




MINISTRY OF SCIENCE AND HIGHER EDUCATION OF RUSSIAN FEDERATION
Federal State Autonomous Educational Institution of Higher Education
Far Eastern Federal University
SCHOOL OF BIOMEDICINE

AGREED
Head of OP


(Signed) (Full name)



CLAIM
Director of the Department of Medical Biology and
Biotechnology


(Signed) (Acting Name)
December 30, 2021

WORK PROGRAM OF THE DISCIPLINE
Methodology and methods of teaching natural science disciplines
Direction of training 06.04.01 Biology
(Molecular and Cell Biology)
Form of training: full-time

Course 1 semester 1
lectures - hour.
practical exercises 18 hours.
laboratory work - hour.
total hours of classroom load 18 hours.
independent work 90 hours.
including 36 hours of exam preparation.
exam 1 semester

The work program is drawn up in accordance with the requirements of the Federal State Educational Standard in the direction of training 06.04.01 Biology, approved by the order of the Ministry of Education and Science of Russia dated 11.08.2020 No. 934.

The work program was discussed at the meeting of the Department of Medical Biology and Biotechnology Protocol dated December 30, 2021 No. 5

Director of the Department of Implementing Structural Unit Ph.D., Associate Professor Kumeiko V.V.

Compiled by: Ph.D., Associate Professor Kumeiko V.V.

Vladivostok
2021

Reverse side of the RPD cover page

1. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " _____ № _____

2. The work program was revised at the meeting of the Department / department / department (implementing the discipline) and approved at the meeting of the Department / department / department (issuing structural unit), the protocol from " _____ № _____

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5. The work program was revised at the meeting of the Department / Department / Department (implementing the discipline) and approved at the meeting of the Department / Department / Department (issuing structural unit), the protocol from " _____ № _____

1. Goals and objectives of mastering the discipline:

Purpose: to prepare graduates who know their field of science well enough for teaching.

Tasks:

- 1) to acquaint students with the elementary methods of conducting lessons (lectures and seminars, practical classes) at school and university.
- 2) prepare for complex psychological and pedagogical situations.
- 3) to provide an understanding of the teacher's place of work in the practical and spiritual life of mankind.

Professional competencies of graduates and indicators of their achievement:

Task type	Code and name of professional competence (the result of mastery)	Code and name of the competency achievement indicator
pedagogical	PC-8 Is able to form educational material, conduct lectures, seminars, practical and laboratory classes on higher education programs.	PP-8.1 Develops methodological materials on topics and forms of classes in higher education programs.
		PC-8.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on higher education programs.
		PP-8.3 Conducts lectures, seminars, practical and laboratory classes on higher education programs.
	PP-9 Is capable of presenting educational material in oral, written and graphic forms to various contingents of trainees.	PP-9.1 Develops training materials on topics and formats of classes in oral, written and graphic forms for various participants.
		PP-9.2 Presents training material in oral, written and graphic form to various participants
	PK-10 Is capable of teaching in general education organizations, as well as in educational organizations of higher education and management of research activities of students.	PK-10.1 Plans classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.
		PC-10.2 Organizes classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.
		PK-10.3 Teaches in general education organizations, as well as in educational organizations of higher education and directs the research activities of students.

	<p>PC-11 Is able to use in pedagogical activities knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific and production potential of the country.</p>	<p>PK-11.1 Uses in pedagogical activities knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country.</p>
	<p>PP-12 The ability to form educational material, conduct lectures, seminars, practical and laboratory classes on vocational education programs for various contingents of students</p>	<p>PP-12.1 Develops methodological materials on topics and forms of classes on vocational education programs for various contingents of students</p> <p>PC-12.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on vocational education programs for various contingents of students</p> <p>PP-12.3 Conducts lectures, seminars, practical and laboratory classes on vocational education programs for various contingents of students</p>
	<p>PC-13 Is capable of teaching in professional educational organizations and supervising the research activities of students.</p>	<p>PP-13.1 Plans classes in vocational training and continuing professional education using the knowledge and methodology of vocational training.</p> <p>PP-13.2 Organizes classes in the field of vocational training and further vocational education, using a methodology in accordance with vocational training.</p> <p>PP-13.3 Conducts training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training.</p> <p>PP-13.4 Plans research activities of students in the field of professional interests using knowledge of scientific design and research methodology.</p> <p>PP-13.5 Organizes research activities of students in the field of professional interests using knowledge of scientific design and research methodology.</p>

		PP-13.6 Supervises the research activities of students in the field of professional interests using knowledge of scientific design and research methodology.
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Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
PP-8.1 Develops methodological materials on topics and forms of classes in higher education programs.	Knows fundamentals of natural science disciplines in the field of molecular and cell biology Can develop methodological materials on topics and forms of classes on higher education programs Owns skills in the development of methodological materials on topics and forms of classes in higher education programs
PC-8.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on higher education programs.	Knows methodological developments and regulatory requirements in the field of molecular and cell biology Can to form educational and thematic material on higher education programs in the field of molecular and cellular biology Owns skills of formation in accordance with methodological developments and regulatory requirements of educational and thematic material on higher education programs
PP-8.3 Conducts lectures, seminars, practical and laboratory classes on higher education programs.	Knows fundamentals of pedagogical activity Can find the necessary literature for conducting lecture, seminar and practical classes; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies Owns necessary competencies for conducting lecture, seminar and practical classes
PP-9.1 Develops training materials on topics and formats of classes in oral, written and graphic forms for various participants.	Knows training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students in the field of molecular and cell biology Can develop training materials on the topics and formats of the lessons in oral, written and graphic forms for various contingents of participants Owns skills in developing training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students
PP-9.2 Presents training material in oral, written and graphic form to various participants	Knows ways of presenting educational material in oral, written and graphic forms for different contingents of students Can to present educational material in oral, written and graphic forms for different contingents of trainees Owns

	skills and methods of presenting educational material in oral, written and graphic forms for various contingents of students
PK-10.1 Plans classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.	Knows Fundamentals of Research Management Can plan classes in general education organizations, as well as in educational organizations of higher education Owns skills in planning classes in general education organizations, as well as in educational organizations of higher education and management of research activities of students
PC-10.2 Organizes classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.	Knows fundamentals of organization and management of research activities Can organize classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students Owns skills in organizing classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students
PK-10.3 Teaches in general education organizations, as well as in educational organizations of higher education and directs the research activities of students.	Knows fundamentals of pedagogical activity Can conduct classes in general education organizations, as well as in educational organizations of higher education and manage the research activities of students Owns pedagogical teaching skills in general education organizations, as well as in educational organizations of higher education
PK-11.1 Uses in pedagogical activities knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country.	Knows about Far Eastern scientists who have contributed to the research and development potential of the country Can to use in pedagogical activities knowledge about the history of the development of marine biology in the Far East Owns skills in the application of knowledge in pedagogical activities of knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country
PP-12.1 Develops methodological materials on topics and forms of classes on vocational education programs for various contingents of students	Knows fundamentals of natural science disciplines in the field of molecular and cell biology Can to develop methodological materials on the topics and forms of classes on higher education programs for various contingents of students Owns skills in developing methodological materials on topics and forms of classes on higher education programs for various contingents of students
PC-12.2 Forms in accordance with methodological developments and	Knows

