agent of brucellosis. | 2 |  |  |  | 4 |  | 4 |
| 6. | The causative agent of anthrax and the group  clostridial infections | 2 |  |  |  | 4 |  | 4 |
| 7. | Principles of sanitary-bacteriological research objects  environmental  environment. principle and  methods  diagnostics  food  toxic infections | 2 |  |  |  | 4 |  | 5 |
| 8. | The causative agents of tuberculosis and paratuberculosis | 1 |  |  |  | 4 |  | 7 |
| 9. | Causative agents of rickettsiosis and chlamydia. | 1 |  |  |  | 2 |  | 7 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  | 2 |  | 3 |
| 2. | Causative agents of staphylococcus goat and streptococcosis | 2 |  |  |  | 4 |  | 6 |
| 3. | Causative agents of Escherichiosis and Serraciosis. | 2 |  |  |  | 6 |  | 8 |
| 4. | Causative agents of colibacillosis and salmonellosis. The causative agent of pasteurellosis | 2 |  |  |  | 4 |  | 4 |
| 5. | The causative agent of brucellosis. | 2 |  |  |  | 4 |  | 5 |
| 6 | The causative agent of anthrax and the group  clostridial infections | 2 |  |  |  | 4 |  | 5 |
| 7 | Principles of sanitary and bacteriological research objects  environmental  environment. The principle and methods of diagnosing food  toxic infections | 2 |  |  |  | 4 |  | 4 |
| 8 | The causative agents of tuberculosis and paratuberculosis | 2 |  |  |  | 4 |  | 5 |
| 9 | Causative agents of rickettsiosis and chlamydia. | 2 |  |  |  | 4 |  | 5 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p / n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
| 1. | Introduction. Subject and tasks of the discipline | Subject and tasks of veterinary microbiology. General properties of microorganisms and their position in the system of living beings. Brief historical outline of the development of microbiology. |
| 2 | Causative agents of staphylo-coccosis and strepto-coccosis. | Discovery history. Methods for their detection. Antigenic structure. Sustainability. drug resistance.  Significance in the pathology of animals and humans. Toxins and pathogenicity factors. |
| 3 | Causative agents of Escherichia oz and Serraciosis. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention. |
| 4 | Causative agents of colibacteriosis and salmonellosis. The causative agent of pasteurellosis | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
| 5 | The causative agent of brucellosis. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
| 6 | The causative agent of anthrax and the group  clostridial infections. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
| 7 | Principles of sanitary and bacteriological research of objects  environment. principle and methods  food diagnostics  toxic infections | causative agents of food poisoning. Diagnostics. Research methods Sustainability. Types of toxic infections. Ways of infection. |
| 8 | The causative agents of tuberculosis and paratuberculosis | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
| 9 | Causative agents of rickettsia-oses and chlamydia. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p / n** | **Name of the topic (section) of the discipline** | ***The content of the laboratory lesson*** |
| 1 | Rules of work and safety precautions in the microbiological laboratory. | Safety briefing in the laboratory, familiarization with the rules of work. |
| 2 | Microbiological diagnosis of staphylococcal infections | Conducting laboratory work in accordance with the development on this topic. |
| 3 | Microbiological diagnosis of streptococcal infections | Conducting laboratory work in accordance with the development on this topic. |
| 4 | Microbiological diagnostics of escherichiosis and serraciosis | Conducting laboratory work in accordance with the development on this topic. |
| 5 | Microbiological diagnosis of colibacillosis | Conducting laboratory work in accordance with the development on this topic. |
| 6 | Microbiological diagnosis of salmonellosis | Conducting laboratory work in accordance with the development on this topic. |
| 7 | Microbiological diagnosis of pasteurellosis | Conducting laboratory work in accordance with the development on this topic. |
| 8 | Microbiological diagnosis of brucellosis | Conducting laboratory work in accordance with the development on this topic. |
| 9 | Microbiological diagnosis of anthrax | Conducting laboratory work in accordance with the development on this topic. |
| 10 | Microbiological diagnosis of clostridiosis | Conducting laboratory work in accordance with the development on this topic. |
| eleven | Microbiological diagnosis of tuberculosis and paratuberculosis | Conducting laboratory work in accordance with the development on this topic. |
| 12 | Microbiological diagnosis of rickettsiosis and chlamydia | Conducting laboratory work in accordance with the development on this topic. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p / n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Causative agents of staphylococcosis and streptococcosis. | OR, LW, T |
| 2. | Causative agents of Escherichiosis and Serraciosis. | OR, LW, IP (report with presentation) |
| 3. | The causative agent of brucellosis. | OR, LW, IP (report with presentation) |
| 4. | The causative agent of anthrax and the group  clostridial infections. | OR, LW, IP (report with presentation) |
| 5. | The causative agents of tuberculosis and paratuberculosis | OR, LW, IP (report with presentation) |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Cases (situations and tasks with given conditions)**

The student should be able to highlight the main provisions from the text of the problem that require analysis and serve as conditions for the solution. Based on the question posed in the problem, try to define the problem as accurately as possible and solve it accordingly.

Problems can be solved orally and/or in writing. When solving problems, it is also important to correctly formulate and write down questions, starting with more general and ending with particular ones.

*Evaluation criteria*- the assessment takes into account the methods and means used in solving a situational, problematic task.

The mark "excellent" is given in the case when the student completed the task (solved the problem), using in full the theoretical knowledge and practical skills gained in the learning process.

The mark "good" is given if the student as a whole fulfilled all the requirements, but the reliance on the theoretical provisions set forth in the scientific literature on this issue is not clearly defined.

The grade "satisfactory" is given if the student showed positive results in the process of solving the problem.

The mark "unsatisfactory" is given if the student has not fulfilled all the requirements.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic educational literature

1.Lebedev V.N. Microbiology with the basics of virology. Part I. Fundamentals of General Virology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 62 p.- Access mode: http://www.iprbookshop.ru/22556.html.- ELS "IPRbooks"

2. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook / Tyumentseva E.Yu.— Electron. text data.— Omsk: Omsk State Service Institute, Omsk State Technical University, 2015.— 123 pp.— Access mode: http://www.iprbookshop.ru/32788.html.— EBS “IPRbooks”

3. General biology and microbiology [Electronic resource]: textbook / A.Yu.

Prosekov [et al.]. Electron. text data.— St. Petersburg: Prospekt Nauki,

2017.— 320 p.— Access mode: http://www.iprbookshop.ru/35796.html.— EBS

IPRbooks

6.2 Additional educational literature:

1.Bukhar M. Popular about microbiology [Electronic resource] / Bukhar M. — Electron. text data.— M.: Alpina Publisher, Alpina non-fiction, 2016.— 218 p.— Access mode: http://www.iprbookshop.ru/48576.html.— EBS “IPRbooks”

2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [et al.]. Electron. text data.— Voronezh: Voronezh State University of Engineering Technologies, 2017.— 316 p.— Access mode: http://www.iprbookshop.ru/70810.html.— EBS “IPRbooks”

3. Kovalev N.A. The World of Microorganisms in the Biosphere [Electronic resource]/ Kovalev N.A., Krasochko P.A., Litvinov V.F.— Electron. text data.— Minsk: Belarusian Science, 2014.— 532 pp.— Access mode: http://www.iprbookshop.ru/29476.html.— EBS

6.3Periodicals

"Biological membranes", "Biochemistry", "Biophysics", "Biotechnology", "Proceedings of the Russian Academy of Sciences. Biological Series”, “Microbiology”, “Molecular Biology”, “Applied Biochemistry and Microbiology”.

