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Информация о владельце:

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Должность: Проректор по учебно-воспитательной работе

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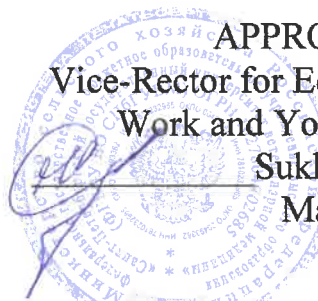
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**Ministry of Agriculture of the Russian Federation
Federal State Budgetary Educational Institution
of Higher Education**

"St. Petersburg State University of Veterinary Medicine"

**APPROVED BY
Vice-Rector for Educational
Work and Youth Policy
Sukhinin A.A.
May 6, 2024**



Department of Biology, Ecology and Histology

**EDUCATIONAL WORK PROGRAM
for the discipline
«BIOLOGY WITH BASICS OF ECOLOGY»
The level of higher education
SPECIALIST COURSE**

**Specialty 36.05.01 Veterinary Medicine
Full-time education
Education starts in 2024**

**Reviewed and accepted
at a department meeting
on May 2, 2024.
Protocol No. 10**

**Head Department of Biology, Ecology and Histology
Doctor of Veterinary Sciences, Associate Professor
M.E. Mkrtchyan**

**Saint Petersburg
2024**

1. AIMS AND OBJECTIVES OF THE DISCIPLINE.

The main goal of the discipline in training veterinarians is to develop in students a holistic view on nature, the multi-level nature on biological systems and modern ideas about the biochemical, cellular, tissue, organismic and supraorganismic levels of the structure of living beings.

To achieve this goal, it is necessary to solve the following **tasks**:

a) The general educational task is to get the students familiarized with the structure of the cell, its biochemistry and physiology, cellular relationships in tissues and organs, the structure and functioning of the body and the ecology of organisms and communities, their evolution within the framework of fundamental biological education in accordance with the requirements for higher educational institutions of biology profile.

b) The applied task is to consider issues related to structural, functional, evolutionary biology at all levels of the organization of life to create a conceptual basis for a holistic approach to biological systems and develop biological thinking skills.

c) The special task is to familiarize students with modern concepts and methodological approaches used in biology to solve problems in animal husbandry and veterinary medicine, as well as existing achievements in this area.

2. THE LIST OF THE PLANNED RESULTS OF THE DISCIPLINE (MODULE), CORRELATED WITH THE PLANNED RESULTS OF THE REALISED EDUCATIONAL PROGRAM

As a result of mastering the discipline, the student prepares for the following types of activities, in accordance with the educational standard of Federal State Educational Standard of Higher Education 36.05.01 “Veterinary Medicine”.

Area of professional activity: 13 Agriculture

Student competencies formed as a result of mastering the discipline

Studying the discipline should form the following competencies:

a) Universal competencies:

UC-1 Able to critically analyze problem situations based on a systematic approach and develop an action strategy.

UC—1.1 - Know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis.

UC--1.2 - Be able to obtain new knowledge based on analysis, synthesis, etc.; collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies.

UC--1.3 - Be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; identifying problems and using adequate methods to solve them; demonstrating value judgments in solving problematic professional situations.

UC-8 Able to create and maintain safe living conditions, including in emergency situations

UC -8.1 - Know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers.

UC -8.3 - Possess the skills to ensure safety in the “human-animal-habitat” system. Possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies.

b) General professional competencies:

GPC-2 Able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals.

GPC—2.1 - Know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body.

GPC—2.2 - Be able to use environmental factors and end laws in agricultural production; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods during environmental assessment of agro-industrial complex objects and production of agricultural products, including using digital technologies; assess the influence of anthropogenic and economic factors on the animal body.

GPC—2.3- Have an understanding of the emergence of living organisms, levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, including using digital technologies.

3. THE PLACE OF DISCIPLINE IN THE STRUCTURE OF THE MPEP

Discipline B1.O.10 "Biology with fundamentals of ecology" is a discipline in Block 1 of the mandatory part of the federal state educational standard of higher education in specialty 36.05.01 "Veterinary Medicine" (Specialist Degree).

It is mastered in the 1st semester (Full-time education).

When teaching the discipline "Biology with the basics of ecology", the knowledge and skills acquired by students in mastering the disciplines: zoology, histology, embryology, biochemistry, physiology, genetics are used. The discipline "Biology with the basics of ecology" is the basic one on which most subsequent disciplines are built, such as:

1. Veterinary genetics
2. Physiology and ethology of animals
3. Cytology, histology and embryology
4. Virology
5. Microbiology
8. Animal hygiene
9. Biological physics
10. Biological chemistry
11. Epizootology and infectious diseases

4. THE SCOPE OF DISCIPLINE AND TYPES OF ACADEMIC WORK

4.1. The scope of the discipline for full-time education

Type of educational work	Total hours	Semesters
		1
Classroom lessons (total)	36	36
Including:	-	-
Lectures, including interactive forms	18	18
Practical (PP) exercises including interactive forms	18	18
Practical training (PT)	4	4
Independent work (total)	36	36
Type of intermediate certification (test, exam)	credit	credit
Total labor input hours / credits	72/2	72/2

5. THE CONTENT OF THE DISCIPLINE AND TYPES OF CLASSES

5.1. The content of the discipline (full-time education)

№	NAME	Formed competencies	Semester	Types of educational work, including independent work of students and labor intensity (in hours)			
				L	PT	PP	IW
1.	Introduction to biology. Life as a phenomenon of the material world. Origin of life. Hierarchy of biological systems. The main properties of life.	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies.	1	2	2	4	

	GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body. GPC -2.2 - To be able to use the environmental factors and laws in agricultural production; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods during environmental assessment of agro-industrial complex objects and production of agricultural products, including using digital technologies; assess the influence of anthropogenic and economic factors on the animal body. GPC -2.3 - To have an understanding of the emergence of living organisms, levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, including using digital technologies					
2. Cellular level of life organization	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods	1	2	1	1	4

					to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies. GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body. GPC -2.2 - To be able to use the environmental factors and laws in agricultural production; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods during environmental assessment of agro-industrial complex objects and production of agricultural products, including using digital technologies; assess the influence of anthropogenic and economic factors on the animal body. GPC -2.3 - To have an understanding of the emergence of living organisms, levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic				
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		factors on living objects, including using digital technologies					
3.	Protein biosynthesis	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies. GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body.	1	2	2	1	4

	GPC -2.2 - To be able to use the environmental factors and laws in agricultural production; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods during environmental assessment of agro-industrial complex objects and production of agricultural products, including using digital technologies; assess the influence of anthropogenic and economic factors on the animal body. GPC -2.3 - To have an understanding of the emergence of living organisms, levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, including using digital technologies					
4. Respiratory exchange	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency	1	2	2	1	4

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5. The life cycle of a cell	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis,	1	2	2	1	4

	synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies. GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body. GPC -2.2 - To be able to use the environmental factors and laws in agricultural production; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods during environmental assessment of agro-industrial complex objects and production of agricultural products, including using digital technologies; assess the influence of anthropogenic and economic factors on the animal body. GPC -2.3 - To have an understanding of the emergence of living organisms, levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the				
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		laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, including using digital technologies				
6.	Molecular genetic level of life organization	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies. GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of bioecology; interspecific relationships between animals and plants, predator and prey, parasites and hosts; environmental features of certain types of pathogenic	1	2	1	4

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7. Reproduction of organisms. Ontogenesis	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers.	1	2	2	4	

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8. Evolution of the organic world	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience,	1	2	1	4