<p>regulatory requirements educational and thematic material on vocational education programs for various contingents of students</p>	<p>methodological developments and regulatory requirements in the pedagogical and research field Can to form educational and thematic material on vocational education programs for various contingents of students Owns skills in using the formed educational and thematic material on vocational education programs for various contingents of students</p>
<p>PP-12.3 Conducts lectures, seminars, practical and laboratory classes on vocational education programs for various contingents of students</p>	<p>Knows fundamentals of pedagogical activity Can find the necessary literature for conducting lecture, seminar and practical classes for various contingents of students; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies Owns necessary competencies for conducting lecture, seminar and practical classes for various contingents of students</p>
<p>PP-13.1 Plans classes in vocational training and continuing professional education using the knowledge and methodology of vocational training.</p>	<p>Knows Methodology for training in biology Can plan classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training Owns skills in planning classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training</p>
<p>PP-13.2 Organizes classes in the field of vocational training and further vocational education, using a methodology in accordance with vocational training.</p>	<p>Knows methodology and methods of teaching natural science disciplines Can organize classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training Owns skills in organizing classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training</p>
<p>PP-13.3 Conducts training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training.</p>	<p>Knows principles and methods of teaching Can conduct training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training Owns skills in conducting training sessions in the field of vocational training and additional vocational education, using knowledge and methodology in accordance with vocational training</p>
<p>PP-13.4 Plans research activities of students in the field of professional interests using knowledge of scientific design and research methodology.</p>	<p>Knows fundamentals of scientific design and research methodology Can plan research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns</p>

	skills in planning and implementing research activities of students in the field of professional interests using knowledge of scientific design and research methodology
PP-13.5 Organizes research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows fundamentals of scientific design and research methodology Can to organize research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in organizing research activities of students in the field of professional interests using knowledge of scientific design and research methodology
PP-13.6 Supervises the research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows research activities of students in the field of cell biology Can to manage the research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in managing the research activities of students in the field of professional interests using knowledge of scientific design and research methodology

1. Labor intensity of discipline and types of training sessions in the discipline

The total labor intensity of the discipline is 3 credited units (108 academic hours), (1 credit unit corresponds to 36 academic hours).

Types of training sessions and work of the student in the discipline are:

Designation	Types of training sessions and work of the student
Ave	Practical exercises
Pr electr.	
WED:	Independent work of the student during the period of theoretical training
including control	Independent work of the student and contact work of the student with the teacher during the period of intermediate certification

Structure of the discipline:

The form of training is full-time.

№	Name of the section Discipline	Se me ster	Number of hours by types of training sessions and work of the student						Intermediate attestation forms
			Lek	Lab	Av e	OK	WE D	Cont rol	
1.	Session 1-2	1	-	-	3	-	9	6	Exam Questions

2.	Session 3		-	-	3	-	9	6	
3.	Session 4		-	-	3	-	9	6	
4.	Session 5-6		-	-	3	-	9	6	
5.	Session 7-8		-	-	3	-	9	6	
6.	Session 9		-	-	3	-	9	6	
	Total:	1	-	-	18	-	54	36	Exam

THE STRUCTURE AND CONTENT OF THE THEORETICAL PART OF THE COURSE

Lecture classes are not provided for in the curriculum.

IV. STRUCTURE AND CONTENT OF THE PRACTICAL PART OF THE COURSE AND INDEPENDENT WORK

Practical training of 18 hours.

Session 1. Basics of Didactics.

Questions to the topic. Define the terms.

1. Didactics
2. History of didactics.
3. Object and subject of didactics.
4. Tasks of didactics.
5. Training.
6. Education.
7. Teaching.
8. Knowledge.
9. Skills.
10. Skills.
11. Purpose.

12. Contents.
13. Organization.
14. Form.
15. Method.
16. Tool.
17. Results.
18. Objectivity of thinking and attitude to actions.

Session 2. Modern ideas about the subject and tasks of teaching natural science.

Related Questions

1. Object of study.
2. Natural science.
3. Nature.
4. The purpose of the natural sciences.
5. Tasks of the methodology of teaching natural science.
6. Connection of the methodology of teaching natural science with other sciences.
7. Methods of research of the methodology of teaching natural science.
8. The history of the development of the domestic methodology of teaching natural science.

Session 3. Modern programs in natural history and ecology, as a prototype basis for the methodology of teaching natural science.

Related Questions

1. The system of educational programs "Green House" by A.A. Pleshakov.
2. Program on natural science of N.Y. Dmitrieva and I.P. Tovpinets (according to the system of L.V. Zankov).
- 3.Environment Program.
 - a) Z.A. Klepinin "Nature and People";
N.F. Vinogradova, G.G. Ivchenkova, I.V. Potapov "Surrounding World";
N.Y. Dmitrieva, I.P. Tovpinets, A.V. Kozakova "Natural Science", "Geography" according to the method of L.V. Zonkov;
E.V. Chudinova, E.N. Bukvareva "Natural Science" according to the method of D.B. Elkonina – V.V. Davydova.
- 4.Films of environmental topics recommended for viewing.
5. Literature on environmental topics.
6. The difference in the teaching of natural science in higher education.
7. Features of the goals and objectives of medical ecology, hygiene, sanitation, science of adaptation of biosystems.

8. The relationship between structure and function as a basic feature of teaching natural science.

9. Negentropy of living systems

Lesson 4: Formation and development of natural and ecological ideas and concepts.

Questions to the topic.

1. Objects and phenomena of the surrounding world.

2. Presentation.

3. Judgment.

4. Inference.

5. Content of natural and ecological concepts.

6. Types of concepts.

7. Concretization of the scope of finding concepts.

8. Encyclopedia.

9. Glossaries.

Session 5. Perceptron as a cybernetic model for teaching students the basics of physiological and morphological sciences.

Related Questions

1. Pattern recognition.

2. Sign space.

3. Mahalanobis distance.

4. Linear separator.

5. Mathematical apparatus of pattern recognition.

6. Neural networks are their types.

7. Stochastic neural networks and perceptron.

8. Perceptron structure.

9. Fundamentals of mathematical morphology.

10. Physical meaning of differential equations.

11. Parallelogram rule.

12. Binary drawing

Session 6. Elements of educational psychology.

Questions to the topic.

1. Psychology of learning.

2. Methods and subject of educational psychology.

3. Intelligence.

4. Memory.

5. Attention.

6. Temperaments and character.

7. Creativity.

8. Psychological barrier.
9. Diagnostics of intelligence by drawing test.
10. Cognitive illusions.
11. Gestalt psychology of visual perception.
12. Anatomical drawing.
13. Medical morphometry.
14. Anthropometry.
15. Drawing of geometric shapes.
13. Medical morphometry as a training facility.
14. Anthropometry as a teaching facility.
15. Drawing of geometric shapes.
16. 3-D graphics in biology as an instructional setting.

Session 7. Material base of lessons on cell biology, cytology, histology.

Related Questions

1. Classroom.
2. Means of teaching natural science and cell biology, cytology, histology: verbal, visual, auxiliary.
3. Forms of work with multimedia educational material.
4. Scientific and educational equipment and facilities.
5. Features of work with harmful factors of production.
6. Safety precautions.

Session 8. Methods and methodical methods of teaching natural science in primary school.

Related Questions

1. Plan of the educational lecture.
2. Lesson plan.
3. Plan for the implementation of practical work.
4. General outline of the abstract.
5. General project plan.
6. Tests.
7. Educational games in the form of drawings.