**7.Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

http://[www.rusbio.biz/en/nugm.shtml](http://www.rusbio.biz/ru/nugm.shtml)

http://[www.sibbio.ru](http://www.sibbio.ru/)

http://elibrary.ru

**8.Composition of software**

Office suite, email client, Internet browser

**9.Equipment and teaching aids**

classroom for conducting lecture-type classes (classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

seminar type, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive whiteboard- 1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1)

rooms for independent work with Internet access (classroom board, educational furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces ) (for independent work) (room No. 07 of the CUC);

- educational laboratory in microbiology and virology (4-15)

Equipment:

1.Steam sterilizer BES-15L-LED-Nautomatic

2. Drying cabinet ShS-40 (40l. 180C)

3. Shaker medical series S:S -3. 02LA20

5.Irradiator-recycler of air ultraviolet

6.Laboratory medical centrifuge

7. Biological microscope Mikromed S-11 with accessories

8. Scales Mass-1

9. Electric water distiller

10. Stand for test tubes ShPU Kront

11. Senco water bath, W-2- 1003 p

12. Electric stove Irit IR-8201 1- burner with thermostat

13.Measuring technology

14. Laboratory savochek

15. Porcelain cups of different sizes

16. Small plastic petri dishes

17. Large plastic Petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

Veterinary microbiology

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

* 1. **The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes of the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | Able to use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of microbiological material | Knows the basic systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  Able to participate in the work on microbiological control of the safety of food products and the habitat of organisms. |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 4/144 | 4/144 |  |
| **contact work**: | | 48 | 54 |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 32(lab) | 36(lab) |  |
| Intermediate certification: credit / credit with grade / exam \* | 45 | 45 |  |
| **Independent work**(IWS) | | 51 | 45 |  |
| Of which for course work (course project) | |  |  |  |

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work
     1. Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  | 2 |  | 6 |
| 2. | Causative agents of staphylococcus goat and streptococcosis | 2 |  |  |  | 4 |  | 6 |
| 3. | Causative agents of Escherichiosis and Serraciosis. | 2 |  |  |  | 4 |  | 6 |
| 4. | Causative agents of colibacillosis and salmonellosis. The causative agent of pasteurellosis | 2 |  |  |  | 4 |  | 6 |
| 5. | The causative agent of brucellosis. | 2 |  |  |  | 4 |  | 4 |
| 6. | The causative agent of anthrax and the group  clostridial infections | 2 |  |  |  | 4 |  | 4 |
| 7. | Principles of sanitary-bacteriological research objects  environmental  environment. principle and  methods  diagnostics  food  toxic infections | 2 |  |  |  | 4 |  | 5 |
| 8. | The causative agents of tuberculosis and paratuberculosis | 1 |  |  |  | 4 |  | 7 |
| 9. | Causative agents of rickettsiosis and chlamydia. | 1 |  |  |  | 2 |  | 7 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Seminars* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Subject and tasks of the discipline | 2 |  |  |  | 2 |  | 3 |
| 2. | Causative agents of staphylococcus goat and streptococcosis | 2 |  |  |  | 4 |  | 6 |
| 3. | Causative agents of Escherichiosis and Serraciosis. | 2 |  |  |  | 6 |  | 8 |
| 4. | Causative agents of colibacillosis and salmonellosis. The causative agent of pasteurellosis | 2 |  |  |  | 4 |  | 4 |
| 5. | The causative agent of brucellosis. | 2 |  |  |  | 4 |  | 5 |
| 6 | The causative agent of anthrax and the group  clostridial infections | 2 |  |  |  | 4 |  | 5 |
| 7 | Principles of sanitary and bacteriological research objects  environmental  environment. The principle and methods of diagnosing food  toxic infections | 2 |  |  |  | 4 |  | 4 |
| 8 | The causative agents of tuberculosis and paratuberculosis | 2 |  |  |  | 4 |  | 5 |
| 9 | Causative agents of rickettsiosis and chlamydia. | 2 |  |  |  | 4 |  | 5 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Introduction. Subject and tasks of the discipline | Subject and tasks of veterinary microbiology. General properties of microorganisms and their position in the system of living beings. Brief historical outline of the development of microbiology. |
|  | Causative agents of staphylo-coccosis and strepto-coccosis. | Discovery history. Methods for their detection. Antigenic structure. Sustainability. drug resistance.  Significance in the pathology of animals and humans. Toxins and pathogenicity factors. |
|  | Causative agents of Escherichia oz and Serraciosis. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention. |
|  | Causative agents of colibacteriosis and salmonellosis. The causative agent of pasteurellosis | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
|  | The causative agent of brucellosis. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
|  | The causative agent of anthrax and the group  clostridial infections. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
|  | Principles of sanitary and bacteriological research of objects  environment. principle and methods  food diagnostics  toxic infections | causative agents of food poisoning. Diagnostics. Research methods Sustainability. Types of toxic infections. Ways of infection. |
|  | The causative agents of tuberculosis and paratuberculosis | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |
|  | Causative agents of rickettsia-oses and chlamydia. | Pathogen. Pathogenesis. Diagnostics. Antigenic structure. Sustainability. Treatment. Prevention |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | ***The content of the laboratory lesson*** |
|  | Rules of work and safety precautions in the microbiological laboratory. | Safety briefing in the laboratory, familiarization with the rules of work. |
|  | Microbiological diagnosis of staphylococcal infections | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of streptococcal infections | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnostics of escherichiosis and serraciosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of colibacillosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of salmonellosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of pasteurellosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of brucellosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of anthrax | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of clostridiosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of tuberculosis and paratuberculosis | Conducting laboratory work in accordance with the development on this topic. |
|  | Microbiological diagnosis of rickettsiosis and chlamydia | Conducting laboratory work in accordance with the development on this topic. |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Causative agents of staphylococcosis and streptococcosis. | OR, LW, T |
| 2. | Causative agents of Escherichiosis and Serraciosis. | OR, LW, IP (report with presentation) |
| 3. | The causative agent of brucellosis. | OR, LW, IP (report with presentation) |
| 4. | The causative agent of anthrax and the group  clostridial infections. | OR, LW, IP (report with presentation) |
| 5. | The causative agents of tuberculosis and paratuberculosis | OR, LW, IP (report with presentation) |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Cases (situations and tasks with given conditions)**

The student should be able to highlight the main provisions from the text of the problem that require analysis and serve as conditions for the solution. Based on the question posed in the problem, try to define the problem as accurately as possible and solve it accordingly.

Problems can be solved orally and/or in writing. When solving problems, it is also important to correctly formulate and write down questions, starting with more general and ending with particular ones.

*Evaluation criteria*- the assessment takes into account the methods and means used in solving a situational, problematic task.

The mark "excellent" is given in the case when the student completed the task (solved the problem), using in full the theoretical knowledge and practical skills gained in the learning process.

The mark "good" is given if the student as a whole fulfilled all the requirements, but the reliance on the theoretical provisions set forth in the scientific literature on this issue is not clearly defined.

The grade "satisfactory" is given if the student showed positive results in the process of solving the problem.

The mark "unsatisfactory" is given if the student has not fulfilled all the requirements.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1 Basic educational literature

1.Lebedev V.N. Microbiology with the basics of virology. Part I. Fundamentals of General Virology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 62 p.- Access mode: http://www.iprbookshop.ru/22556.html.- ELS "IPRbooks"

2. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook / Tyumentseva E.Yu.— Electron. text data.— Omsk: Omsk State Service Institute, Omsk State Technical University, 2015.— 123 pp.— Access mode: http://www.iprbookshop.ru/32788.html.— EBS “IPRbooks”

3. General biology and microbiology [Electronic resource]: textbook / A.Yu.

Prosekov [et al.]. Electron. text data.— St. Petersburg: Prospekt Nauki,

2017.— 320 p.— Access mode: http://www.iprbookshop.ru/35796.html.— EBS

IPRbooks

6.2 Additional educational literature:

1.Bukhar M. Popular about microbiology [Electronic resource] / Bukhar M. — Electron. text data.— M.: Alpina Publisher, Alpina non-fiction, 2016.— 218 p.— Access mode: http://www.iprbookshop.ru/48576.html.— EBS “IPRbooks”

2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [et al.]. Electron. text data.— Voronezh: Voronezh State University of Engineering Technologies, 2017.— 316 p.— Access mode: http://www.iprbookshop.ru/70810.html.— EBS “IPRbooks”

3. Kovalev N.A. The World of Microorganisms in the Biosphere [Electronic resource]/ Kovalev N.A., Krasochko P.A., Litvinov V.F.— Electron. text data.— Minsk: Belarusian Science, 2014.— 532 pp.— Access mode: http://www.iprbookshop.ru/29476.html.— EBS

6.3 Periodicals

"Biological membranes", "Biochemistry", "Biophysics", "Biotechnology", "Proceedings of the Russian Academy of Sciences. Biological Series”, “Microbiology”, “Molecular Biology”, “Applied Biochemistry and Microbiology”.