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		levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for the study of ecological knowledge of the surrounding world, the laws of development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, including using digital technologies				
9.	Organism and environment. Biosphere and human	UC-1 To be able to critically analyze problem situations based on a systematic approach and develop an action strategy UC -1.1 - To know the methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis. UC -1.2 – To be able to obtain new knowledge based on analysis, synthesis, etc.; to collect and summarize data on current scientific issues related to the professional field; search for information and solutions based on actions, experiment, experience, information and communication technologies. UC -1.3 – To be able to study the problem of professional activity using analysis, synthesis and other methods of intellectual activity, including the use of information and communication technologies; to identifying problems and using adequate methods to solve them; to demonstrating value judgments in solving problematic professional situations. UC -8 To be able to create and maintain safe living conditions, including in emergency situations UC -8.1- To know the consequences of exposure to harmful and dangerous factors on the body of animals, humans and the natural environment, methods and methods of protection from emergencies and military conflicts; basics of life safety, emergency phone numbers. UC -8.3 - To possess the skills to ensure safety in the “human-animal-habitat” system. To possess methods for predicting the occurrence of dangerous or emergency situations; skills to maintain safe living conditions, including those based on digital technologies. GPC-2 To be able to interpret and evaluate in professional activities the influence of natural, socio-economic, genetic and economic factors on the physiological state of animals GPC-2.1 - To know environmental factors, their classification and the nature of relationships with living organisms; basic ecological concepts, terms and laws of	1	2	1	4

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	TOTAL FOR 1 SEMESTER					18	14	4	36

6. THE LIST OF EDUCATIONAL AND METHODOLOGICAL SUPPORT FOR INDEPENDENT WORK OF STUDENTS

6.1. Guidelines for independent work

6.2. Literature for independent work

1. Essential cell biology / Bruce Alberts [and seven others]. Fourth edition. [Electronic resource]: textbook <https://archive.org/details/essentialcellbio0000albe> (accessed: 04/27/2024).
2. Biologiya s osnovami ehkologii [Ehlektronnyi resurs]: uchebnoe posobie / V.M. Tsarevskaya [i dr.]. — Ehlektron. dan. — Samara : , 2018. — 125 s. — Rezhim dostupa: <https://e.lanbook.com/book/109418>. (accessed: 04/27/2024).
3. Shabasheva, S.V. Biologiya s osnovami ehkologii [Ehlektronnyi resurs] : uchebnoe posobie / S.V. Shabasheva. — Ehlektron. dan. — Kemerovo: KeMGU, 2016. — 127 s. — Rezhim dostupa: <https://e.lanbook.com/book/92382> (accessed: 04/27/2024).
4. Labutina, M.V. Biologiya s osnovami ehkologii [Ehlektronnyi resurs] : uchebnoe posobie / M.V. Labutina, T.A. Maskava, N.D. Chegodaeva. — Ehlektron. dan. — Saransk : MGPI im. M.E. Evsev'eva, 2013. — 125 s. — Rezhim dostupa: <https://e.lanbook.com/book/74453> (accessed: 04/27/2024).
5. Biologiya: uchebnik v 2-kh tomakh / pod red. V.N. Yarygina. – M.: GEHOTAR-Media, 2014. T.1 – 736 s. ISBN 978-5-9704-3028-6 (obshch.) 978-5-9704-3029-3 (t.1)

7. THE LIST OF BASIC AND ADDITIONAL LITERATURE NECESSARY FOR THE DEVELOPMENT OF THE DISCIPLINE

a) basic literature:

1. Amosov P.N. Biology with basics of ecology: textbook / P.N. Amosov; Ministry of Agriculture of the Russian Federation, St. Petersburg State University of Veterinary Medicine. – St. Petersburg: Publishing house of St. Petersburg State University of Veterinary Medicine, 2022. – 130 p.

b) additional literature:

1. Pehov A.P. Biologiya s osnovami ehkologii: ucheb. dla stud. vissh. ucheb. zavedeniy / Pehov A.P. - Spb. : Lan, 2000. - 672 c.. - ISBN 5-8114-0219-8 (2 ecz.)
2. Pehov A.P. Biologiya s osnovami ehkologii / Pehov A.P. - Spb : Lan, 2001. - 672 c. - (Uchebniki dla vuzov. Specialnaya literature.). - ISBN 5-8114-0219-8 (3 ecz.)
3. Pehov A.P. Biologiya s osnovami ehkologii: uchebnik/ Pehov A.P. - 5-e izd., Stereotip. - Spb : Lan, 2005. - 688 c. - (Uchebniki dla vuzov. Specialnaya literature.). - ISBN 5-8114-0219-8 (24 ecz.)
4. Achmadullina, L.G. Biologiya s osnovami ehkologii: uchebnoe posobie / L.G. Achmadullina - Moscva: RIOR: INFRA-M, 2016. - 128 c. - ISBN 978-5-9557-0288-9 (1 ecz.)

8. THE LIST OF RESOURCES OF THE INFORMATION AND TELECOMMUNICATION NETWORK "INTERNET" NECESSARY FOR THE DEVELOPMENT OF THE DISCIPLINE

To prepare for practical classes and perform independent work, students can use the following online resources:

1. <https://meduniver.com> – Medical information site.
2. <http://vanat.cvm.umn.edu> – Animal Anatomy University of Minnesota
3. www.studmedlib.ru

Electronic library systems:

1. EBS «SPbGUV»
2. EBS «Izdatel'stvo «Lan'»
3. EBS «Konsul'tant studenta»
4. Spravochno-pravovaya sistema «Konsul'tantPlus»
5. Universitetskaya informatsionnaya sistema «ROSSIYA»
6. Polnotekstovaya baza dannykh POLPRED.COM
7. Nauchnaya ehlektronnaya biblioteka ELIBRARY.RU
8. Rossiiskaya nauchnaya Set'
9. Ehlektronno-bibliotchnaya sistema IQlib
10. Baza dannykh mezhdunarodnykh indeksov nauchnogo tsitirovaniya Web of Science
11. Full-text interdisciplinary database on agricultural and environmental sciences ProQuest AGRICULTURAL AND ENVIRONMENTAL SCIENCE DATABASE
12. Electronic books of the publishing house "Prospekt Nauki"
<http://prospektnauki.ru/ebooks/>
13. Collection "Agriculture. Veterinary medicine" publishing house "Quadro"
<http://www.iprbookshop.ru/586.html>

9. METHODOLOGICAL GUIDELINES FOR STUDENTS ON THE DEVELOPMENT OF THE DISCIPLINE

Methodological recommendations for students are a set of recommendations and explanations that allow the student to optimally organize the process of studying this discipline.

The content of methodological recommendations, as a rule, may include:

- Tips on planning and organizing the time needed to study the discipline. Description of the sequence of actions of the student, or the "scenario of studying the discipline".

Morning time is the most fruitful for academic work (from 8-14 hours), followed by afternoon time (from 16-19 hours) and evening time (from 20-24 hours). The most difficult material is recommended to be studied at the beginning of each time interval after rest. After 1.5 hours of work, a break is required (10-15 minutes), after 4 hours of work, the break should be 1 hour. Part of the scientific organization of labor is the mastery of the technique of mental labor. Normally, a student should devote about 10 hours a day to studying (6 hours at university, 4 hours at home).

Recommendations for working on lecture material

When preparing for a lecture, the student is recommended:

- 1) view the recordings of the previous lecture and restore the previously studied material in memory;
- 2) it is useful to review the upcoming material of a future lecture;
- 3) if an independent study of individual fragments of the topic of the last lecture is set, then it must be completed without delay;
- 4) psychologically tune in to the lecture.

This work includes two main stages: lecture notes and subsequent work on lecture material.

Taking notes means making a synopsis, i.e. a brief written statement of the content of something (an oral presentation - a speech, lecture, report, etc. or a written source – a document, article, book, etc.).

The methodology of work when taking notes of oral presentations differs significantly from the methodology of work when taking notes of written sources.