Session 9. Methods and methodical methods of teaching cell biology, cytology, histology.

Related Questions

1. Preparation for the lesson.
2. Planning a training experiment.
3. Projection equipment and demonstration experiment.
4. Verification and control measures.
5. The device of the microscope and the rules of work on it.

6. Album and sketch rules.
7. Microscopic preparations.
8. Structural-logical scheme. Reference scheme of the structure of the body.
9. Anatomical nomenclature.
10. Medical and biological terms.
11. Universal decimal code-UDC.
12. Normative acts of Russia and the international community on cell biology, cytology, histology.
13. Testing based on pictures.
14. Testing based on glossaries. The basis of object thinking.
15. Trinocular.
16. Microphotography.
17. Abbe device
18. Leading experts in cell biology, cytology, histology of the Russian Far East.

Independent work

Sample abstract topics

1. Terminological wordpъ – biology in terms.
2. The terminological wordr is about the dreams of didactics.
3. Terminological wordpъ – anatomic nomenclature.
4. Terminological wordpъ – and stories of anatomical drawing.
5. Terminological wordpъ – medicine morphometry.
6. Terminological wordpъ – functional morphology of the cardiovascular system.
7. Terminological wordpъ – Gestalt psychology.
8. Hemholtz-Cognitive Illusions.

V. EDUCATIONAL AND METHODOLOGICAL SUPPORT OF INDEPENDENT WORK OF STUDENTS

Recommendations for independent work of students

The purpose of the independent work of the student is to work meaningfully and independently first with educational material, then with scientific information, to lay the foundations of self-organization and self-education in order to instill the ability to further continuously improve their professional qualifications.

The process of organizing the independent work of the student includes the following stages:

- preparatory (setting goals, drawing up a program, preparing methodological support, preparing equipment);
- basic (implementation of the program, the use of methods of information retrieval, assimilation, processing, application, transfer of knowledge, fixation of results, self-organization of the work process);
- final (assessment of the significance and analysis of the results, their systematization, assessment of the effectiveness of the program and methods of work, conclusions on the directions of labor optimization).

In the process of independent work, the student acquires the skills of self-organization, self-control, self-government, self-reflection and becomes an active independent subject of educational activity. Independent work of students should have an important impact on the formation of the personality of the future specialist, it is planned by the student independently. Each student independently determines the mode of his work and the measure of work spent on mastering the educational content in each discipline. He performs extracurricular work according to a personal individual plan, depending on his preparation, time and other conditions.

Methodical recommendations for independent work of students

As the material on the subject of the discipline is mastered, it is planned to perform independent work of students on the collection and processing of literary material to expand the field of knowledge in the discipline under study, which allows you to deepen and consolidate specific practical knowledge gained in classroom classes. To study and fully master the program material on the discipline, educational, reference and other literature recommended by this program, as well as specialized periodicals, are used.

When independently preparing for classes, students take notes on the material, independently study the issues on the topics covered, using the educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks.

Independent work consists of such types of work as the study of material on textbooks, reference books, videos and presentations, as well as other reliable sources of information; preparation for the zechet. To consolidate the material, it is enough, flipping through the notes or reading it, mentally restore the material. If necessary, refer to the recommended educational and reference literature, write down incomprehensible moments in the questions to understand them in the upcoming lesson.

Preparation for practical exercises. This type of independent work consists of several stages:

1) Repetition of the studied material. For this purpose, lecture notes, recommended basic and additional literature are used;

2) Deepening knowledge on the proposed topics. It is necessary to differentiate the available material in lectures, textbooks in accordance with the points of the plan of the practical lesson. Separately write out unclear questions, terms. It is better to do this in the margins of the lecture notes or textbook. Clarification should be carried out with the help of reference literature (dictionaries, encyclopedic publications, etc.);

3) Drawing up a detailed plan for the speech, or conducting calculations, solving problems, exercises, etc. In preparation for practical exercises, students take notes on the material, prepare answers to the above questions on the topics of practical exercises. In addition to the practical material, students independently study questions on the proposed topics, using educational literature from the proposed list, periodicals, scientific and methodological information, databases of information networks (Internet, etc.).

Requirements for the presentation and design of the results of independent work

There are no special requirements for the provision and design of the results of this independent work.

Control over the implementation of the plan of independent work of students is carried out by the teacher in practical classes by interviewing and by including in the final tasks specified in the lesson from the plan of independent work.

VI. MONITORING THE ACHIEVEMENT OF COURSE OBJECTIVES

No p/n	Supervised sections / topics of the discipline	Achievement indicator code and name	Learning outcomes	Assessment tools	
				current control	Intermediate -accurate certification
	Session 1-2	PP-8.1 Develops methodological materials on topics and forms of classes in higher education programs.	Knows fundamentals of natural science disciplines in the field of molecular and cell biology Can develop methodological materials on topics and forms of classes on higher education programs Owns skills in the development of methodological materials on topics and forms of classes in higher education programs	Poll	Exam Questions
		PC-8.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on higher education programs.	Knows methodological developments and regulatory requirements in the field of molecular and cell biology Can to form educational and thematic material on higher education programs in the field of molecular and cellular biology Owns skills in the formation in accordance with methodological developments and regulatory requirements of the educational and thematic material on higher education programs		

		PP-8.3 Conducts lectures, seminars, practical and laboratory classes on higher education programs.	<p>Knows fundamentals of pedagogical activity</p> <p>Can find the necessary literature for conducting lecture, seminar and practical classes; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies</p> <p>Owns necessary competencies for conducting lecture, seminar and practical classes</p>		
Session 3	PP-9.1 Develops training materials on topics and formats of classes in oral, written and graphic forms for various participants.	<p>Knows training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students in the field of molecular and cell biology</p> <p>Can develop training materials on the topics and formats of the lessons in oral, written and graphic forms for various contingents of participants</p> <p>Owns skills in developing training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students</p>	Poll	Exam Questions	
	PP-9.2 Presents training material in oral, written and graphic form to various participants	<p>Knows ways of presenting educational material in oral, written and graphic forms for different contingents of students</p> <p>Can to present educational material in oral, written and graphic forms for different contingents of trainees</p> <p>Owns skills and methods of presenting educational material in oral, written and graphic forms for various contingents of students</p>			

Session 4	PK-10.1 Plans classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.	Knows Fundamentals of Research Management Can plan classes in general education organizations, as well as in educational organizations of higher education Owns skills in planning classes in general education organizations, as well as in educational organizations of higher education and management of research activities of students	Test	Exam Questions
	PC-10.2 Organizes classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.	Knows fundamentals of organization and management of research activities Can organize classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students Owns skills in organizing classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students		
	PK-10.3 Teaches in general education organizations, as well as in educational organizations of higher education and directs the research activities of students.	Knows fundamentals of pedagogical activity Can conduct classes in general education organizations, as well as in educational organizations of higher education and manage the research activities of students Owns pedagogical teaching skills in general education organizations, as well as in educational organizations of higher education		