**7.Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

http://[www.rusbio.biz/en/nugm.shtml](http://www.rusbio.biz/ru/nugm.shtml)

http://[www.sibbio.ru](http://www.sibbio.ru/)

http://elibrary.ru

**8. Composition of software**

Office suite, email client, Internet browser

9.Equipment and teaching aids

classroom for conducting lecture-type classes (classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

seminar type, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive whiteboard- 1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-(1)

rooms for independent work with Internet access (classroom board, educational furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces ) (for independent work) (room No. 07 of the CUC);

- educational laboratory in microbiology and virology (4-15)

Equipment:

1.Steam sterilizer BES-15L-LED-Nautomatic

2. Drying cabinet ShS-40 (40l. 180C)

3. Shaker medical series S:S -3. 02LA20

5.Irradiator-recycler of air ultraviolet

6.Laboratory medical centrifuge

7. Biological microscope Mikromed S-11 with accessories

8. Scales Mass-1

9. Electric water distiller

10. Stand for test tubes ShPU Kront

11. Senco water bath, W-2- 1003 p

12. Electric stove Irit IR-8201 1- burner with thermostat

13.Measuring technology

14. Laboratory savochek

15. Porcelain cups of different sizes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Soil microbiology»**

|  |  |
| --- | --- |
| ***Direction of training*** | Biology |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |
|  |  |

The work program of the discipline "Soil Microbiology"

Compiled by:

Candidate of Biological Sciences, Associate Professor Dokhtukaeva A.M.

APPROVED

Minutes of the meeting of the department "Cell biology, morphology and microbiology"

No. 1 dated September 08, 2022

**1. Goals and objectives of mastering the discipline**

The purpose of the discipline:acquaintance with the most general principles, laws and methods of soil microbiology, modern achievements of biological sciences, their practical significance.

Tasks:

1. To study the physiological groups of soil microorganisms;

2. To acquaint students with the methods of studying soil microflora;

3. To study the influence of environmental factors on soil microflora;

4. Form the concept of soil self-purification.

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Professional skills | PC-2.1  PC-2.2  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes of the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | The ability to use knowledge of certain sections of microbiology in professional activities, to use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | **know: about**the main systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  **Be able to:**use knowledge about the vital activity of microorganisms in professional activities  **Own:**knowledge of sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 108/3 | 108/3 |  |
| **contact work**: | | 32 | 54 |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 16 | 36 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(IWS) | | 76 | 54 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Soil as the main distribution area of ​​microorganisms. | 2 |  |  |  |  |  | 8 |
| 2. | Ecology of soil microorganisms. | 2 |  |  |  | 6 |  | 8 |
| 3. | Biogeochemical activity of soil microorganisms. | 2 |  |  |  | 4 |  | 15 |
| 4. | Participation of microorganisms in the carbon cycle. | 4 |  |  |  | 4 |  | 15 |
| 5. | Chemicalization of agriculture and soil microorganisms. | 3 |  |  |  | 2 |  | 15 |
| 6. | Agroecological role of soil microorganisms | 3 |  |  |  |  |  | 15 |
|  | Total | 16 |  |  |  | 16 |  | 76 |

* + 1. Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Introduction. Soil as the main distribution area of ​​microorganisms. | 3 |  |  |  | 6 |  | 6 |
| 2. | Ecology of soil microorganisms. | 3 |  |  |  | 6 |  | 8 |
| 3. | Biogeochemical activity of soil microorganisms. | 3 |  |  |  | 6 |  | 8 |
| 4. | Participation of microorganisms in the carbon cycle. | 3 |  |  |  | 6 |  | 8 |
| 5. | Chemicalization of agriculture and soil microorganisms. | 3 |  |  |  | 6 |  | 8 |
| 6. | Agroecological role of soil microorganisms | 3 |  |  |  | 6 |  | 8 |
|  | Total | 18 |  |  |  | 36 |  | 54 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Introduction. Soil as the main distribution area of ​​microorganisms. | History of soil microbiology. soil biota. Distribution of microorganisms in the soil. |
|  | Ecology of soil microorganisms. | The main taxonomic groups of soil microorganisms. Metabolism in soil microorganisms. Influence of environmental factors on microorganisms. The number of soil microorganisms and their distribution. Dynamics of microbiological processes. Distribution of microorganisms along the soil profile. |
|  | Biogeochemical activity of soil microorganisms. | The nitrogen cycle. The carbon cycle. Cycle of mineral elements. |
|  | 3.1. Participation of microorganisms in the nitrogen cycle in nature | Processes of mineralization, immobilization, nitrification and denitrification. Regulation of denitrification and immobilization by agricultural practices. Measures to combat dissimilatory denitrification in the soil. |
|  | 3.2. Transformations by microorganisms of compounds of sulfur, phosphorus, iron, etc. | Cycle of carbon in nature. Assimilatory sulfate reduction. Sulfur bacteria and thionic bacteria. The role of microorganisms in the release of acid from organic phosphorus-containing compounds and in the conversion of insoluble phosphates into a soluble state. Biological binding of phosphorus. The role of microorganisms in phosphorus nutrition of plants. Direct and indirect participation of soil microorganisms in the transformations of iron, manganese, aluminum, potassium. |
|  | Participation of microorganisms in the carbon cycle. | Carbon sequestration processes.  Other ways of transformation of one-carbon compounds. |
|  | Chemicalization of agriculture and soil microorganisms. | Influence of fertilizers on the food regime and biological activity of soils. The intensity of ammonification and nitrification processes during soil fertilization. Influence of fertilizers on the intensity of cellulose decomposition. Influence of fertilizers on the intensity of "breathing" of the soil. |
|  | Agroecological role of soil microorganisms | Importance of soil microorganisms in soil fertility. Associations of microorganisms with the root system of plants: rhizosphere and rhizoplane. The role of soil microorganisms in the formation and destruction of humus. Ecological, biochemical and microbiological concepts of humus formation. The value of soil microflora in land reclamation. The effect of organic and mineral fertilizers, various methods of tillage and melioration on soil microorganisms. Degradation by soil microorganisms of pesticides and other synthetic chemicals. |

* + 1. The content of laboratory classes

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the discipline section** | ***The content of the laboratory lesson*** |
| 1. | Introduction. Soil as the main habitat for microorganisms | Soil sampling and sample preparation for analysis. |
|  | Ecology of soil microorganisms. | Isolation and quantitative accounting of soil microorganisms on solid nutrient media. |
|  | Biogeochemical activity of soil microorganisms. | Quantitative accounting of soil microorganisms by the method of limiting dilutions on liquid nutrient media. |
|  | Biogeochemical activity of soil microorganisms. | Qualitative and quantitative accounting of soil microflora by the method of D.M. Novogrudsky. |
|  | Biogeochemical activity of soil microorganisms. | Study of soil and rhizosphere microbiocenoses. |
|  | Biogeochemical activity of soil microorganisms. | The study of soil microflora by the method of simplified pedoscopes. Glass fouling method according to Kholodny. |
|  | Biogeochemical activity of soil microorganisms. | Participation of soil microorganisms in the processes of transformation of the main biogenic elements. |
|  | Participation of microorganisms in the nitrogen cycle in nature | Experience of ammonification of proteins. |
|  | Participation of microorganisms in the nitrogen cycle in nature | Microscopic study of pathogens of putrefactive decomposition of protein substances. |
|  | Participation of microorganisms in the nitrogen cycle in nature | Nitrification experience. |
|  | Agroecological role of soil microorganisms | Direct counting of soil microorganisms under a microscope. |

**5.Fund of assessment tools for the certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled Sections** | **Name of the evaluation tool** |
| 1. | Introduction. Soil as the main distribution area of ​​microorganisms. | OR. P, P, T |
| 2. | Ecology of soil microorganisms. | OR. P, P, T |
| 3. | Biogeochemical activity of soil microorganisms. | OR. P, P, T |
| 4. | Participation of microorganisms in the carbon cycle. | OR. P, P, T |
| 5. | Chemicalization of agriculture and soil microorganisms. | OR. P, P, T |
| 6. | Agroecological role of soil microorganisms | OR. P, P, T |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Testing**

It is one of the means of controlling the knowledge of students in the discipline.