By taking notes of written sources, the student has the opportunity to repeatedly read the desired passage of the text, reflect on it, highlight the main thoughts of the author, briefly formulate them, and then write them down. If necessary, he can also note his attitude to this point of view. Listening to the lecture, the student should postpone most of the complex of the above-mentioned

works for another time, trying to use every minute to record the lecture, and not to comprehend it - there is no time left for this. Therefore, when taking notes of a lecture, it is recommended to separate fields on each page for subsequent entries in addition to the summary. After recording a lecture or making a summary of it, you should not leave work on the lecture material before preparing for the test. It is necessary to do as early as possible the work that accompanies taking notes of written sources and which could not be done during the recording of the lecture - read your notes, deciphering individual abbreviations, analyze the text, establish logical connections between its elements, in some cases show them graphically, highlight the main thoughts, mark issues requiring additional processing, in particular, the teacher's consultations.

When working on the text of the lecture, the student should pay special attention to the problematic issues raised by the teacher during the lecture, as well as to his assignments and recommendations.

For each lecture, practical lesson and laboratory work, the number, topic, list of issues under consideration, volume in hours and links to recommended literature are provided. For classes conducted in interactive forms, their organizational form should be indicated: computer simulation, business or role-playing game, analysis of a specific situation, etc.

- Recommendations for preparing for practical classes

Practical (seminar) classes are an important part of the professional training of students. The main purpose of conducting practical (seminar) classes is to form students' analytical, creative thinking through the acquisition of practical skills. Practical classes are also conducted in order to deepen and consolidate the knowledge gained in lectures and in the process of independent work on normative documents, educational and scientific literature. When preparing for a practical lesson for students, it is necessary to study or repeat theoretical material on a given topic.

When preparing for a practical lesson, the student is recommended to follow the following algorithm;

- 1) get acquainted with the plan of the upcoming lesson;
- 2) study the literature sources that have been recommended and familiarize yourself with the introductory notes to the relevant sections.

Methodological guidelines for practical (seminar) classes in the discipline, along with the work program and schedule of the educational process, refer to methodological documents that determine the level of organization and quality of the educational process.

The content of practical (seminar) classes is recorded in the working curricula of the disciplines in the sections "List of topics of practical (seminar) classes".

The most important component of any form of practical training is assignments. The basis of the assignment is an example that is understood from the standpoint of the theory developed in the lecture. As a rule, the main attention is paid to the formation of specific skills, which determines the content of students' activities - problem solving, laboratory work, clarification of categories and concepts of science, which are a prerequisite for correct thinking and speech.

Practical (seminar) classes perform the following tasks:

- stimulate regular study of recommended literature, as well as attentive attitude to the lecture course;
- consolidate the knowledge gained in the process of lecture training and independent work on literature;
- expand the scope of professionally significant knowledge, skills, and abilities;
- allow you to verify the correctness of previously acquired knowledge;
- instill skills of independent thinking, oral presentation;
- contribute to the free operation of terminology;
- provide the teacher with the opportunity to systematically monitor the level of independent work of students.

Methodological guidelines for practical (seminar) classes in the discipline should be focused on modern business conditions, current regulatory documents, advanced technologies, the latest achievements of science, technology and practice, modern ideas about certain phenomena, the studied reality.

- Recommendations for working with literature.

Working with literature is an important stage of the student's independent work on mastering the subject, contributing not only to the consolidation of knowledge, but also to the expansion of horizons, mental abilities, memory, the ability to think, express and confirm their hypotheses and ideas. In addition, the skills of research work necessary for further professional activity are being developed.

When starting to study the literature on the topic, it is necessary to make notes, extracts, notes. It is mandatory to take notes of the works of theorists, which allow us to comprehend the theoretical basis of the study. For the rest, you can limit yourself to extracts from the studied sources. All extracts and quotations must have the exact "return address" (author, title of the work, year of publication, page, etc.). It is advisable to write an abbreviated title of the question to which the extract or quotation refers. In addition, it is necessary to learn how to immediately compile a file of special literature. At the same time, publications of sources (articles, book titles, etc.) should be written on separate cards, which must be filled in according to the rules of bibliographic description (surname, initials of the author, title of the work. Place of publication, publisher, year of publication, number of pages, and for journal articles – the name of the journal, year of publication, page numbers). On each card, it is advisable to record the thought of the author of the book or a fact from this book on only one specific issue. If the work, even in the same paragraph or phrase, contains more judgments or facts on another issue, then they should be written out on a separate card. The presentation should be concise, accurate, without subjective assessments. On the back of the card, you can make your own notes about this book or article, its content, structure, on which sources it is written, etc.

- Explanations about working with control and test materials for the course, recommendations for completing homework.

Testing is a test that allows you to determine whether the actual behavior of the program corresponds to the expected one by performing a specially selected set of tests. A test is the fulfillment of certain conditions and actions necessary to verify the operation of the function under test or part of it. Each question in the discipline must be answered correctly by choosing one option.

10. EDUCATIONAL SOCIAL WORK

As part of the implementation of the discipline, educational work is carried out to form a modern scientific worldview and a system of basic values, the formation and development of spiritual and moral, civil and patriotic values, a system of aesthetic and ethical knowledge and values, attitudes of tolerant consciousness in society, the formation of students' need for work as the first vital necessity, the highest value and the main way to achieve to achieve success in life, to realize the social significance of your future profession.

11. THE LIST OF INFORMATION TECHNOLOGIES USED IN THE IMPLEMENTATION OF THE EDUCATIONAL PROCESS

11.1 Information technologies

For the educational process of the discipline is previewed the use of information technologies:

- ✓ conducting practical classes using multimedia;
- ✓ interactive technologies (conducting dialogues, collective discussion of various approaches to solving a particular educational and professional task);
- ✓ interaction with students via e - mail;
- ✓ EIOS SPbGUVU: <https://spbguvm.ru/academy/eios/>

11.2. Software

The list of licensed and free- distributed software, including national programs

№ п/п	The name of the technical and computer training tools recommended by sections and topics of the program	License
1	MS PowerPoint	67580828
2	LibreOffice	free software
3	OS Alt Education 8	AAO.0022.00
4	АБИС "МАРК-SQL"	02102014155
5	MS Windows 10	67580828
6	The ConsultantPlus system	503/KL
7	Android OC	free software

12. THE MATERIAL AND TECHNICAL BASE NECESSARY FOR THE IMPLEMENTATION OF THE DISCIPLINE EDUCATIONAL PROCESS

Name of the discipline (module), practice in accordance with the curriculum	The name of special rooms and rooms for independent work	Equipment of special rooms and rooms for independent work
Biology with the basics of ecology	219 (196084, St. Petersburg, Chernihiv str., 5) Classroom for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification	<i>Specialized furniture:</i> blackboard, tables, chairs. <i>Technical training facilities:</i> TV, laptop. <i>Visual aids and educational materials:</i> micro-preparations; posters on biology sections.
	223 (196084, St. Petersburg, Chernihiv str., 5) Classroom for conducting seminar-type classes, group and individual consultations, ongoing monitoring and intermediate certification	<i>Specialized furniture:</i> blackboard, tables, chairs. <i>Technical training tools:</i> Interactive whiteboard. <i>Visual aids and educational materials:</i> micro-preparations; posters on biology sections.
	206 Large reading room (196084, St. Petersburg, Chernihiv str., house 5) Room for independent work	<i>Specialized furniture:</i> tables, chairs <i>Technical means of education:</i> computers connected to the Internet and access to an electronic information and educational environment
	214 Small reading room (196084, St. Petersburg, Chernihiv str., house 5) Room for independent work	<i>Specialized furniture:</i> tables, chairs <i>Technical means of education:</i> computers connected to the Internet and access to an electronic information and educational environment
	324 Information Technology Department (196084, St. Petersburg,	<i>Specialized furniture:</i> tables, chairs, special equipment, materials and