	Session 5-6	PK-11.1 Uses in pedagogical activities knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country.	<p>Knows about Far Eastern scientists who have contributed to the research and development potential of the country</p> <p>Can to use in pedagogical activities knowledge about the history of the development of marine biology in the Far East</p> <p>Owns skills in the application of knowledge in pedagogical activities of knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country</p>	Test	Exam Questions20
	Session 7-8	PP-12.1 Develops methodological materials on topics and forms of classes on vocational education programs for various contingents of students	<p>Knows fundamentals of natural science disciplines in the field of molecular and cell biology</p> <p>Can to develop methodological materials on the topics and forms of classes on higher education programs for various contingents of students</p> <p>Owns skills in developing methodological materials on topics and forms of classes on higher education programs for various contingents of students</p>	Poll	Exam Questions
		PC-12.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on vocational education programs for	<p>Knows methodological developments and regulatory requirements in the pedagogical and research field</p> <p>Can to form educational and thematic material on vocational education programs for various contingents of students</p> <p>Owns</p>		

		various contingents of students	skills in using the formed educational and thematic material on vocational education programs for various contingents of students		
		PP-12.3 Conducts lectures, seminars, practical and laboratory classes on vocational education programs for various contingents of students	Knows fundamentals of pedagogical activity Can find the necessary literature for conducting lecture, seminar and practical classes for various contingents of listeners; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies Owns necessary competencies for conducting lecture, seminar and practical classes for various contingents of students		
	Session 9	PP-13.1 Plans classes in vocational training and continuing professional education using the knowledge and methodology of vocational training.	Knows Methodology for training in biology Can plan classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training Owns skills in planning classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training	Test	Exam Questions
		PP-13.2 Organizes classes in the field of vocational training and further vocational education, using a methodology in accordance with vocational training.	Knows methodology and methods of teaching natural science disciplines Can organize classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training Owns		

			skills in organizing classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training		
		PP-13.3 Conducts training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training.	Knows principles and methods of teaching Can conduct training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training Owns skills in conducting training sessions in the field of vocational training and additional vocational education, using knowledge and methodology in accordance with vocational training		
		PP-13.4 Plans research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows fundamentals of scientific design and research methodology Can plan research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in planning and implementing research activities of students in the field of professional interests using knowledge of scientific design and research methodology		
		PP-13.5 Organizes research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows fundamentals of scientific design and research methodology Can		

			<p>to organize research activities of students in the field of professional interests using knowledge of scientific design and research methodology</p> <p>Owns skills in organizing research activities of students in the field of professional interests using knowledge of scientific design and research methodology</p>		
		<p>PP-13.6 Supervises the research activities of students in the field of professional interests using knowledge of scientific design and research methodology.</p>	<p>Knows research activities of students in the field of cell biology</p> <p>Can to manage the research activities of students in the field of professional interests using knowledge of scientific design and research methodology</p> <p>Owns skills in managing the research activities of students in the field of professional interests using knowledge of scientific design and research methodology</p>		

VII. LIST OF REFERENCES AND INFORMATION AND METHODOLOGICAL SUPPORT OF THE DISCIPLINE

Main literature

1. Khodusov, A. N. Methodology of professional education : uchebnoe posobie / A.N. Khodusov. — Moscow : INFRA-M, 2020. — 351 p. + Add. materialy [Elektronnyi resurs]. — (Higher education: Magistracy). — DOI 10.12737/textbook_5d541d1d3494f5.67018551. - ISBN 978-5-16-014406-1. - Text : electronic. - URL: <https://znanium.com/catalog/product/980302>
2. Boush, G. D. Methodology of scientific research (in kursovykh i vychalnykh qualificationnykh raboty) : uchebnik / G.D. Boush, V.I. Razumov. — Moscow : INFRA-M, 2022. — 210 p. — (Higher education: Bachelor's degree). — DOI 10.12737/textbook_5c4efe94f12440.58691332. - ISBN 978-5-16-014583-9. - Text : electronic. - URL: <https://znanium.com/catalog/product/1815958>
3. Methodology of pedagogy: monograph / E.A. Alexandrova, R.M. Asadullin, E.V. Berezhnova [et al.] ; ed. by V.G. Ryndak. — Moscow : INFRA-M, 2022. — 296 p. — (Scientific thought). — DOI 10.12737/monography_594a85bac8dd55.84618831. - ISBN 978-5-16-012947-1. - Text : electronic. - URL: <https://znanium.com/catalog/product/1761680>
4. Ilyina, O. N. Methodology of project management: stanovlenie, sovremennoe sodom i razvitiya : monografiya / O. N. Ilyina. — Moscow : Vuzovskii uchebnik : INFRA-M, 2019. — 208 p. — (Scientific book). - ISBN 978-5-9558-0400-2. - Text : electronic. - URL: <https://znanium.com/catalog/product/1018367>
5. Teremov, A. V. Methodology of research activities in education : uchebnoe posobie / A. V. Teremov. - Moscow : MPG U, 2018. - 112 p. - ISBN 978-5-4263-0647-9. - Text : electronic. - URL: <https://znanium.com/catalog/product/1316730>
6. Kargin, N. N. Methodology of scientific research : textbook / N.N. Kargin, S.I. Izaak. — Moscow : INFRA-M, 2023. — 259 p. — (Higher education: Magistracy). — DOI 10.12737/1882577. - ISBN 978-5-16-017831-8. - Text : electronic. - URL: <https://znanium.com/catalog/product/1882577>
7. Rabinovich, E. V. Komodologiya nauchnykh issledovaniya : uchebnoe posobie / E. V. Rabinovich. - Novosibirsk : Izd-vo NSTU, 2021. - 100 p. - ISBN 978-5-7782-4345-3. - Text : electronic. - URL: <https://znanium.com/catalog/product/1869476>
8. Afanasyev, V. V. Methodology and methods of scientific research : a textbook for universities / V. V. Afanasyev, O. V. Gribkova, L. I. Ukolova. — Moscow : Izdatelstvo Yurait, 2023. — 154 p. — (Higher education). — ISBN 978-

5-534-02890-4. — Text : electronic // Educational platform Yurait [site]. — URL: <https://urait.ru/bcode/514435>

9. Dreshchinsky, V. A. Methodology of scientific research : a textbook for universities / V. A. Dreshchinsky. — 2-e ed., pererab. i dop. — Moscow : Izdatelstvo Yurait, 2023. — 274 p. — (Higher education). — ISBN 978-5-534-07187-0. — Text : electronic // Educational platform Yurait [site]. — URL: <https://urait.ru/bcode/514505>

10. Ivanov, E. V. History and methodology of pedagogy and education : a textbook for universities / E. V. Ivanov. — 2nd ed., ispr. — Moscow : Izdatelstvo Yurait, 2023. — 173 p. — (Higher education). — ISBN 978-5-534-07233-4. — Text : electronic // Educational platform Yurait [site]. — URL: <https://urait.ru/bcode/514963>

Further reading

1. Logic and methodology of science. Part 1 : textbook / T. V. Filatov, G. M. Ippolitov, A. E. Lazar, N. V. Zaitseva ; edited by T. V. Filatov. — Samara : Povolzhskii gosudarstvennyi universitet telecommunications i informaticsii, 2015. — 339 p. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/73831.html>

2. Philosophy and methodology of science : uchebnoe posobie / compilers A. M. Erokhin [i dr.]. — Stavropol : Severo-Kavkazskii federal'nyi universitet, 2017. — 260 p. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/75609.html>

3. Philosophy and Methodology of Science : Textbook / C. S. Kirvel, A. I. Zelenkov, V. V. Anokhina [et al.] ; edited by C. S. Kirvel. — Minsk : Vysheisha shkola, 2018. — 569 c. — ISBN 978-985-06-3028-5. — Text : electronic // Digital educational resource IPR SMART : [site]. — URL: <https://www.iprbookshop.ru/90719.html>