*Evaluation criteria -*correct answer to the question

The grade "excellent" is given if 90-100% of the tasks are correctly completed

The grade "good" is given if 70-89% of the tasks are correctly completed

The mark "satisfactory" is given if 50-69% of the tasks are correctly completed

The mark "unsatisfactory" is given if less than 50% of the tasks are correctly completed

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

6.1. Main literature:

1. Belyasova N.A. Microbiology [Electronic resource]: textbook / Belyasova N.A. - Electron. text data. - Minsk: Higher School, 2012. - 443 p. - Access mode: http://www.iprbookshop.ru/20229.html. - EBS "IPRbooks"

2. General microbiology [Electronic resource]: teaching aid / - Electron. text data.— Novosibirsk: Novosibirsk State Agrarian University, 2012.— 136 pp.— Access mode: http://www.iprbookshop.ru/64746.html.

6.2. additional literature

1. Ivshina I.B. Large workshop "Microbiology" [Electronic resource]: textbook / Ivshina I.B. - Electron. text data.— St. Petersburg: Prospekt Nauki, 2014.— 128 p.— Access mode: http://www.iprbookshop.ru/80079.html.— EBS “IPRbooks”

2. Lebedev V.N. Test tasks in microbiology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 60 p.- Access mode: http://www.iprbookshop.ru/22562.html.- ELS "IPRbooks"

**7.Modern professional databases and information reference systems**

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

The unified information system UComplex provides:

access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;

1. http://www.ncbi.nlm.nih.gov/

2. http://www.msu-genetics.ru/

3. Sage (STM&HSS) - Science and Humanities Magazines

4. Scientific monographs

5. Book series (BookSeries)

6. Electronic reference books (E-References)

7. Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

**8.Composition of software**

- independent search for additional educational and scientific material, using search engines and Internet sites;

- the use of social networks and e-mail of the teacher and students for mailing, correspondence and discussion of the educational problems that have arisen.

**9. Equipment and teaching aids**

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

Unified information systemUComplexprovides:

access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;

1. http://www.ncbi.nlm.nih.gov/
2. <http://www.msu-genetics.ru/>
3. [SAGE (STM&HSS)](http://online.sagepub.com/browsejournals.dtl)-Journals on natural science and humanitarian topics
4. [Scientific monographs](http://www.springerlink.com/books/)
5. [Book series (BookSeries)](http://www.springerlink.com/book-series/)
6. [Electronic reference books (E-References)](http://www.springerlink.com/reference-works/)

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

The lecture course requires computer equipment with multimedia support.

To provide laboratory classes, you need: a laboratory equipped with gas and water supply, UV lamps for sterilizing rooms, sterilization equipment (autoclaves, sterilization cabinets), thermostats, anaerostats, light microscopes with a set of dyes and immersion oils, an electron microscope, photoelectric colorimeters, pH- meters, shakers, water baths, test systems for the identification of microorganisms, laboratory glassware, computer equipment with multimedia software.

Classes in "Soil Microbiology" are held in a specialized laboratory. As a demonstration, computer programs and videos with materials on the discipline can be used.

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**Private bacteriology**

|  |  |
| --- | --- |
| ***Direction of training*** | **Biology** |
| *Code* | 06.03.01 |
| *Orientation (profile)* | Microbiology |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional | Professional skills | PC-2.1  PC-2.3 |

**2. Competences, indicators of their achievement and learning outcomes of the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2 | The ability to use knowledge of certain sections of microbiology in professional activities, to use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material | **know: about**the main systems of life support and regulation of the vital functions of microorganisms, the structure and properties of pathogenic and opportunistic microorganisms; the basics of the interaction of microorganisms with their habitat, sanitary and microbiological standards for the state of environmental objects, food products and drinks; methods of microbiological diagnostics and prevention  **Own:**knowledge of sanitary and hygienic requirements when performing microbiological work; technical support for microbiological work: preparation of laboratory glassware and instruments, preparation of reagents and nutrient media for growing microorganisms |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 3/108 | 3/108 |  |
| **contact work**: | |  |  |  |
|  | Lecture-type classes | 16 | 18 |  |
| Seminar type classes | 16(lab) | 36(lab) |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(IWS) | | 76 | 54 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

4.1 Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Structural  organization  bacterial cell | 1 |  | 1 |  |  |  | 2 |
| 2. | Classification  bacteria | 1 |  | 1 |  |  |  | 4 |
| 3 | Growth and reproduction  bacteria | 2 |  | 2 |  |  |  | 6 |
| 4. | Genetics of bacteria | 2 |  | 2 |  |  |  | 8 |
| 5. | bacteria and  environment | 1 |  | 1 |  |  |  | 8 |
| 6. | Metabolism  bacteria | 2 |  | 2 |  |  |  | 8 |
| 7. | Morphological  and cultural  properties of pathogens purulent  inflammatory  processes (staphylococci,  streptococci, enterococci.  Neisseria) | 2 |  | 2 |  |  |  | 10 |
| 8. | Drip pathogens  infections | 2 |  | 2 |  |  |  | 10 |
| 9. | Mycobacteria. | 1 |  | 1 |  |  |  | 10 |
| 10.. | actinomycetes | 2 |  | 2 |  |  |  | 10 |

4.1.2 Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Structural  organization  bacterial cell | 1 |  | 2 |  |  |  | 2 |
| 2. | Classification  bacteria | 2 |  | 2 |  |  |  | 4 |
| 3. | Growth and reproduction  bacteria | 2 |  | 4 |  |  |  | 6 |
| 4. | Genetics of bacteria | 2 |  | 4 |  |  |  | 6 |
| 5. | bacteria and  environment | 2 |  | 4 |  |  |  | 6 |
| 6. | Metabolism  bacteria | 2 |  | 4 |  |  |  | 6 |
| 7. | Morphological  and cultural  properties of pathogens purulent  inflammatory  processes (staphylococci,  streptococci, enterococci.  Neisseria) | 2 |  | 4 |  |  |  | 6 |
| 8. | Drip pathogens  infections | 2 |  | 4 |  |  |  | 6 |
| 9. | Mycobacteria. | 1 |  | 4 |  |  |  | 6 |
| 10. | actinomycetes | 2 |  | 4 |  |  |  | 6 |

* 1. Course program structured by topics/sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Structural  organization  bacterial cell | Shape and size of bacteria.  structures  bacterial cell.  Principal features  cellular organization  bacteria |
|  | Classification  bacteria | Construction principles  classification of bacteria.  Classification of bacteria according to  Berge's determinant. |
|  | Growth and reproduction  bacteria | Growth of a bacterial cell.  Reproduction of bacteria. Height  bacterial cell in  static culture.  Continuous cultures  microorganisms. |
|  | Genetics of bacteria | Phenotypic and  genotypic variation  prokaryotes. The meaning of mutations. |
|  | Bacteria and  environment | The influence of physical and  chemical factors on  bacteria. Relationships  microorganisms. Antibiotics.  Relationships  microorganisms with plants.  Relationships  microorganisms with humans  animals. |
|  | Metabolism of bacteria | The concept of metabolism. Assimilation and dissimilation as the basis of metabolism. Features of metabolism and nutrition of microorganisms. Breath. Aerobic respiration. Anaerobic respiration. Glycolysis Fermentation. Chemistry and energy. The main types of fermentation. Similarities and differences between respiration and fermentation. The practical significance of fermentation |
|  | Morphological  and cultural  properties of pathogens purulent  inflammatory  processes (staphylococci,  streptococci, enterococci.  Neisseria) | Appearance of bacteria and their accumulations.  Nutrient media for the cultivation of staphylococci.,  streptococci, enterococci, neisseria.  Diseases caused by pathogenic cocci |
|  | Drip pathogens  infections | The causative agents of whooping cough, diphtheria, scarlet fever. The causative agents of meningitis pneumonia. Causative agents of hemophilic infection. Morphology and physiology.  Sources and ways of transmission of infection.  Basic principles of laboratory diagnostics, prevention, treatment. |
|  | Mycobacteria | Mycobacterium tuberculosis (morphology, cultural properties,  factors of aggression, biochemical activity). |
|  | Actinomycetes | Morphology, cultural properties, factors of aggression,  biochemical activity. |