	Chernihiv str., house 5) Room for storage and preventive maintenance of educational equipment	spare parts for preventive maintenance of technical training facilities
	Box No. 3 Carpentry workshop (196084, St. Petersburg, Chernihiv str., house 5) A room for storage and preventive maintenance of educational equipment	<i>Specialized furniture:</i> tables, chairs, special equipment, materials and spare parts for preventive maintenance of technical training facilities

Developers:

Candidate of Biological Sciences,
Associate professor

P.N. Amosov

Ministry of Agriculture of the Russian Federation
Federal State Budgetary Educational Institution
Of higher education
"St. Petersburg State University of Veterinary Medicine"

Department of Biology, Ecology, Histology

FUND OF ASSESMENT TOOLS
for the discipline

" BIOLOGY WITH THE BASICS OF ECOLOGY "

Level of higher education

SPECIALIST COURSE

Specialty 36.05.01 Veterinary Medicine

Full-time education

Education starts in 2024

Saint Petersburg
2024

1.PASSPORT OF THE APPRAISAL FUND

Table 1

№	Emerging competencies	Supervised sections (topics) of the discipline	Evaluation tool
1.	UC-1 ID 1 ID 2 ID 3	Section 1. Introduction to biology. Life as a phenomenon of the material world. The origin of life. The hierarchy of biological systems. The main properties of life	Interview
2.		Section 2. Cellular level of life organization	Interviews, tests
3.		Section 3. Protein biosynthesis	Interviews, tests
4.		Section 4. Respiratory metabolism	Interviews, tests
5.		Section 5. Cell life cycle	Interview
6.	UC-8 ID 1 ID 2 ID 3	Section 6. Molecular genetic level of life organization	Interviews, tests, tasks
7.	GPC-2 ID-1 ID-2 ID-3	Section 7. Reproduction of organisms. Ontogenesis	Interviews,
8.		Section 8. Evolution of the organic world	tests
9.		Section 9. The body and the environment. The biosphere and man	Interviews, tests

An approximate list of evaluation tools

Table 2

№	Name of the evaluation tool	Brief description of the evaluation tool	Presentation of an evaluation tool in the fund
1.	Interview (survey)	A control tool organized as a special conversation between the teacher and the student on topics related to the discipline being studied, and designed to clarify the amount of knowledge of the student on a specific section, topic, problem, etc.	Questions on the topics/sections of the discipline presented in relation to the competencies provided for in the RAP
2.	Test	A system of standardized tasks that allows you to automate the procedure	The fund of test tasks

3. INDICATORS AND CRITERIA FOR ASSESSING COMPETENCIES AT VARIOUS STAGES OF THEIR FORMATION, DESCRIPTION OF ASSESSMENT SCALES

Table 3

Planned results of competence development	The level of development			Evaluation tool
	Unsatisfactory	satisfactory	good	excellent
UC-1- Is able to carry out a critical analysis of problematic situations based on a systematic approach, to develop a strategy for manipulation				
UC-1 ID-1 To know methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis	The level of knowledge is below the minimum requirements, gross errors have occurred	The minimum acceptable level of knowledge, many blunders have been made	The level of knowledge in the volume corresponding to the training program, gram, several blunders were made	The level of knowledge in the volume corresponding to the training program, without errors.
UC-1 ID-2 To be able to gain new knowledge based on analysis, synthesis, etc.; collect and summarize data on current scientific problems, related to the professional field; search for information and solutions based on actions, experiment, experience, and information and communication technologies.	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	Basic skills have been demonstrated, typical tasks with minor errors have been solved, all tasks have been completed, but not in full	All basic skills have been demonstrated, all basic tasks have been solved with minor errors, all tasks have been completed in full, but some with flaws	All basic skills have been demonstrated, all basic tasks have been solved with some minor flaws, and all tasks have been completed in full
				Interviews, tests tasks

UC-1 ID-3 To possess skills of evaluation of the problem of professional activity with the analyze of synthesis and other methods of intellectual activity, including the use of information and communication technologies; identification of problems and the use of adequate methods to solve them; demonstration of value judgments to solve problematic professional situations.	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Interviews, tests, tasks
UC-8. Is able to create and maintain safe living conditions, including cases of emergency situations					
UC-8 ID-1 To know: the consequences of harmful and dangerous factors exposure on the body of animals, humans and the natural environment, methods of protection from emergencies and military conflicts; fundamentals of life safety, telephone numbers of rescue services.	The level of knowledge is below the minimum requirements, gross errors have occurred	The minimum acceptable level of knowledge, many blunders have been made	The level of knowledge in the volume corresponding to the training program, several blunders were made	The level of knowledge in the volume corresponding to the training program, without errors.	Interviews, tests
UC-8 ID-2 To be able to: identify the signs, causes and conditions of emergencies and military conflicts; assess the likelihood of a potential danger to the student and take measures to prevent it in an educational institution; provide first aid in emergency situations.	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Interviews, tests, tasks
GPC-2. Is able to interpret and evaluate in professional activity the influence of natural, socio-economic, genetic and economic factors on the physiological					

status of the animal body.					
GPC-2 ID-1 To know: ecology factors of the environment, its classification and the nature of relationships with living organisms; basic ecological concepts; interspecific relations of animals and plants, terms and bio ecology laws, parasites and hosts; ecological features of some types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body	The level of knowledge is below the minimum requirements, gross errors have occurred	The minimum acceptable level of knowledge, many blunders have been made	The level of knowledge in the volume corresponding to the training program, several blunders were made	The level of knowledge in the volume corresponding to the training program, without errors.	Interviews, tests
GPC-2 ID-2 To be able to: use environmental factors and environmental laws in agricultural manufacture; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods in the environmental assessment of agricultural facilities and the production of agricultural products; assess the impact on the animal body, anthropogenic and economic factors	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	Basic skills have been demonstrated, typical tasks with minor errors have been solved, all tasks have been completed, but not in full	All basic skills have been demonstrated, all basic tasks have been solved with minor errors, all tasks have been completed in full, but some with flaws	All basic skills have been demonstrated, all basic tasks have been solved with some minor flaws, and all tasks have been completed in full	Interviews, tests, tasks
GPC-2 ID-3 To possess skills of: the knowledge of the origin of living organisms, the levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for studying environmental knowledge of the environment, the laws of the development of nature and society; skills of observation,	Basic skills were not demonstrated when solving standard tasks, and gross errors occurred	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills are demonstrated in solving standard tasks with some shortcomings	Demonstrated skills in solving non-standard tasks without errors and shortcomings	Interviews, tests, tasks

comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, with the use of digital technologies as well.					
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3. THE LIST OF CONTROL TASKS AND OTHER MATERIALS NECESSARY FOR THE ASSESSMENT OF KNOWLEDGE, SKILLS, SKILLS AND WORK EXPERIENCE

3.1. Typical tasks for the current monitoring of academic performance

3.1.1. Interview questions

UC-1- Is able to carry out a critical analysis of problematic situations based on a systematic approach, to develop a strategy for manipulation

UC-1 ID-1 To know methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis

UC-1 ID-2 To be able to gain new knowledge based on analysis, synthesis, etc.; collect and summarize data on current scientific problems, related to the professional field; search for information and solutions based on actions, experiment, experience, and information and communication technologies.

UC-1 ID-3 To possess skills of evaluation of the problem of professional activity with the analyze of synthesis and other methods of intellectual activity, including the use of information and communication technologies; identification of problems and the use of adequate methods to solve them; demonstration of value judgments to solve problematic professional situations.

To section I. Introduction to biology. Life as a phenomenon of the material world.

The origin of life. The hierarchy of biological systems. The main properties of life

1. What does biology study? Sections of biology. Basic biological methods.
2. The definition of life.
3. Basic properties of living systems.
4. Hypotheses and theories of the origin of life on Earth.
5. Levels of organization of life and their hierarchy.