4. Klimantova, G. I. Methodology and methods of sociological research : textbook for bachelors / G. I. Klimantova, E. M. Chernyak, A. A. Shchegortsov. - 2nd ed., ster. — Moscow : Publishing and Trading Corporation "Dashkov and Co.", 2019. - 256 p. - ISBN 978-5-394-03248-6. - Text : electronic. - URL: <https://znanium.com/catalog/product/1091826>

5. Sosnin, E. A. Methodology of experimentation : uchebnoe posobie / E. A. Sosnin, B. N. Poizner. — 2nd ed., ispr. — Moscow : INFRA-M, 2019. — 162 p. — (Higher education: Magistracy). - ISBN 978-5-16-012591-6. - Text : electronic. - URL: <https://znanium.com/catalog/product/978087>

6. Koldaev, V. D. Methodology and practice of scientific and pedagogical activity: Uchebnoe posobie / Koldaev V.D. - Moscow : ID FORUM, SIC INFRA-

M, 2016. - 400 p. (Higher Education) ISBN 978-5-8199-0650-7. - Text : electronic.
- URL: <https://znanium.com/catalog/product/542667>

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

1. <http://elibrary.ru/> - scientific electronic library
2. <http://molbiol.ru/> is an information resource on molecular biology
3. <http://macroevolution.narod.ru/> is an electronic resource on evolutionary biology.
4. <http://science.km.ru/>- electronic resource on different sections of biology
5. <http://elementy.ru/> is an information and cognitive resource dedicated to the natural sciences.
6. <http://www.iprbookshop.ru/> is an electronic library system IPRbooks.
7. <http://znanium.com/> - EBS "Znanium".
8. <https://nplus1.ru/> - N+1, a popular science online publication on science, engineering and technology
9. <http://antropogenez.ru/> - popular science information resource about human evolution
10. <http://web.a.ebscohost.com/ehost/search/basic?sid=851485f8-6200-4b3e-aaab-df4ba7be3576@sessionmgr4008&vid=1&tid=2003EB> is a collection of books on various sections from the EBSCOhost database.
11. <http://rosalind.info/problems/locations/>- resource for self-study of bioinformatics Rosalind.
12. <http://www.ncbi.nlm.nih.gov/>- website of the National Center for Biotechnology Information NCBI.
13. <http://www.mendeley.com/>- *Mendeley*: Free reference manager and PDF organizer; bibliothecar program.
14. <http://www.ebi.ac.uk/>- website of the European Bioinformatics Institute
15. <http://www.scopus.com> – Bibliographic database and Scopus citation index
16. <http://thomsonreuters.com/thomson-reuters-web-of-science/> bibliographic database and Web of Science citation index

List of information technologies and software

1. Microsoft Office Professional Plus 2013 is an office suite that includes software for working with various types of documents (texts, spreadsheets, databases, etc.);

2. 7Zip 16.04 - free file archiver with a high degree of data compression;
3. Adobe Acrobat XI Pro – a software package for creating and viewing electronic publications in PDF format;
4. AutoCAD Electrical 2015 - three-dimensional computer-aided design and drafting system;
5. ESET Endpoint Security 5 is a comprehensive protection for Windows-based workstations. Virtualization support + new technologies;
6. WinDjView 2.0.2 - a software to recognize and view files with the same format DJV and DjVu; SolidWorks 2016 - CAD software package for automation of industrial enterprise operations at the stages of design and technological preparation of production
7. Compass-3D LT V12 - three-dimensional modeling system
8. Notepad++ 6.68 – text editor

VIII.METHODICAL INSTRUCTIONS FOR MASTERING THE DISCIPLINE

Lecture

The lecture- is the main active form of conducting classroom classes, explaining the fundamental and most difficult theoretical sections of molecular biology and the theory of genetic engineering, which involves intensive mental activity of the student and is especially important for mastering the subject. The lecture should always be cognitive, developmental, educational and organizing in nature. Lecture notes help to assimilate the theoretical material of the discipline. When listening to the lecture, it is necessary to take notes – main information, preferably in your own wording, which allows you to better remember the material. The abstract is useful when it is written by the student independently.

In a lecture, the teacher gives only a small fraction of the material on certain topics that are presented in the textbooks. In addition, the teacher informs students about what additional information can be obtained on the topics discussed, and from what sources. Therefore, when working with lecture notes, it is always necessary to use the main textbooks, additional literature and other recommended sources on this discipline. It is such a serious work of the student with the lecture material that allows him to achieve success in mastering new knowledge.

To present a lecture course in the discipline "Neurobiology", the following are used as forms of active learning: lecture-conversation, lecture-visualization, which are based on the knowledge gained by students in the framework of the subjects preceding the course. To illustrate verbal information, electronic presentations, tables, video files, diagrams on the board are used. In the course of the presentation

of the lecture material, problematic questions or questions with elements of discussion are posed.

Lecture – visualization

The lecture is accompanied by the display of tables, electronic presentations, video files - such a combination of methods of presenting information greatly simplifies its development by students. Verbal presentation of the material should be accompanied and combined with the visual form. Information presented in the form of diagrams on the board, tables, slides, allows you to form problematic issues, and contribute to the development of professional thinking of future specialists.

Lecture - conversation

Lecture-conversation, "dialogue with the audience", is the most common form of active learning and allows you to involve students in the educational process, as there is a direct contact of the teacher with the audience. Such contact is achieved during the lecture, when students are asked questions of a problematic or informational nature or when they are invited to ask the teacher questions themselves. Questions are offered to the entire audience, and any of the students can offer their answer; another can complement it. During the educational process, this allows you to identify the most active students and activate those who do not participate in the work. This form of lecture allows you to involve students in the work process, attract their attention, stimulate thinking, gain collective experience, learn how to form questions. The advantage of the lecture-conversation is that it allows you to attract the attention of students to the most important issues of the topic, determine the content and pace of presentation of the educational material, as well as determine the topics of interest to students, with the aim of possibly adjusting the form of the material taught.

Labs

They are used for conducting experiments, observations of phenomena, processes mainly in the conditions of special laboratories, offices and with the use of technical means. This method stimulates the activity of actions both at the stage of preparation for research and in the process of its implementation. Laboratory work improves the quality of learning, contributes to the development of cognitive activity in students, their logical thinking and creative independence. In the process of performing laboratory work, theoretical knowledge is deepened and concretized, the ability to apply them in practice is developed. Skills in working with microscopes, tables and atlases are acquired. The student learns to analyze the data obtained, identify the norm and deviation from it, acquires the skills of working with a living object and physiological measuring devices, performing operations, conducting a comparative analysis, summarizing the material obtained and drawing conclusions. All this allows us to better understand the mechanisms of functioning

of a living organism and the principles of its interaction with the environment. Research skills and professional competencies are formed.

Traditionally, laboratory classes are the main type of training sessions aimed at experimental confirmation of theoretical positions. In the process of laboratory classes, students perform one or more laboratory work (tasks) under the guidance of a teacher in accordance with the studied content of the educational material. Students perform laboratory work is aimed at:

- generalization, systematization, deepening of theoretical knowledge on specific topics of the academic discipline;
- formation of skills to accept the acquired knowledge in practical activities;
- development of analytical, design, constructive skills;
- development of independence, responsibility and creative initiative.