4.2.2Content of practical exercises

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
|  | Rules for working in bacteriological  laboratories. Methods for studying morphology  bacteria. | Acquaintance with safety precautions in the bacteriological laboratory.  microscopic method. Preparation of a fixed micropreparation, preparation "crushed drop", "hanging drop" |
|  | The structure of bacterial cells. Simple and  complex methods of staining bacteria. | A simple coloring method. Staining of bacteria according to the methods of Gram, Romanovsky-Giemsa, Burri-Gins.  The study of the structure of a bacterial cell. |
|  | Nutrient media for the cultivation of cocci that cause purulent-inflammatory processes | Preparation of meat-peptone agar. Yolk-salt agar. Culture of bacteria from pus for MPA and F-SA. The study of colonies of staphylococci and streptococci. |
|  | Microorganism culture technique. Selection  pure cultures of bacteria. | Preparation of laboratory glassware, nutrient medium for seeding bacteria.  Inoculation of bacteria on a nutrient medium. Obtaining a pure culture. |
|  | Study of the biochemical properties of bacteria | Preparation of the Hiss nutrient medium. Bacteria inoculation on Hiss medium. The study of such biochemical properties as the fermentation of various carbohydrates, the release of gas. |
|  | Studying the sensitivity of bacteria to antibiotics | Obtaining a pure culture to study the antibiotic sensitivity of bacteria. Using the disk-diffusion method. |
|  | Phage typing of bacteria | Obtaining phages from environmental objects.  Use of these phages to determine phage sensitivity. |
|  | Bacteriological research methods  soil, water and air. | The study of bacteria in water, soil, air.  Allahotochny and autotochny bacteria. |

1. **Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Structural  organization  bacterial cell | *oral questioning* |
| 2. | Classification  bacteria | *Information project (report* |
| 3. | Growth and reproduction  bacteria | *oral questioning* |
| 4. | Genetics of bacteria | *Research project (paper)* |
| 5. | bacteria and  environment | *Information project (report* |
| 6. | Metabolism of bacteria | *oral questioning* |
| 7. | Morphological  and cultural  properties of pathogens purulent  inflammatory  processes (staphylococci,  streptococci, enterococci.  Neisseria) | *oral questioning*  *Research project (paper)* |
| 8. | Drip pathogens  infections | *Research project (paper)* |
| 9. | Mycobacteria | *Information project (report)* |
| 10. | Actinomycetes | *Research project (paper)* |

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

1. Lebedev V.N. Microbiology with the basics of virology. Part I. Fundamentals of General Virology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 62 p.- Access mode: http://www.iprbookshop.ru/22556.html.- ELS "IPRbooks"
2. Lebedev V.N. Test tasks in microbiology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 60 p.- Access mode: http://www.iprbookshop.ru/22562.html.- ELS "IPRbooks"
3. Tyumentseva E.Yu. Fundamentals of microbiology [Electronic resource]: textbook / Tyumentseva E.Yu.— Electron. text data.— Omsk: Omsk State Service Institute, Omsk State Technical University, 2015.— 123 pp.— Access mode: http://www.iprbookshop.ru/32788.html.— EBS “IPRbooks”
4. General biology and microbiology [Electronic resource]: study guide / A.Yu. Prosekov [et al.]. Electron. text data.— St. Petersburg: Prospekt Nauki, 2017.— 320 p.— Access mode: http://www.iprbookshop.ru/35796.html.— EBS “IPRbooks”
5. Krasnikova L.V. Microbiology [Electronic resource]: textbook / Krasnikova L.V.— Electron. text data.— St. Petersburg: Troitsky Most, 2015.— 294 p.— Access mode: http://www.iprbookshop.ru/40872.html.— EBS “IPRbooks”

Additional literature

1. 1. Bukhar M. Popular about microbiology [Electronic resource] / Bukhar M. - Electron. text data.— M.: Alpina Publisher, Alpina non-fiction, 2016.— 218 p.— Access mode: http://www.iprbookshop.ru/48576.html.— EBS “IPRbooks”
2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [et al.]. Electron. text data.— Voronezh: Voronezh State University of Engineering Technologies, 2017.— 316 p.— Access mode: http://www.iprbookshop.ru/70810.html.— EBS “IPRbooks”
3. Sboychakov V.B. Microbiology with basic epidemiology and methods
4. Lebedev V.N. Test tasks in microbiology [Electronic resource]: a manual for students of biological specialties / Lebedev VN — Electron. text data.— St. Petersburg: Russian State Pedagogical University. A.I. Herzen, 2014.- 60 p.- Access mode: http://www.iprbookshop.ru/22562.html.- ELS "IPRbooks"
5. Lykov I.N. Microorganisms. Biology and ecology [Electronic resource] / Lykov I.N., Shestakova G.A. - Electron. text data. Kaluga: Publisher Zakharov S.I. (“Serna”), 2014.— 400 pp.— Access mode: http://www.iprbookshop.ru/32840.html.— EBS “IPRbooks”
   1. Periodicals
6. "Biological membranes"
7. "Biochemistry", "Biophysics", "Biotechnology"
8. "Proceedings of the Russian Academy of Sciences. Biological Series»
9. "Microbiology, epidemiology, immunology",
10. "Molecular biology",
11. "Applied Biochemistry and Microbiology".

**7. Modern professional databases and information reference systems**

1. EBS "IP Air Media" Agreement No. 3422/17 of 01/01/2018

2. EBS "Ibux" Contract No. 04-06/18K dated 01.01.2018

3. EBS “Lan Publishing House” Agreement No. 113/18 dated 02.02.2018

4. EBS "IP Air Media" Agreement No. 4110/18 dated 06/15/2018

http://microbiol.ru

http://micro.moy.su

http://[www.agroxxi.ru](http://www.agroxxi.ru/)

**8.Composition of software**

Office suite, email client, Internet browser

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;

rooms for independent work with Internet access.

Classroom for conducting lecture-type classes (Classroom board, educational furniture (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1 (4-08 for lectures);

Seminar-type classroom, group and individual consultations, current control and intermediate certification (4-03 for practical and self-student - classroom board, educational furniture (student tables, student chairs) for 12 seats, projector-1, interactive board-1, laptop-1, with multimedia presentation equipment for demonstrating presentations and illustrative material (4-08) (student tables, student chairs) for 24 seats, projector-1, interactive whiteboard-1, laptop-1);

Rooms for independent work with Internet access (Classroom board, study furniture (student tables, student chairs) for 8 seats, computer furniture for 5 seats; 5 computers with Internet access, keyboard (5 pieces), mouse (5 pieces) ) (for independent work) (room No. 07 of the TsKP).

Educational Laboratory for Microbiology and Virology (4-15)

Equipment:

1. Sterilizer steam BES -15L-LED-N automatic
2. Drying cabinet ShS-40 (40l. 180C)
3. Shaker medical series S:S -3. 02LA20
4. Air irradiator-recycler ultraviolet
5. Medical laboratory centrifuge
6. Biological microscope Mikromed S-11 with accessories
7. Scales Mass-1
8. Electric water distiller
9. Support for test tubes ShPU Kront
10. Water bath Senco, W-2- 1003 p
11. Electric stove Irit IR-8201 1 burner with thermostat
12. Measuring technology
13. Savochek laboratory
14. Porcelain cups of various sizes
15. Small plastic petri dishes
16. Large plastic petri dishes

MINISTRY OF SCIENCE AND HIGHER EDUCATION OF THE RUSSIAN FEDERATION

Federal State Budgetary Educational Institution of

Higher Education

"Chechen State University"

**BIOLOGICAL AND CHEMICAL FACULTY**

**Department of Cell Biology, Morphology and Microbiology**

Work program of the discipline

**"Industrial Microbiology"**

|  |  |
| --- | --- |
| **Direction of training** | Biology |
| Code | 06.03.01 |
| Orientation (profile) | Microbiology |
|  |  |

**1.The list of competencies formed by the discipline in the process of mastering the educational program**

|  |  |  |
| --- | --- | --- |
| **Competence group** | **Category of competencies** | **Code** |
| Professional competencies |  | PC-2.5 |

**2. Competences, indicators of their achievement and learning outcomes in the discipline**

|  |  |  |
| --- | --- | --- |
| **Competency code** | **Code and name of the indicator of competence** | **Learning Outcomes**  **by discipline** |
| PC-2.5 |  | Knows: basic concepts and methods of natural sciences  Able to: use knowledge of certain sections of microbiology in professional activities, use modern ideas about the role, structure, properties of microorganisms in professional activities; apply methods of analysis of biological material  Owns the theoretical foundations and technology of modern microbiological and biotechnological industries |

**3. Volume of discipline**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| ***Types of educational work*** | | ***Forms of study*** | | |
| ***Full-time*** | ***Part-time*** | ***Correspondence*** |
| **General labor intensity**: credits/hours | | 3/108 | 3/108 |  |
| **contact work**: | | 36 | 54 |  |
|  | **Lecture-type classes** | 18 | 18 |  |
| **Seminar type classes** | 18 | 36 |  |
| Intermediate certification: credit / credit with grade / exam \* |  |  |  |
| **Independent work**(IWS) | | 72 | 54 |  |
| Of which for course work (course project) | |  |  |  |

\* - highlight in bold italics

Notes:

credit and credit with full-time assessment is carried out within the framework of seminar-type classes. The curriculum does not include hours.