To section II. The cellular level of life organization:

1. Give a comparative description of the structure of pro- and eukaryotic cells.
2. Describe the structural and functional organization of the cell nucleus and its biological significance.
3. Describe the main levels of chromatin compactification and explain the biological significance of this phenomenon.
4. Describe the main modes of transport of molecules from the hyaloplasm to the nucleus and their mechanisms.
5. Describe the main types of chromosomes of cells and formulate the concept of karyotype.
6. Describe the receptor-barrier-transport system of the cell and its biological significance.
7. Formulate modern ideas about the structure and properties of biological membranes of cells and plasmalemmas.
8. Describe the structural and functional organization of the cell surface apparatus.
9. Describe the main types of transmembrane transport and characterize their biological significance.
10. Describe the main types of intercellular contacts.
11. Describe the chemical composition of the hyaloplasm and the biological processes occurring in it.
12. Describe the system of synthesis, segregation and intracellular transport of cell biopolymers and its biological significance.
13. Describe the mechanisms that ensure the segregation of cell proteins intended for export from proteins used for their own needs.
14. Explain the mechanisms of protein sorting in the Golgi apparatus trans-network using

the example of lysosomal hydrolases.

15. Describe the current understanding of the ways of lysosome formation and their biological role.

16. Describe the structural and functional organization of peroxisomes.

17. Describe the structural and functional organization of microtubules and their biological significance.

18. Describe the structural and functional organization of microfilaments.

19. Describe the main types of intermediate filaments.

20. Describe the structure and functions of the cell center.

21. Describe the structure and functions of special-purpose organoids (cilia and flagella).

To section III. Protein biosynthesis

1. Describe the flow of information in the cell and its biological significance.

2. Describe the sequence of DNA and pro- and eukaryotic replication processes. Specify the enzymes involved in the DNA replication process.

3. Explain the nature and biological significance of polyreplicate DNA replication in eukaryotes.

4. Explain the essence and causes of the phenomenon of terminal DNA underreplication of chromosomes in eukaryotes.

5. Characterize the protective mechanisms against terminal DNA underreplication of eukaryotic cell chromosomes involving telomeres and telomerases.

6. Give a comparative description of the structure of the genes of pro- and eukaryotes.

7. Explain the biological significance of the polycistronic organization of prokaryotic genes and the exointronic structure of eukaryotic genes.

8. Describe the transcription factors and their role in the initiation of transcription in eukaryotes.

9. Describe the molecular mechanisms of splicing and its biological significance.

10. Describe the processes of transcription and translation in pro- and eukaryotes.

To section IV. Respiratory exchange

1. Describe the structure and functions of mitochondria and their role in cell metabolism.

2. Describe the processes of assimilation and dissimilation and their interdependence, as well as the variety of ways of metabolism in cells.

3. Give a description of the physico-chemical processes and the basic biological principles underlying energy metabolism.

4. Describe the biological principles underlying plastic metabolism.

5. Explain the relationship between catabolic and anabolic pathways in cell metabolism.

6. Give a description of the biological principles of regulation of cell metabolism.

Section V. The life cycle of a cell

1. Characterize the cells of the mammalian and human body by their ability to divide.

2. Describe the structural and functional changes of the cell at various stages of interphase.

3. Describe the molecular mechanisms that regulate the cell cycle.

4. Describe the mechanisms that ensure the control of the state of the hereditary cell material during the mitotic cycle.

5. Give a description of apoptosis and its biological significance.

To section VI. The molecular genetic level of life organization

1. Define the basic concepts of genetics: gene, allele, genotype, genome, trait, phenotype, tolerance and expressiveness of gene action.

2. Describe the properties of the gene.

3. Characterize the genome of pro- and eukaryotes (size, organization of DNA nucleotide

sequences, transposons, number and functional features of genes, information provision of the genome and the concept of gene networks).

4. Give a description of inheritance in mono-, di- and polyhybrid crosses, describe the conditions for the independent transmission of traits in a number of generations.
5. Methods of solving problems of independent inheritance.
6. Give a description of the patterns of concatenated inheritance of traits.
7. Describe the mechanisms of gene recombination in the process of crossing over.
8. Give a description of the genetic definition of sex.
9. Give a description of gender-linked inheritance.
10. Methodology for solving problems of linked inheritance and gender-linked inheritance.
11. The interaction of alleles of one gene.
12. Interaction of alleles of different genes (polygenic inheritance, complementary interaction of alleles, dominant and recessive epistasis, pleiotropic effect of genes).
13. Variability and its forms (genetic, chromosomal, genomic).

To section VII. Reproduction of organisms. Ontogenesis

1. Describe the reproduction methods characteristic of viruses and prokaryotes.
2. Specify the features of asexual and sexual reproduction.
3. Characterize the stages of meiosis and describe the processes occurring at each stage of spermatogenesis and oogenesis.
4. Give a comparative description of sex determination in different groups of organisms.
5. Characterize the life cycles of organisms (metagenesis, heterogeneity).
6. Characterize the types of ontogenesis and its periodization.
7. Describe the structural features of the eggs and characterize their classification based on the amount of yolk and its distribution in the eggs.
8. Give a comparative description of the stages of embryonic development of chordate animals.
9. Give a description of the provision and differential organs and their biological significance.

To section VIII. The evolution of the organic world

1. The main factors of evolution (hereditary variability, natural selection, the struggle for existence - competition, gene drift, migration). The results of evolution.
2. Describe the genetic structure of the population.
3. Describe the genetic structure of natural populations and populations of domestic animals.
4. The biological essence of the Hardy-Weinberg law.
5. Determine the veterinary significance of genetic polymorphism.
6. Methodology for solving problems to determine the genetic structure of a population.

UC-8. Is able to create and maintain safe living conditions, including cases of emergency situations

UC-8 ID-1 To know: the consequences of harmful and dangerous factors exposure on the body of animals, humans and the natural environment, methods of protection from emergencies and military conflicts; fundamentals of life safety, telephone numbers of rescue services.

UC-8 ID-2 To be able to: identify the signs, causes and conditions of emergencies and military conflicts; assess the likelihood of a potential danger to the student and take measures to prevent it in an educational institution; provide first aid in emergency situations.

UC-8 ID-3 To possess skills of: the ways to ensure safety in the human-animal-habitat system. Possess methods of forecasting the occurrence of dangerous or emergency situations; skills in maintaining safe living conditions, including those based on digital technologies.

GPC-2. Is able to interpret and evaluate in professional activity the influence of natural,

socio-economic, genetic and economic factors on the physiological status of the animal body.

GPC-2 ID-1

To know: ecology factors of the environment, its classification and the nature of relationships with living organisms; basic ecological concepts; interspecific relations of animals and plants, terms and bio ecology laws, parasites and hosts; ecological features of some types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body.

GPC-2 ID-2

To be able to: use environmental factors and environmental laws in agricultural manufacture; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods in the environmental assessment of agricultural facilities and the production of agricultural products; assess the impact on the animal body, anthropogenic and economic factors

GPC-2 ID-3

To possess skills of: the knowledge of the origin of living organisms, the levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for studying environmental knowledge of the environment, the laws of the development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, with the use of digital technologies as well.

To section IX. The body and the environment. The biosphere and man

1. Give a classification of environmental factors and characterize the action of biotic factors using the example of interspecific relationships between organisms.
2. Describe the main patterns of the relationship of organisms with the environment at the ontogenetic level, the concepts of "ecological valence", "limiting factor" and "ecological niche".
3. Describe the patterns of relationships between organisms and the environment at the ontogenetic level, the concepts of "biotic potential", "resistance" and "capacity of the environment".
4. Describe the patterns of relationships between organisms and the environment at the ecosystem level from the perspective of the structural and functional organization of natural ecosystems.
5. The concept of the biosphere and its boundaries. The role of man in the biosphere. The noosphere.