Necessary structural elements of the laboratory lesson:

- instruction conducted by the teacher;
- independent activity of students;
- discussion of the results of the laboratory work (task).

Before performing a laboratory task (work), students' knowledge is tested - their theoretical readiness to perform the task.

Laboratory task (work) can be reproductive, partially search and search in nature.

Works of a **reproductive** nature are distinguished by the fact that when conducting them, students use detailed instructions, which indicate: the purpose of the work, explanations (theory, main characteristics), equipment, materials and their characteristics, the order of work, tables, conclusions (without wording), control questions, educational and special literature.

The works, which are **of a partial-exploratory** nature, differ in that when conducting students do not use detailed instructions, they are not given the order of performing the necessary actions, students are required to independently select equipment, choose ways to perform work, instructional and reference literature.

Works of a **exploratory** nature are distinguished by the fact that students must solve a new problem for them, relying on their theoretical knowledge.

The forms of organization of students for conducting a laboratory lesson - frontal, group and individual - is determined by the teacher, based on the topic, purpose, order of work. With the frontal form of organization of classes, all students perform the same work. In the group form of organizing classes, the same work is performed in teams of 2-5 people. With an individual form of organization of classes, each student performs an individual task.

The results of the laboratory task (work) are drawn up by students in the form of a report, grades for the implementation of the laboratory task (work) are indicators of the current performance of students in the academic discipline.

Research skills and professional competencies are formed.

IX. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE

Training sessions on the discipline are held in rooms equipped with appropriate equipment and software.

The list of material and technical and software of the discipline is given in the table.

Logistics and Software Discipline

Name of special premises and premises for independent work	Equipment special premises and rooms for independent work	List of licensed software. Details of the supporting document
690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 605	Multimedia audience: 236*147 cm Trim Screen Line; DLP Projector, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; Specialized Equipment Mount Subsystem CORSA-2007 Tuarex; Video Switching Subsystem: DVI DXP 44 DVI Protron Matrix Switch DVI 201 Tx/Rx Extron Twisted Pair Extension Cable; Audio Switching and Sound Amplification Subsystem; SI 3CT LP Extron Ceiling Mount Speaker; DMP 44 LC Extron Digital Audio Processor; Extension for IPL T CR Control Controller 48; Wireless LANs for trainees are provided with a system based on 802.11a/b/g/n 2x2 MIMO(2SS) access points. HP All-in-One 400 All-in-One 19.5 (1600x900), Core i3-4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, WT, usb kbd/mse, Win7Pro (64-bit)+Win8.1Pro(64-bit), 1-1-1 Wty	-

<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 422</p>	<p>Multimedia audience: Monoblock HP ProOne 400 G1 AiO 19.5" Intel Core i3-4130T 4GB DDR3-1600 SODIMM (1x4GB)500GB; Projection screen Projecta Elpro Electrol, 300x173 cm; Multimedia projector, Mitsubishi FD630U, 4000 ANSI Lumen, 1920x1080; Mortise interface with TLS TAM 201 Stan automatic cable retraction system; Avervision CP355AF Visualizer; Microphone cordless radio system UHF band Sennheiser EW 122 G3 consisting of a wireless microphone and receiver; LifeSizeExpress 220-Codeonly- Non-AES video conferencing codec; Network video camera Multipix MP-HD718; Two 47" LCD panels, Full HD, LG M4716CCBA; Subsystem of audio switching and sound amplification; centralized uninterrupted power supply</p>	<p>-</p>
<p>690922, Primorsky Krai, Vladivostok, Russky Island, Saperny Peninsula, Ajax village, 10, aud. M 627</p>	<p>Light microscope Carl Zeiss GmbH Primo Star 3144014501 (13 pcs.); Light microscope with digital camera Altami BIO8 (2 pcs).</p>	<p>-</p>
<p>Computer Class of the School of Biomedicine Aud. M723, 15 workplaces</p>	<p>Screen with electric drive 236 * 147 cm Trim Screen Line; Projector DLP, 3000 ANSI Lm, WXGA 1280x800, 2000:1 EW330U Mitsubishi; Subsystem of specialized fasteners of equipment CORSA-2007 Tuarex; Video switching subsystem: DVI DXP 44 DVI Pro Extron matrix switch; DVI twisted pair extender DVI 201 Tx/Rx Extron; Subsystem of audio switching and sound amplification; acoustic system for ceiling mounting SI 3CT LP Extron; digital audio processor DMP 44 LC Extron; extension for IPL T CR48 management controller; Wireless LANs for trainees are provided with a system based on 802.11a/b/g/n 2x2 MIMO(2SS) access points. HP All-in-One 400 All-in-One 19.5 (1600x900), Core i3-</p>	<p>-</p>

	4150T, 4GB DDR3-1600 (1x4GB), 1TB HDD 7200 SATA, DVD+/-RW, GigEth, Wi-Fi, WT, usb kbd/mse, Win7Pro (64- bit)+Win8.1Pro(64-bit), 1-1-1 Wty	
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X. VALUATION FUNDS

Code and name of the competency achievement indicator	Name of the assessment indicator (the result of training in the discipline)
PP-8.1 Develops methodological materials on topics and forms of classes in higher education programs.	<p>Knows fundamentals of natural science disciplines in the field of molecular and cell biology</p> <p>Can develop methodological materials on topics and forms of classes on higher education programs</p> <p>Owns skills in the development of methodological materials on topics and forms of classes in higher education programs</p>
PC-8.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on higher education programs.	<p>Knows methodological developments and regulatory requirements in the field of molecular and cell biology</p> <p>Can to form educational and thematic material on higher education programs in the field of molecular and cellular biology</p> <p>Owns skills of formation in accordance with methodological developments and regulatory requirements of educational and thematic material on higher education programs</p>
PP-8.3 Conducts lectures, seminars, practical and laboratory classes on higher education programs.	<p>Knows fundamentals of pedagogical activity</p> <p>Can find the necessary literature for conducting lecture, seminar and practical classes; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies</p> <p>Owns necessary competencies for conducting lecture, seminar and practical classes</p>
PP-9.1 Develops training materials on topics and formats of classes in oral, written and graphic forms for various participants.	<p>Knows training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students in the field of molecular and cell biology</p> <p>Can develop training materials on the topics and formats of the lessons in oral, written and graphic forms for various contingents of participants</p> <p>Owns skills in developing training materials on topics and forms of classes in oral, written and graphic forms for various contingents of students</p>
PP-9.2 Presents training material in oral, written and graphic form to various participants	<p>Knows ways of presenting educational material in oral, written and graphic forms for different contingents of students</p> <p>Can to present educational material in oral, written and graphic forms for different contingents of trainees</p> <p>Owns skills and methods of presenting educational material in oral, written and graphic forms for various contingents of students</p>
PK-10.1 Plans classes in general education organizations, as well as in	<p>Knows Fundamentals of Research Management</p>