***4. The content of the discipline (module), structured by topics / sections, indicating the number of academic hours allocated to them and types of training sessions***

* 1. Distribution of hours by sections/topics and types of work

4.1.1 Full-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Subject and methodology of industrial microbiology | 2 |  |  |  |  |  | 9 |
| 2. | Scientific foundations of industrial microbiology | 2 |  | 4 |  |  |  | 9 |
| 3. | Technological scheme of microbiological production | 2 |  | 2 |  |  |  | 9 |
| 4. | Obtaining biologically active substances and individual components of a microbial cell | 2 |  | 2 |  |  |  | 9 |
| 5. | Use of fermentation and other metabolic processes | 2 |  | 4 |  |  |  | 9 |
| 6 | Production of proteins by microbial synthesis | 2 |  |  |  |  |  | 9 |
| 7 | Industrial microbiology and environmental protection | 2 |  | 2 |  |  |  | 9 |
| 8 | Subject and methodology of industrial microbiology | 2 |  | 2 |  |  |  | 9 |

4.1.1 Part-time education

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **No. p/n** | **Section/topic** | **Types of educational work (in hours)** | | | | | | |
| **contact work** | | | | | | Independent work |
| **Lecture-type classes** | | **Seminar type classes** | | | |
| *Lectures* | *Other training sessions* | *Practical lessons* | *Semi bunk* | *Laboratory works.* | *Other activities* |
| 1. | Subject and methodology of industrial microbiology | 2 |  | 4 |  |  |  | 6 |
| 2. | Scientific foundations of industrial microbiology | 2 |  | 4 |  |  |  | 7 |
| 3. | Technological scheme of microbiological production | 2 |  | 4 |  |  |  | 7 |
| 4. | Obtaining biologically active substances and individual components of a microbial cell | 2 |  |  |  |  |  | 7 |
| 5. | Use of fermentation and other metabolic processes | 2 |  | 4 |  |  |  | 7 |
| 6. | Production of proteins by microbial synthesis | 2 |  | 4 |  |  |  | 7 |
| 7. | Industrial microbiology and environmental protection | 2 |  | 6 |  |  |  | 7 |

4.2 The program of the discipline, structured by topics / sections

4.2.1. The content of the lecture course

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | **The content of the lecture** |
|  | Subject and methodology of industrial microbiology | The first technologies for the use of microorganisms in the manufacture of products important to humans. Acetic fermentation. Lactic acid fermentation. Alcoholic fermentation. pectin fermentation. Industrial microbiology at the turn of the XX-XXI centuries. The latest advances in industrial microbiology, genomics and proteomics. Development of research and commercialization of industrial technologies in the USA, Japan, EU countries and Russia. Definition of industrial microbiology as a science. Tasks and methods of industrial microbiology  Achievements of industrial microbiology and prospects. Objects of industrial microbiology  The structure and chemical composition of cells. The main biopolymers of cells: proteins, nucleic acids, carbohydrates, lipids. Cell organelles, their structure and functions. Target products of industrial microbiology: recombinant DNA, genetically engineered proteins, vaccines, antibodies, biomaterials. Social, legislative and ethical issues of modern industrial biotechnology. Innovation in Industrial Microbiology: Commercialization and Technology Transfer Procedure |
|  | Scientific foundations of industrial microbiology | General characteristics of microorganisms. Characteristics of individual groups of microorganisms. Algae, protozoa, fungi, bacteria, viruses (morphology, reproduction, nutrition, role in nature, practical significance). Advantages of microorganisms over other objects in solving modern microbiological problems. Industrial, model and basic microorganisms. Bacteriophages in the microbiological industry. Immobilized cells of microorganisms and their application. Requirements for producers used in industrial production.  Methods for improving BAS producers: mutation, selection, Levels of regulation of cellular metabolism and ways of influencing it. Nutrient media for the cultivation of microorganisms. Composition of nutrient media. Physiological and genetic methods of regulation of the metabolism of microorganisms-producers. The role of external factors in the regulation of metabolism of producers. The use of genetic methods in the microbiological industry. Genetic ways to improve producers: organismal, cellular and molecular levels |
|  | Technological scheme of microbiological production | Methods of cultivation of microorganisms.  Principal technological scheme of microbiological production. Hardware design of the processes of growing microorganisms. Types of bioreactors. Types and composition of nutrient media for growing microorganisms. Mixing and aeration systems. Systems of heat exchange, defoaming and sterilization of bioreactors. Periodic cultivation. Continuous cultivation. Surface and deep cultivation. Cultivation on the surface of a solid medium. Surface cultivation on a liquid medium. Deep cultivation. Asepsis of biotechnological processes.  Principles of scaling technological processes: laboratory, pilot and industrial fermenters and tasks solved with their use. Dependence of the design features of bioreactors on the properties of the substrate used. Specialized fermentation technologies: aerobic, solid phase and gas phase processes |
|  | Obtaining biologically active substances and individual components of a microbial cell | Antibiotics. Technology of biosynthesis of antibiotic preparations for agriculture. Vitamins. Getting vitamin B12. Producers. Practical use. Riboflavin. Producers. Riboflavin biosynthesis pathway and its regulation. Receipt and application. Ergosterol. Producers. Biosynthesis of ergosterol. Receipt and application. biosynthesis of carotenoids. Conditions for the formation of carotenoids by microorganisms. Producers and industrial production of carotenoids. The use of carotenoids in the national economy. Carotenoids. Gibberellins. Alkaloids. Amino acids. Technology of biosynthesis of amino acids. Nucleotides. Lipids. Technology for obtaining microbial lipids. Polysaccharides. Polysaccharides of the cytoplasm and membrane structures. cell wall polysaccharides. extracellular polysaccharides. Producers. Conditions for cultivation of microorganisms and biosynthesis of polysaccharides, control mechanisms. Industrial receipt. Practical use of polysaccharides in the food, paint and varnish, textile, paper, pharmaceutical, cosmetic industries and in medicine. Dextran is a blood plasma substitute. Receipt. Prospects for the industrial production and use of bacterial and fungal exopolysaccharides Enzymes. Production of vaccines, bacteriophages and medicines. Theoretical and practical bases of microbiological production of vaccines. Main types of bacterial and viral vaccines. Features of growing bacteria for the preparation of vaccines. Vaccines based on live, attenuated and inactivated bacteria. Viral vaccines. Substrates and methods for growing viruses for the preparation of vaccines. Attenuated and inactivated viral vaccines. Prospects for obtaining highly purified antigens from vaccines. Obtaining bacterial preparations of bifidumbacterin, colibacterin and lactobacterin. Application in medicine |
|  | Use of fermentation and other metabolic processes | Alcoholic fermentation. Lactic acid fermentation. propionic acid fermentation. Acetone-butyl fermentation. Obtaining vinegar and other aspects of the use of acetic acid bacteria. Obtaining organic acids. Receiptα-ketoglutaric, fumaric, malic and succinic acids. Obtaining organic acids from carbohydrates. Production of citric acid. Producers. The mechanism of biosynthesis. Production of itaconic, fumaric, gluconic acids and the mechanism of biosynthesis. Organic acids from n-alkanes. Transformation of organic compounds |
|  | Production of proteins by microbial synthesis | Technological scheme for obtaining fodder biomass. Obtaining protein substances on hydrocarbon raw materials. Obtaining microbial protein on lower alcohols. Obtaining protein substances on carbohydrate raw materials. Technology for obtaining bacterial preparations for agriculture. Microbial fertilizer preparations. Nitragin. Physiological features of nodule bacteria and their relationship with leguminous plants. Obtaining nitrogen-fixing bacterial preparations. Azotobacterin. Physiological features of Azotobacter. Methods for the preparation and use of soil-fertilizing preparations. Phosphobacterin. The role of bacterial fertilizers in increasing crop yields. Preparations of microorganisms against animal pests. Bacterial plant protection products. Advantages of bacterial plant protection products over chemical ones. Entomopathogenic preparations of bacterial, fungal and viral origin. Producers of entomopathogenic drugs, their physiological features. The damaging effect of entomopathogenic drugs: penetration, reproduction in the body of insects, the formation of toxins. Dendrobacillin, entobacterin, bitoxibacillin, boverin. Cooking. Application. Viral drugs. Cultivation of viruses for the preparation of drugs. Application methods. The use of microorganisms in the production of fuels. Ethanol production. Biogas production. Biogeotechnology of metals. Damage by microorganisms of materials and methods of their protection. Biohydrometallurgy or bacterial leaching of metals. Microbiology of the process. Biological and chemical reactions of the leaching process. Microorganisms and methods. Mechanisms and conditions of bacterial oxidation of sulfide minerals. Prospects for the use of metallurgy of mixed cultures, thermophilic and anaerobic bacteria. Technology of bacterial leaching of metals. Heap, underground and vat leaching. Bacteria biomass technology |
|  | Industrial microbiology and environmental protection | Industrial microbiology and problems of environmental protection Prospects for the development of the microbiological industry |