1.1.1. Tests

Tests questions:

UC-1- Is able to carry out a critical analysis of problematic situations based on a systematic approach, to develop a strategy for manipulation

UC-1 ID-1 To know methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis

UC-1 ID-2 To be able to gain new knowledge based on analysis, synthesis, etc.; collect and summarize data on current scientific problems, related to the professional field; search for information and solutions based on actions, experiment, experience, and information and communication technologies.

UC-1 ID-3 To possess skills of evaluation of the problem of professional activity with the analyze of synthesis and other methods of intellectual activity, including the use of information and communication technologies; identification of problems and the use of adequate methods to solve them; demonstration of value judgments to solve problematic professional situations.

Test. THE STRUCTURE OF THE CELL

1. Prokaryotic cells, unlike eukaryotic cells, do not have:

- a) a decorated core;
- b) DNA;
- c) ribosomes;
- d) cytoplasm;
- e) the cell wall.

2. The composition of the surface apparatus of the nucleus of an animal cell includes the following structures:

- a) plasmalemma, pore complexes, lamina;
- b) glycocalyx, karyolemma, submembrane component;
- c) peripheral dense plate, karyolemma, pore complexes;
- d) submembrane complex, glycocalyx, karyotheca;
- e) karyolemma, the nuclear matrix.

3. The genetic material includes:

- a) only euchromatin;
- b) only heterochromatin;
- c) euchromatin and heterochromatin;
- d) euchromatin, heterochromatin and karyoplasm;
- e) euchromatin, heterochromatin and the nuclear matrix.

4. Through the nuclear pores, the following are transported from the cytoplasm to the nucleus:

- a) histone molecules, protein transcription factors, enzymes involved in the synthesis of DNA and RNA;
- b) histone molecules, ribosome subunits, protein transcription factors;
- c) ribosome subunits, molecules of various types of RNA;
- d) protein transcription factors, enzymes involved in the synthesis of DNA, RNA and protein.

5. There are no nucleoli in the structure:

- a) maturing small ribosome subunits;
- b) maturing large ribosome subunits;
- c) fibrils of the nuclear matrix;
- d) centromeric regions of chromosomes carrying multiple copies of rRNA genes;
- e) telomeric sections of chromosomes.

6. There is no core in the structure of the surface apparatus:

- a) outer nuclear membrane;
- b) peripheral dense plate;
- c) perinuclear spaces;
- d) glycocalyx;
- e) internal nuclear membrane.

7. Transcription is carried out at:

- a) the nucleosomal level of chromatin compactification;
- b) the nucleomeric level of chromatin compactification;
- c) the chromomeric level of chromatin compactification;
- d) chromatid level of chromatin compactification;
- e) all specified levels of chromatin compactification.

8. The formation of ribosome subunits occurs in:

- a) hyaloplasm;
- b) rough EPS;
- c) karyoplasm;
- d) the nucleolus;
- e) the Golgi complex.

9. The plasma membrane, or plasmalemma, has a thickness of about:

- a) 2 nm;
- b) 10 nm;
- c) 100 nm;
- d) 200 nm;
- e) 300 nm.

10. The fluidity of the plasmalemma and its ability to self-assemble are due to the properties of its constituent molecules:

- a) lipids;
- b) proteins;
- c) polysaccharides;
- d) all specified compounds.

Section III. Protein biosynthesis

1. A replicon is:

- a) a section of DNA that is currently replicating;
- b) a section of DNA located between two points of Ori;
- c) the chromosomal DNA molecule that is currently replicating;
- d) all chromosomal DNA molecules that are currently replicating.

2. The enzyme DNA polymerase III:

- a) removes overcoiling of maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) conducts DNA synthesis by attaching nucleotides to the 3 – end of the growing chain;
- d) conducts DNA synthesis by attaching nucleotides to the 5 – end of the growing chain;
- e) stitches together individual DNA fragments of the lagging chain.

3. The enzyme DNA polymerase III:

- a) removes overcoiling of maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) conducts DNA synthesis by attaching nucleotides to the 3 – end of the growing chain;
- d) conducts DNA synthesis by attaching nucleotides to the 5 – end of the growing chain;
- e) stitches together individual DNA fragments of the lagging chain.

4. The enzyme DNA-helicase:

- a) a) removes the overcoiling of the maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) conducts DNA synthesis by attaching nucleotides to the 3 – end of the growing chain;
- d) synthesizes the RNA seed;
- e) stitches together individual DNA fragments of the lagging chain.

5. The enzyme DNA topoisomerase:

- a) removes the overcoiling of the maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) conducts DNA synthesis by attaching nucleotides to the 3 – end of the growing chain;
- d) synthesizes the RNA seed;
- e) stitches together individual DNA fragments of the lagging chain.

6. The enzyme DNA ligase:

- a) removes overcoiling of maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) conducts DNA synthesis by attaching nucleotides to the 3 – end of the growing chain;
- d) synthesizes the RNA seed;
- e) stitches together individual DNA fragments of the lagging chain.

7. The enzyme DNA polymerase-I:

- a) removes overcoiling of maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) removes primers and replaces them with deoxyribonucleotides;
- d) synthesizes the RNA seed;
- e) stitches together individual DNA fragments of the lagging chain.

8. The enzyme primase:

- a) removes overcoiling of maternal DNA chains;
- b) breaks hydrogen bonds between complementary DNA chains;
- c) removes primers and replaces them with deoxyribonucleotides;
- d) synthesizes the RNA seed;
- e) stitches together individual DNA fragments of the lagging chain.

9. Okazaki fragments are:

- a) sections of the leading DNA chain;
- b) sections of the lagging DNA chain;
- c) short DNA sequences synthesized by DNA polymerase on a lagging DNA chain;
- d) short RNA sequences synthesized by primase on the leading DNA chain.

10. Primers are:

- a) short RNA sequences synthesized by primase only on the leading DNA chain;
- b) short RNA sequences synthesized by primase only on the lagging DNA chain;
- c) short RNA sequences synthesized by primase on both the leading and lagging DNA chains;
- d) short DNA sequences synthesized by primase only on the lagging DNA chain;
- e) short DNA sequences synthesized by primase only on the leading DNA chain.

Section IV. RESPIRATORY METABOLISM

1. Where does the Krebs cycle take place in cells?

- a) in ribosomes;
- b) in the cytoplasm;
- c) in the core;
- d) in the mitochondria;

2. Cells capable of using the energy of chemical bonds of substances obtained from the external environment and synthesizing organic compounds only from carbon of organic compounds belong to the group:
 - a) photoautotrophs;
 - b) photoheterotrophs;
 - c) chemoautotrophs;
 - d) chemoheterotrophs.
3. When glucose is oxidized, most of the ATP molecules are formed in reactions:
 - a) electron transfer along the electron transport chain and conjugated phosphorylation of ADP by ATP synthetases;
 - b) the Krebs cycle;
 - c) glycolysis;
 - d) fermentation;
 - e) formation of acetyl-CoA.
4. The final electron acceptor in the reactions of aerobic oxidation of glucose are the molecules of:
 - a) water;
 - b) oxygen;
 - c) pyruvate;
 - d) ABOVE;
 - e) ADF.
5. The final acceptor of electrons in the reactions of lactic acid fermentation of glucose are the molecules of:
 - a) water;
 - b) oxygen;
 - c) pyruvate;
 - d) ABOVE;
 - e) ADF.
6. Substrate phosphorylation during aerobic oxidation of glucose is carried out during the reactions of:
 - a) lactic acid fermentation (reduction of pyruvate to lactate);
 - b) formation of acetyl-CoA;
 - c) Krebs cycle;
 - d) electron transport along the electron transport chain;
 - e) phosphorylation of ADP by the enzyme ATP synthetase.
7. The energy of a pair of electrons transferred to the respiratory chain by one molecule of $\text{NAD}^+ \cdot \text{H}_2$ is sufficient to form:
 - a) one molecule of ATP;
 - b) two ATP molecules;
 - c) three ATP molecules;
 - d) four ATP molecules;
 - e) six ATP molecules.
8. During the catabolism of organic compounds, CO_2 molecules are formed during the reactions of:
 - a) glycolysis;
 - b) lactic acid fermentation;
 - c) electron transport along electron transport chains and conjugated phosphorylation of ADP by ATP synthetases;
 - d) the Krebs cycle;
 - e) substrate phosphorylation.
9. Synchronization of the rates of glycolysis reactions and the Krebs cycle is achieved by:
 - a) allosteric regulation of enzyme activity;
 - b) changes in the catalytic activity of enzymes by their chemical modification;
 - c) changes in the rate of transcription of genes encoding enzymes;
 - d) all of these mechanisms.
10. Intermediates of glycolysis reactions and the Krebs cycle are used for the synthesis of:
 - a) fats only;