<p>educational organizations of higher education and the management of research activities of students.</p>	<p>Can plan classes in general education organizations, as well as in educational organizations of higher education Owns skills in planning classes in general education organizations, as well as in educational organizations of higher education and management of research activities of students</p>
<p>PC-10.2 Organizes classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students.</p>	<p>Knows fundamentals of organization and management of research activities Can organize classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students Owns skills in organizing classes in general education organizations, as well as in educational organizations of higher education and the management of research activities of students</p>
<p>PK-10.3 Teaches in general education organizations, as well as in educational organizations of higher education and directs the research activities of students.</p>	<p>Knows fundamentals of pedagogical activity Can conduct classes in general education organizations, as well as in educational organizations of higher education and manage the research activities of students Owns pedagogical teaching skills in general education organizations, as well as in educational organizations of higher education</p>
<p>PK-11.1 Uses in pedagogical activities knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country.</p>	<p>Knows about Far Eastern scientists who have contributed to the research and development potential of the country Can to use in pedagogical activities knowledge about the history of the development of marine biology in the Far East Owns skills in the application of knowledge in pedagogical activities of knowledge about the history of the development of marine biology in the Far East, the contribution of Far Eastern scientists to the research and scientific-production potential of the country</p>
<p>PP-12.1 Develops methodological materials on topics and forms of classes on vocational education programs for various contingents of students</p>	<p>Knows fundamentals of natural science disciplines in the field of molecular and cell biology Can to develop methodological materials on the topics and forms of classes on higher education programs for various contingents of students Owns skills in developing methodological materials on topics and forms of classes on higher education programs for various contingents of students</p>
<p>PC-12.2 Forms in accordance with methodological developments and regulatory requirements educational and thematic material on vocational education programs for various contingents of students</p>	<p>Knows methodological developments and regulatory requirements in the pedagogical and research field Can to form educational and thematic material on vocational education programs for various contingents of students</p>

	Owns skills in using the formed educational and thematic material on vocational education programs for various contingents of students
PP-12.3 Conducts lectures, seminars, practical and laboratory classes on vocational education programs for various contingents of students	Knows fundamentals of pedagogical activity Can find the necessary literature for conducting lecture, seminar and practical classes for various contingents of students; conduct lectures, seminars, practical and laboratory classes in an interactive form using modern technologies Owns necessary competencies for conducting lecture, seminar and practical classes for various contingents of students
PP-13.1 Plans classes in vocational training and continuing professional education using the knowledge and methodology of vocational training.	Knows Methodology for training in biology Can plan classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training Owns skills in planning classes in the field of vocational training and additional vocational education using the knowledge and methodology of vocational training
PP-13.2 Organizes classes in the field of vocational training and further vocational education, using a methodology in accordance with vocational training.	Knows methodology and methods of teaching natural science disciplines Can organize classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training Owns skills in organizing classes in the field of vocational training and additional vocational education, using the methodology in accordance with vocational training
PP-13.3 Conducts training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training.	Knows principles and methods of teaching Can conduct training sessions in the field of vocational training and further vocational education, using knowledge and methodology in accordance with vocational training Owns skills in conducting training sessions in the field of vocational training and additional vocational education, using knowledge and methodology in accordance with vocational training
PP-13.4 Plans research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows fundamentals of scientific design and research methodology Can plan research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in planning and implementing research activities of students in the field of professional interests using knowledge of scientific design and research methodology

PP-13.5 Organizes research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows fundamentals of scientific design and research methodology Can to organize research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in organizing research activities of students in the field of professional interests using knowledge of scientific design and research methodology
PP-13.6 Supervises the research activities of students in the field of professional interests using knowledge of scientific design and research methodology.	Knows research activities of students in the field of cell biology Can to manage the research activities of students in the field of professional interests using knowledge of scientific design and research methodology Owns skills in managing the research activities of students in the field of professional interests using knowledge of scientific design and research methodology

The following assessment tools are used for discipline:

1. Poll
2. Testing

Oral questioning.

Oral questioning allows you to assess the knowledge and logic of the student, the ability to use terminology, speech skills and other communication skills.

The training function is to identify details that for some reason were not sufficiently understood during the training sessions and in preparation for the test.

A survey is a means of control, organized as a special conversation of the teacher with the student on topics related to the discipline being studied, and designed to clarify the amount of knowledge of the student on a certain section, topic, problem, etc.

1. What is the subject of studying the methodology of teaching natural science?
2. Why is it included in the system of pedagogical sciences?
3. What is the object of study of natural science as a science?
4. What determines the classification of natural sciences?
5. What is the difference between science and academic subject?
6. What sciences is associated with the methodology of teaching natural science?
7. What are the methods of studying the methodology of natural science as a science?

8. What problems do the methodology face at the present stage of school development?

9. Draw a diagram showing the interdisciplinary connections of the methodology of teaching natural science.

10. Show on the example of one of the courses of morphology, what knowledge is integrated into the system "man, nature, society".

11. Define and write down the stages of conducting pedagogical research on the methodological problem you have chosen.

Testing.

Testing is the most effective and objective form of assessing knowledge, skills and abilities, which allows to identify not only the level of educational achievements, but also the structure of knowledge, the degree of its deviation from the norm. Testing involves a standardized, verified procedure for collecting and processing data, as well as their interpretation, allows you to check the knowledge of students on a wide range of issues. Testing excludes the subjectivity of the teacher, both in the process of control and in the process of assessment.

Examples of test tasks

The reasons for the continuous increase in the role of science?

(A) Due to population growth

B) Due to the inevitable decrease in the area of agricultural land and arable land per 1 person

(B) Because of the inevitable increase in human needs

D) Due to the increase in population, the inevitable decrease in the area of agricultural land and arable land per 1 person, as well as the increase in human needs*

2. What types of cognitive activities does a person use?

(A) Study and trial

B) Study, research and testing*

(B) Study

D) Study

3. What does it mean: "part of the objects of the general population included in the survey to characterize the population according to the necessary features"?

(A) Basic

B) Sampling*

C) A certain set

D) Pilot plot

4. What stages of scientific planning are distinguished during research?

- A) Planning, conducting the experiment, formulating conclusions
 - B) Planning, laying the experiment, accumulation of primary data, mathematical analysis with subsequent formulation of conclusions and proposals to production*
 - C) Conducting research, mathematical processing of the data obtained
 - D) Planning, accumulation of primary data, formulation of conclusions and proposals to production
5. What methods are intended for the accumulation of primary data on the objects of research?
- (A) Observation and analysis of variance
 - B) Experiment and variation analysis
 - B) Observation and experiment*
 - D) Variation analysis and analysis of variance
6. What is an experiment scheme?
- A) Placement of variants and repetitions in the pilot site
 - B) List of experimental and control options included in the experiment to test the hypothesis*
 - C) Drawing showing the boundaries of the experiment
 - D) List of research methods that are planned to be carried out in the experiment
7. What is the duration in time of short-term experiments?
- A) 1-3 years
 - B) 4-10 years*
 - B) 11-50 years
 - D) more than 50 years
8. What is the duration in time of many years of experiments?
- A) 1-3 years
 - B) 4-10 years
 - B) 11-50 years*
 - D) more than 50 years
9. In which experiments is the influence of several factors studied?
- (A) Perennial
 - B) Multifactorial*
 - B) Single-factor
 - D) Short-term
10. What does it mean: "a scientific assumption whose true meaning is uncertain"?
- (a) Inference
 - B) Judgment

- (B) Deduction
- D) Hypothesis*

11. What does it mean: "purposeful concentration of the researcher's attention on the phenomena of experiment or nature, their quantitative and qualitative registration"?

- (A) Experiment
- B) Observation*
- (B) Statistical analysis
- D) Experience

12. What does "reproducibility of the results of experience" mean?

(A) If the experiment is repeated under identical conditions and with similar techniques, similar results should be obtained*

B) The results of the experiment should be the same in other soil and climatic zones

C) Next year of research, the results of the experiment should be repeated

D) That even with a change in the conditions of experience and research methods, the results of the experiment must be confirmed.