* + 1. The content of practical classes

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Name of the topic (section) of the discipline** | ***The content of the practical lesson*** |
| 1 | Subject and methodology of industrial microbiology | Obtaining pure cultures of microorganisms |
| 2 | Scientific foundations of industrial microbiology | The effect of different sterilization modes on the death of microorganisms |
| 3 | Technological scheme of microbiological production | Influence of Nutrient Medium Composition on Amylase Accumulation in Solid-Phase Mycomycete Cultivation |
| 4 | Obtaining biologically active substances and individual components of a microbial cell | Familiarization with the work of bioreactors |
| 5 | Use of fermentation and other metabolic processes | Alcoholic fermentation. Getting ethyl alcohol |
| 6 | Production of proteins by microbial synthesis | Lactic acid fermentation. Getting curd |

**5. Fund of assessment tools for certification of students in the discipline (module)**

The following types of quality control for mastering a particular discipline are provided:

- ongoing monitoring of progress

- intermediate certification of students in the discipline

The fund of assessment tools for conducting intermediate certification of students in the discipline is drawn up in the appendix to the work program of the discipline.

5.1 Passport of the fund of evaluation funds for the current certification in the discipline (module)

|  |  |  |
| --- | --- | --- |
| **No. p/n** | **Controlled sections (topics)** | **Name of the evaluation tool** |
| 1. | Subject and methodology of industrial microbiology | OR, P, P |
| 2. | Scientific foundations of industrial microbiology | OR, P, P |
| 3. | Technological scheme of microbiological production | OR, P, P |
| 4. | Obtaining biologically active substances and individual components of a microbial cell | OR, P, P |
| 5. | Use of fermentation and other metabolic processes | OR, P, P |
| 6. | Production of proteins by microbial synthesis | OR, P, P |
| 7. | Industrial microbiology and environmental protection | OR, P, P |
| 8. | Subject and methodology of industrial microbiology | OR, P, P |

*List of evaluation tools:*

1. *oral questioning*
2. *Research project (paper)*
3. *Information project (report)*
4. *Presentation*

5.2 Standard control tasks or other materials necessary to assess knowledge, skills and (or) experience in the process of current control

5.3 Methodological materials that determine the procedures for assessing knowledge, skills and (or) work experience

**Oral response**

Knowledge assessment involves a differentiated approach to the student, taking into account his individual abilities, the degree of assimilation and systematization of the basic concepts and categories in the discipline. In addition, not only the depth of knowledge of the questions posed is assessed, but also the ability to use practical material in the answer. The culture of speech, oratory skills are assessed.

*Evaluation criteria:*consistency, completeness, consistency of presentation, analysis of different points of view, independent generalization of the material, use of professional terms, culture of speech, oratory skills. Presentation of material without factual errors.

The mark "excellent" is given in the case when the material is presented exhaustively, consistently, competently and logically, while not only the basic concepts are revealed, but also the points of view of various authors are analyzed. The student does not hesitate to answer, observes the culture of speech.

The grade “good” is given if the student knows the material well, presents it competently and to the point, knows the practical base, but when answering the question, he makes minor errors.

Grade*"satisfactorily"*it is set if the student has mastered only the basic material, but does not know individual details, allows inaccuracies, insufficiently correct wording, violates the sequence in the presentation of the material, finds it difficult to answer, shows the lack of proper connection between analysis, argumentation and conclusions.

The grade "unsatisfactory" is given if the student does not answer the questions.

**Research project (paper)**

Research project - a project whose structure is close to the format of scientific research and contains evidence of the relevance of the chosen topic, the definition of a scientific problem, the subject and object of research, goals and objectives, methods, sources, historiography, generalization of results, conclusions.

The results of the research project are drawn up in the form of an paper.

*Evaluation criteria*- since the structure of the research project is as close as possible to the format of scientific research, the proof of the relevance of the research topic, the definition of the scientific problem, the object and subject of research, the goals and objectives, sources, research methods, the formulation of a hypothesis, the generalization of results and the formulation of conclusions, the designation of prospects are taken into account further research.

The grade "excellent" is given when the student demonstrates a complete understanding of the problem, all the requirements for the task are met.

The mark "good" is given if the student demonstrates a significant understanding of the problem, all the requirements for the task are met.

The grade "satisfactory" is given if the student demonstrates a partial understanding of the problem, most of the requirements for the task are met

An “unsatisfactory” grade is given if the student demonstrates a lack of understanding of the problem, many of the requirements for the task are not met.

**Information project (report with presentation)**

Information project - a project aimed at stimulating the educational and cognitive activity of a student with a pronounced heuristic orientation (search, selection and systematization of information about an object, its design for presentation).

An information project differs from a research project, since it is a form of educational and cognitive activity that has a pronounced heuristic orientation.

*Evaluation criteria*- atgrading takes into account independent search, selection and systematization of information, disclosure of the issue (problem), familiarization of the student audience with this information (presentation of information), its analysis and generalization, design, full answers to questions from the audience with examples.

The grade "excellent" is given when the student fully reveals the question (problem), presents information in a systematic, consistent, logical, interconnected way, uses more than 5 professional terms, makes extensive use of information technology, there are no errors in the information, gives complete answers to questions from the audience with examples.

The mark "good" is given if the student reveals the question (problem), presents the information in a systematic, consistent, logical, interconnected manner, uses more than 2 professional terms, uses information technology sufficiently, makes no more than 2 errors in the presentation of the material, gives complete or partially complete answers. to questions from the audience.

The grade "satisfactory" is given if the student does not fully disclose the question (problem), presents information in a not systematized and not quite consistent manner, uses 1-2 professional terms, uses information technology, makes 3-4 errors in the presentation of the material, answers only elementary audience questions without explanation.

An “unsatisfactory” rating is given if the question is not disclosed, the information provided is not logically connected, professional terms are not used, it makes more than 4 errors in the presentation of the material, and does not answer questions from the audience.