- b) only carbohydrates;
- c) only amino acids;
- d) only nucleotides;
- e) all specified organic compounds.

Section VII. BIOLOGY OF REPRODUCTION

1. The forms of asexual reproduction of unicellular organisms include:

- a) schizogony;
- b) conjugation;
- c) copulation;
- d) parthenogenesis;
- e) metagenesis.

2. The forms of sexual reproduction of unicellular organisms include:

- a) gynogenesis;
- b) sporogony;
- c) plasmogony;
- d) copulation;
- e) schizogony.

3. The forms of asexual reproduction of multicellular animals include:

- a) metagenesis;
- b) copulation;
- c) budding;
- d) schizogony;
- e) gynogenesis.

4. Fragmentation (separation of the maternal individual into viable separate parts) is observed in:

- a) round-mouthed;
- b) flatworms;
- c) shellfish;
- d) lower chordal;
- e) arthropods.

5. The acrosome is a modified Golgi complex in a sperm located in its:

- a) head;
- b) the tail;
- c) neck;
- d) the intermediate department.

6. From each cell of spermatogonia, as a result of spermatogenesis,:

- a) 1 sperm;
- b) 2 sperm cells;
- c) 3 sperm cells;
- d) 4 sperm cells;
- e) 8 sperm cells.

7. Crossing is carried out in prophase of meiosis I at the stage:

- a) zygotens;
- b) pachytenes;
- c) leptotenes;
- d) diakinesis;
- e) diplotens.

8. The final stage of prophase of meiosis I is called:

- a) zygotene;
 - b) pachitene;
 - c) leptotene;
 - d) diakinesis;
 - e) diplotene.
9. From each oogonium cell, as a result of oogenesis,:
- a) 1 egg;
 - b) 2 eggs;
 - c) 3 eggs;
 - d) 4 eggs;
 - e) 8 eggs.
10. Meiosis I during spermatogenesis occurs at the stage of:
- a) maturation;
 - b) growth;
 - c) reproduction;
 - d) formations.

Section VIII. The evolution of the organic world

1. The reserve of hereditary variability in populations is created as a result of:
- a) mutations;
 - b) gene drift;
 - c) waves of life;
 - d) isolation.
2. The appearance of new gene alleles in the population is facilitated by:
- a) mutations;
 - b) gene drift;
 - c) waves of life;
 - d) isolation.
3. Directly reducing the heterozygosity of the population contributes to:
- a) mutations;
 - b) gene drift;
 - c) waves of life;
 - d) isolation.
4. According to the Hardy-Weinberg law, in an ideal population:
- a) the frequency of alleles of genes and genotypes and their ratios in a number of generations do not change;
 - b) the frequency of alleles of genes and genotypes and their ratios change in a number of generations;
 - c) the frequency of alleles of genes in a number of generations remains constant, while the frequency of genotypes varies;
 - d) the frequency of alleles of genes in a number of generations varies, while the frequency of genotypes remains constant.
5. The result of gene drift is:
- a) increased heterozygosity of individuals in the population;
 - b) loss of rare alleles of the population and homozygosity of its constituent individuals at most loci;
 - c) increased gene expression;
 - d) the constancy of the frequencies of alleles and genotypes in the population.

6. Gene drift contributes to:
- a) to increase the adaptability of populations to the action of environmental factors;
 - b) reducing the adaptability of populations to environmental factors;
 - c) increasing the heterozygosity of the population;
 - d) increased gene expression;
 - e) an increase in the frequency of mutations.
7. If p is the frequency of occurrence of allele I^A , q – allele I^B , r – allele I^O , then the frequency of occurrence of blood group IV is determined by the formula:
- a) $p^2 + 2pr$;
 - b) $q^2 + 2pr$;
 - c) r^2 ;
 - d) $p^2 + q^2 + r^2$;
 - e) $2pq$.
8. A Rhesus-negative man has a Rhesus-positive wife whose father was Rhesus-negative. The probability of Rhesus conflict in this family is:
- a) 100%;
 - b) 75%;
 - c) 50%;
 - d) 0%.
9. The ideal population is characterized by:
- a) panmixia;
 - b) migration of individuals;
 - c) a limited (certain) number of individuals in the population;
 - d) selective gamete meeting;
 - e) unequal viability of individuals with different genotypes.
10. If the frequency of the recessive allele (q) in a population is 0.3, then the proportion of individuals with a dominant phenotype in the specified population will be:
- a) 91%;
 - b) 49%;
 - c) 42%;
 - d) 21%;
 - e) 9%.

UC-8. Is able to create and maintain safe living conditions, including cases of emergency situations

UC-8 ID-1 To know: the consequences of harmful and dangerous factors exposure on the body of animals, humans and the natural environment, methods of protection from emergencies and military conflicts; fundamentals of life safety, telephone numbers of rescue services.

UC-8 ID-2 To be able to: identify the signs, causes and conditions of emergencies and military conflicts; assess the likelihood of a potential danger to the student and take measures to prevent it in an educational institution; provide first aid in emergency situations.

UC-8 ID-3 To possess skills of: the ways to ensure safety in the human-animal-habitat system. Possess methods of forecasting the occurrence of dangerous or emergency situations; skills in maintaining safe living conditions, including those based on digital technologies.

GPC-2. Is able to interpret and evaluate in professional activity the influence of natural, socio-economic, genetic and economic factors on the physiological status of the animal body.

GPC-2 ID-1

To know: ecology factors of the environment, its classification and the nature of relationships with living organisms; basic ecological concepts; interspecific relations of animals and plants, terms and bio ecology laws, parasites and hosts; ecological features of some types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body.

GPC-2 ID-2

To be able to: use environmental factors and environmental laws in agricultural manufacture; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods in the environmental assessment of agricultural facilities and the production of agricultural products; assess the impact on the animal body, anthropogenic and economic factors

GPC-2 ID-3

To possess skills of: the knowledge of the origin of living organisms, the levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for studying environmental knowledge of the environment, the laws of the development of nature and society; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, with the use of digital technologies as well.

Section XI. The body and the environment. The biosphere and man

1. Environmental factors include:

- a) altitude above sea level and partial pressure of oxygen in the air;
- b) water temperature and landscape type;
- c) area and ultraviolet radiation;
- d) salt concentration in water and air temperature;
- e) geographic latitude and sound wave.

2. Commensalism is a form of interspecific relations between organisms in which:

- a) one of the partners benefits from co-existence;
- b) both partners benefit from living together;
- c) one of the partners causes harm to the other;
- d) both partners harm each other.
- e) the relationship between organisms is neutral.

3. A form of interspecific relations between organisms in which co-existence is beneficial for both partners, but optional for them, is called:

- a) antibiosis;
- b) protocol operation;
- c) symbiosis;
- d) mutualism;
- e) commensalism.