13. What kind of errors leads to overestimation or underestimation of research results under the influence of certain factors (natural changes in soil fertility, etc.)?

- (A) Systematic*
- B) Rude
- B) Random
- D) Unidirectional

14. What are the names of errors that occur during miscalculations in the process of work?

- (A) Systematic
- B) Random
- B) Rough*
- D) Unidirectional

15. For what purpose are repetitions of the experiment laid?

- (A) To increase the number of data
- B) To increase the repeatability of the experiment
- B) To take into account the influence of conditions in the experience
- D) To reduce the error of the experiment*

16. What symbol is variance?

- (a) (s)
- B) S^2 *
- (B) V
- D) n

17. When the relationship between two features is investigated, is it a correlation?

- A) Simple *
- B) Multiple
- (B) Medium
- D) Intermediate

Test Evaluation Criteria

evaluation	50-60 points (unsatisfactory)	61-75 points (satisfactory)	76-85 points (good)	86-100 points (excellent)
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Methodological recommendations that determine the procedures for assessing the results of mastering the discipline

Assessment tools for intermediate attestation

Intermediate certification of students in the discipline is carried out in accordance with local fevu regulations and is mandatory. The form of reporting on the discipline is an exam.

Methodical instructions for passing the exam

The exam is taken by the leading teacher (associate professor, professor), for whom this type of educational load is assigned in an individual plan. The form of the exam is oral.

The time allowed to the student to prepare for the answer to the exam should be no more than 40 minutes. After this time, the student should be ready to respond.

The presence at the examination of unauthorized persons (except for persons carrying out the inspection) without the permission of the relevant persons (rector or vice-rector for academic affairs, director of the School, head of the OBOR or director of the department) is not allowed. Disabled persons and persons with disabilities who do not have the opportunity to move independently are allowed to take the exam with accompanying persons.

With an intermediate assessment, students are given a grade of "excellent", "good", "satisfactory" or "unsatisfactory". If the student does not appear for the exam, an entry "did not appear" is made in the statement.

Exam Questions

1. Basics of Didactics.
2. History of Didactics.
3. Object and subject of didactics.
4. Problems of didactics.
5. Teaching.
6. Education.
7. Teaching.
8. Knowledge.
9. Skills.
10. Skills.
11. Purpose.
12. Content.
13. Organization.
14. Form.
15. Method.
16. Means.
17. Outcomes.
18. Modern ideas about the subject and tasks of teaching natural science.
19. Natural science.
20. Nature.
21. The purpose of the natural sciences.
22. Tasks of the methodology of teaching natural science.
23. Connection of the methodology of teaching natural science with other sciences.
24. Methods of research of the methodology of teaching natural science.
25. The history of the development of the domestic methodology of teaching natural science.
26. Modern programs in natural history and ecology, as a prototype basis for the methodology of teaching natural science.
27. The system of educational programs "Green House" by A.A. Pleshakov.
28. Program on natural science of N.Y. Dmitrieva and I.P. Tovpinets (according to the system of L.V. Zankov).
29. Environment Programme.
Z.A. Klepinina "Nature and People";
N.F. Vinogradova, G.G. Ivchenkova, I.V. Potapov "Surrounding World";
N.Y. Dmitrieva, I.P. Tovpinets, A.V. Kozakova "Natural Science", "Geography" according to the method of L.V. Zankov;

E.V. Chudinova, E.N. Bukvareva "Natural Science" according to the method of D.B. Elkonina – V.V. Davydova.

30. Environmental films recommended for viewing.
31. Literature on environmental topics.
32. Distinction in teaching natural science in higher education.
33. Features of the goals and objectives of medical ecology, hygiene, sanitation, science of adaptation of biosystems.
34. Formation and development of natural and ecological ideas and concepts.
35. Objects and phenomena of the surrounding world.
36. Presentation.
37. Judgement.
38. Deduction.
39. Content of natural and ecological concepts.
40. Types of concepts.
41. Concretization of the scope of finding concepts.
42. Encyclopedia.
43. Glossary.
44. Perceptron as a cybernetic model for teaching students the basics of physiological and morphological sciences.
45. Pattern recognition.
46. A space of signs.
47. Distance mahalanobis.
48. Linear separator.
49. Mathematical apparatus of pattern recognition.
50. Neural networks are their kinds.
51. Stochastic neural networks and perceptron.
52. Structure of the perceptron.
53. Fundamentals of Mathematical Morphology.
54. The physical meaning of differential equations. Parallelogram rule.
55. Elements of educational psychology.
56. Psychology of learning.
57. Methods and subject of educational psychology.
58. Intelligence.
59. Memory.
60. Attention.
61. Temperaments and typologies.
62. Creation.
63. Psychological barrier.

64. Diagnosis of intelligence by the method of drawing test.
65. Cognitive illusions.
66. Gestalt psychology of visual perception.
67. Anatomical drawing.
68. Medical morphometry as a training facility.
69. Anthropometry as an attitude of learning.
70. Drawing of geometric shapes.
71. 3-D graphics in biology as an instructional setting.
72. Material base of lessons on cell biology, cytology, histology.
73. Study room.
74. Means of teaching natural science and cell biology, cytology, histology:
verbal, visual, auxiliary.
75. Forms of work with multimedia educational material.
76. Scientific and educational equipment and facilities.
77. Features of work with harmful factors of production.
78. Safety engineering.
79. Outline of the training lecture.
80. Lesson plan.
81. Implementation plan.
82. General outline of the essay.
83. Overall project plan.
84. Tests.
85. Educational games in the form of drawings.
86. Methods and methodical methods of teaching cell biology, cytology,
histology.
87. Preparation for the lesson.
88. Planning a training experiment.
89. Projection equipment and demonstration experiment.
90. Verification and control measures.
91. The device of the microscope and the rules of work on it.
92. Album and sketch rules.
93. Microscopic preparations.
94. Structural-logical scheme. Reference scheme of the structure of the body.
95. Anatomical nomenclature.
96. Biomedical terms.
97. Universal decimal code-UDC.
98. Normative acts of Russia and the international community on cell
biology, cytology, histology.
99. Testing based on figures.

100. Testing based on glossaries. The basis of object thinking.

Criteria for grading a student on the exam

Evaluation of the test	Requirements for the formed competencies
"Excellent"	The "excellent" grade is given to the student if he has deeply and firmly mastered the program material, exhaustively, consistently, clearly and logically coherently presents it, is able to closely link the 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 made, has versatile skills and techniques implementation of practical tasks on the methodology of scientific research.
"Good"	The "good" grade is given to the student if he firmly knows the material, correctly and substantively presents it, avoiding significant inaccuracies in the answer to the question, correctly applies theoretical provisions when solving practical questions and problems, possesses the necessary skills and techniques for their implementation.
"satisfactory"	The grade "satisfactory" is given to the student if he has knowledge only of the basic material, but has not mastered its details, admits inaccuracies, insufficiently correct wording, violations of the logical sequence in the presentation of the program material, has difficulties in performing practical work.
"unsatisfactory"	The grade "unsatisfactory" is given to a student who does not know a significant part of the program material, makes significant mistakes, uncertainly, with great difficulties performs practical work. As a rule, the grade "unsatisfactory" is given to students who cannot continue their studies without additional classes in the relevant discipline.