**6. List of basic and additional educational literature, periodicals necessary for mastering the discipline (module)**

**6.1 Main literature**

1. Belyasova N.A. Microbiology [Electronic resource]: textbook / Belyasova N.A. - Electron. text data. - Minsk: Higher School, 2012. - 443 p. - Access mode: http://www.iprbookshop.ru/20229.html. - EBS "IPRbooks"
2. Pavlovich S.A. Microbiology with microbiological research [Electronic resource]: textbook / Pavlovich S.A.— Electron. text data. - Minsk: Higher School, 2009. - 502 p. - Access mode: http://www.iprbookshop.ru/20093.html. - EBS "IPRbooks"
3. Sakovich G.S. Microbiology. Part II [Electronic resource]: teaching aid / Sakovich G.S., Bezmaternykh M.A. - Electron. text data. - Ekaterinburg: Ural Federal University, EBS DIA, 2013. - 92 p. - Access mode: http://www.iprbookshop.ru/68258.html. - EBS "IPRbooks"
4. Kuznetsova E.A. Microbiology. Part 1 [Electronic resource]: tutorial / Kuznetsova E.A., Knyazev A.A.— Electron. text data. - Kazan: Kazan National Research Technological University, 2017. - 88 p. - Access mode: http://www.iprbookshop.ru/79327.html. — EBS «IPRbooks»
5. Tkachenko K.V. Microbiology [Electronic resource]: textbook / Tkachenko K.V.— Electron. text data. - Saratov: Scientific book, 2019. - 159 p. - Access mode: http://www.iprbookshop.ru/80990.html. — EBS «IPRbooks»

**6.2 Further reading**

1. Biotechnology and microbiology of anaerobic processing of organic municipal waste [Electronic resource]: collective monograph / - Electron. text data. -: Logos, University Book, 2016. - 320 pp. - Access mode: http://www.iprbookshop.ru/70738.html. — EBS «IPRbooks»
2. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [i dr.]. — Electron. text data. - Voronezh: Voronezh State University of Engineering Technologies, 2017. - 316 p. - Access mode: http://www.iprbookshop.ru/70810.html. - EBS "IPRbooks"
3. Biotechnology and microbiology of anaerobic processing of organic municipal waste [Electronic resource]: collective monograph / - Electron. text data.— : Logos, University Book, 2016.— 320 pp.— Access mode: http://www.iprbookshop.ru/70738.html.— EBS “IPRbooks”
4. Microbiology with the basics of biotechnology (theory and practice) [Electronic resource]: textbook / G.P. Shuvaeva [et al.]. Electron. text data.— Voronezh: Voronezh State University of Engineering Technologies, 2017.— 316 p.— Access mode: http://www.iprbookshop.ru/70810.html.— EBS “IPRbooks”

**6.3 Periodicals**

Russian scientific journal. Publishing house: Autonomous non-profit organization Ryazan Institute of Economic, Legal, Political and Sociological Research and Expertise. Year of foundation: 2007. 6 issues. Ryazan. HAC.

Journal website:<http://rnjournal.narod.ru>

2. Modern science: actual problems of theory and practice. series: natural and technical sciences. Publishing House: Limited Liability Company Scientific Technologies. Year of foundation: 2011. 12 issues. Moscow.

Journal website:<http://www.nauteh-journal.ru/index.php/ru/m/60>.

**7.Modern professional databases and information reference systems**

1. *www.slideshare.net/galinahurtina/ss-3897383 Biotechnology as a slide lecture (presentation).*
2. *biotechnolog.ru/ Materials for the training course Biotechnology*
3. *library.krasu.ru/ft/ft/\_umkd/1323/u\_lab.pdf Electronic textbook (laboratory work) on Biotechnology.*
4. *sdb.su/svalka/529-vvedenie-v-biotexnologiyu.html Introduction to biotechnology.*
5. *window.edu.ru/window\_catalog/pdf2txt?p\_id=44908 Biotechnology Manual*
6. *www.rusdocs.com/biotexnologii Electronic Manual on Biotechnology.*
7. */biomolecule.ru/content/927 Perspectives of biotechnology*
8. *window.edu.ru/window\_catalog/pdf2txt?p\_id=28505&p\_page=1 Biosynthesis of biologically active substances*
9. *zorgbiogas.ru/biblioteka/kniga-o-biogaze Materials about biogas and installations for its production.*
10. [*www.nauka.kz/biol\_med/razd4/*](http://www.nauka.kz/biol_med/razd4/)*vivovoco.rsl.ru/VV/PAPERS/NATURE/SPIDER.HTM Biotechnology for fiber production.*
11. *www.biorosinfo.ru/press/chto-takoe-biotekhnologija/ Website of the Society of Biotechnologists of Russia*
12. *biotechnolog.ru/ Materials for the training course Biotechnology*
13. *www.iprbookshop.ru/70810.html. — EBS «IPRbooks»*
14. *Student consultant (http://www.studentlibrary.ru)*
15. *EBS "Lan" - services for inclusive education (https://e.lanbook.com)*
16. *Polpred.com - Internet resources*
17. [*www.pubmed.com*](http://www.pubmed.com)
18. [*www.medline.ru*](http://www.medline.ru)
19. [*www.elibrary.ru*](http://www.elibrary.ru)
20. [*http://biblioclub.ru*](http://biblioclub.ru)
21. [*http://znanium.com/*](http://znanium.com/)
22. [*http://e.lanbook.com/*](http://e.lanbook.com/)

**8.Composition of software**

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

Unified information system UComplexprovides:

access to curricula, work programs of disciplines (modules), practices, to publications of electronic library systems and electronic educational resources specified in work programs; fixing the course of the educational process, the results of intermediate certification and the results of mastering the main educational program; the formation of an electronic portfolio of the student, including the preservation of the student's work, reviews and assessments of these works by any participants in the educational process;

1. http://www.ncbi.nlm.nih.gov/
2. <http://www.msu-genetics.ru/>
3. [SAGE (STM&HSS)](http://online.sagepub.com/browsejournals.dtl)-Journals on natural science and humanitarian topics
4. [Science](http://www.sciencemag.org/magazine.dtl)-
5. [Scientific monographs](http://www.springerlink.com/books/)
6. [Book series (BookSeries)](http://www.springerlink.com/book-series/)
7. [Electronic reference books (E-References)](http://www.springerlink.com/reference-works/)

Electronic library system IPRbooks is a resource that includes an electronic library system, printed and electronic books (http://www.iprbookshop.ru/).

When reading lectures on Introduction to Biotechnology, computer technology is used to demonstrate presentation multimedia materials. In practical classes, students present presentations prepared by them during self-study hours.

Information Technology:

* office suite,
* mail client,
* Internet browser

**9. Equipment and teaching aids**

The minimum list of material and technical support necessary for the implementation of the discipline includes:

* a classroom for conducting lecture-type classes, seminar-type classes, group and individual consultations, current control and intermediate certification, with multimedia presentation equipment for demonstrating presentations and illustrative material;
* rooms for independent work with Internet access.

For the discipline "Industrial Microbiology" students are provided with all the necessary material and technical base:

* classroom for lecture-type, seminar-type classes, group and individual consultations, current control and intermediate certification, equipped with multimedia presentation equipment for demonstrating presentations and illustrative material
* rooms for self-study with Internet access
* Educational Laboratory of Microbiology and Virology

Characteristics of the available instrumental (instrumental) base

laboratories of microbiology and virology

Equipment for the educational process: steam sterilizer BES -15L-LED-N automatic, steam sterilizer BES-22L-B-LCD 22l. /1 (without lamps), bactericidal ultraviolet irradiator for local irradiation OUFb-04 "Sun", ultraviolet air irradiator-recycler, medical shaker series S:S -3. 02L A20, medical laboratory centrifuge, medical centrifuge of the SM series in SM-20 version, laboratory microscope LUM, biological microscope Micromed C-11 with accessories, biological microscope Micromed R-1, microscope MS-4-ZOOM LED (trinocular), microscope EUM , ToupCam 5.1 MP video eyepiece, Massa-1 scales, electric water distiller, bidistilator, bactericidal lamp TUVC-15Vy G13 (China), stand for test tubes ShPU Kront,

(multimedia projector, laptop) to demonstrate educational and visual aids, ensuring the implementation of thematic illustrations.

The main equipment for the educational process, the preparation of nutrients and disinfection / sterilization: autoclaves (“clean” and “dirty”), dry heat sterilizer, distiller, thermostat, refrigerator.

Specialized educational laboratories with a set of equipment for microscopic, bacteriological and immunological research (microscope, dyes, spirit lamp, stands, trays, bacteriological loops, test tubes, pipettes, sets of disks with antibiotics, vaccines, sera, diagnostic preparations).

Special equipment for bacteriological research: automatic dispensers, devices for gel electrophoresis, thermal cycler for PCR research.

Special equipment for immunological studies: automatic dispensers, enzyme immunoassay analyzer, centrifuge.

Visual aids (tables and posters) for the diagnosis of major infectious diseases.