4. The form of interspecific relationships of organisms in which one organism uses another as a habitat, food source and causes harm to it, but does not cause immediate death, is called:

- a) mutualism;
- b) symbiosis;
- c) protocol operation;
- d) parasitism;
- e) commensalism.

5. Antibiosis refers to such a form of interspecific relations of organisms as:

- a) commensalism;
- b) protocol operation;
- c) parasitism;
- d) mutualism.

6. The form of interspecific relationships of organisms in which co-existence, beneficial for organisms of both species and obligatory for them, is called:

- a) parasitism;
- b) protocol operation;
- c) symbiosis;
- d) mutualism;
- e) commensalism.

7. The ecological valence of organisms corresponds to:

- a) the zone of normal life activity;
- b) the optimum zone;
- c) limits of endurance.

8. Species with high ecological valence are called:

- a) eurytopic;
- b) mixotrophic;
- c) stenotopic;
- d) heterotrophic.

9. The number of components that make up the ecological niche includes:

- a) the relation of the species to abiotic environmental factors;
- b) the relationship of the species to biotic environmental factors;
- c) methods and nature of nutrition of the species;
- d) breeding sites of the species;
- e) all specified components.

10. An integral indicator reflecting the state of the population under these conditions is:

- a) the dynamics of changes in the number of individuals in the population over time;
- b) birth rate;
- c) mortality;
- d) emigration and immigration;
- e) the age structure of the population.

11. Exponential population growth is observed with:

- a) an increase in environmental resistance;
- b) the absence of environmental resistance;
- c) any changes in the resistance of the medium.

12. The ability to exponentially increase the population in ideal environmental conditions

- is inherent in: a) viruses;
b) prokaryotes;
c) eukaryotes;
d) all living organisms.

13. Sustainable co-existence of organisms of different species is impossible if they:

- a) occupy different ecological niches;
- b) occupy the same ecological niche;
- c) inhabit one area.

14. The biotic potential characterizes:

- a) the power of reproduction of individuals of a given species in specific environmental conditions;
- b) the potential breeding power of individuals of this species in the absence of environmental resistance;
- c) the dynamics of population growth in these environmental conditions.

15. The effect of abiotic factors on population size:

- a) depends on population density;
- b) it always does not depend on population density;
- c) does not depend on the density of the population until it reaches the capacity of the medium.

16. The mineralization process is carried out:

- a) autotrophic organisms;
- b) heterotrophic organisms;
- c) mixotrophic organisms;
- d) detritus-eating organisms;
- e). all of these organisms.

17. The climax community is characterized by:

- a) the maximum biomass for these conditions and the greatest number of interspecific interactions;
- b) the minimum biomass for these conditions and the largest number of interspecific interactions;
- c) the maximum biomass for these conditions and the least number of interspecific interactions;
- d) the minimum biomass for these conditions and the minimum number of interspecific interactions.

18. The stability of natural ecosystems is disrupted if:

- a) large biomass accumulates at the ends of food chains;
- b) food chains are formed between organisms in which substances, which are waste products for organisms of the same trophic level, they serve as resources for organisms of another trophic level;
- c) the organisms that make up them, they differ in great species diversity.

2.2. Standard tasks for intermediate certification

2.2.1. Questions for the test

Emerging competencies:

UC-1- Is able to carry out a critical analysis of problematic situations based on a systematic approach, to develop a strategy for manipulation

UC-1 ID-1 To know methods of critical analysis and evaluation of modern scientific achievements; basic principles of critical analysis

UC-1 ID-2 To be able to gain new knowledge based on analysis, synthesis, etc.; collect and summarize data on current scientific problems, related to the professional field; search for information and solutions based on actions, experiment, experience, and information and communication technologies.

UC-1 ID-3 To possess skills of evaluation of the problem of professional activity with the analyze of synthesis and other methods of intellectual activity, including the use of information and communication technologies; identification of problems and the use of adequate methods to solve them; demonstration of value judgments to solve problematic professional situations.

UC-8. Is able to create and maintain safe living conditions, including cases of emergency situations

UC-8 ID-1 To know: the consequences of harmful and dangerous factors exposure on the body of animals, humans and the natural environment, methods of protection from emergencies and military conflicts; fundamentals of life safety, telephone numbers of rescue services.

UC-8 ID-2 To be able to: identify the signs, causes and conditions of emergencies and military conflicts; assess the likelihood of a potential danger to the student and take measures to prevent it in an educational institution; provide first aid in emergency situations.

UC-8 ID-3 To possess skills of: the ways to ensure safety in the human-animal-habitat system. Possess methods of forecasting the occurrence of dangerous or emergency situations; skills in maintaining safe living conditions, including those based on digital technologies.

GPC-2. Is able to interpret and evaluate in professional activity the influence of natural, socio-economic, genetic and economic factors on the physiological status of the animal body.

GPC-2 ID-1

To know: ecology factors of the environment, its classification and the nature of relationships with living organisms; basic ecological concepts; interspecific relations of animals and plants, terms and bio ecology laws, parasites and hosts; ecological features of some types of pathogenic microorganisms; mechanisms of influence of anthropogenic and economic factors on the animal body.

GPC-2 ID-2

To be able to: use environmental factors and environmental laws in agricultural manufacture; apply the achievements of modern microbiology and ecology of microorganisms in animal husbandry and veterinary medicine in order to prevent infectious and invasive diseases and treat animals; use environmental monitoring methods in the environmental assessment of agricultural facilities and the production of agricultural products; assess the impact on the animal body, anthropogenic and economic factors

GPC-2 ID-3

To possess skills of: the knowledge of the origin of living organisms, the levels of organization of living matter, favorable and unfavorable factors affecting the body; the basis for studying environmental knowledge of the environment, the laws of the development of nature and soci-

ety; skills of observation, comparative analysis, historical and experimental modeling of the impact of anthropogenic and economic factors on living objects, with the use of digital technologies as well.

1. The subject and tasks of biology. Biology is a complex science. Interdisciplinary research in biology.
2. The essence and origin of life.
3. The diversity of life.
4. Properties of living systems.
5. The structure of the viral particle.
6. Structural features of the prokaryotic cell.
7. The structure of animal and plant cells – similarities and differences.
8. The structure of the cell membrane and the cell nucleus. Their functions.
9. Structure and functions of EPS, Golgi complex and lysosomes.
10. Structure and functions of the mitochondria.
11. Structure and functions of the ribosome. Polysomes.
12. Chromosomes.
13. Genes. The structure of the prokaryotic and eukaryotic genes.
14. Metabolism. The unity of assimilation and dissimilation processes in the cell.
15. Glycolysis and fermentation.
16. Oxygen breathing.
17. The genetic code. Properties of the genetic code.
18. DNA replication, its mechanisms and regulation.
19. Protein biosynthesis. Transcription in pro- and eukaryotes.
20. Protein biosynthesis. Translation in pro- and eukaryotes.
21. Heredity, basic laws.
22. Independent inheritance and its patterns.
23. The interaction of allelic and non-allelic (complementarity, epistasis) genes.
24. Linked inheritance. Crossingover.
25. Inheritance of gender. Gender-linked inheritance.
26. The cell cycle. Mitosis.
27. Meiosis. Ovogenesis. Spermatogenesis.
28. Types of eggs according to the content and distribution of yolk.
29. Patterns of embryonic development of animals.
30. The main ways of reproduction of organisms.
31. Environmental factors.
32. Forms of relationships between organisms.
33. Ecology of populations.
34. Communities. Succession. Menopause.
35. The doctrine of the biosphere.
36. Factors of evolution (hereditary variability, natural selection, struggle for existence, gene drift, waves of life, migration, isolation).
37. The main directions of the evolutionary process.
38. Types of phylogeny of taxa.

METHODOLOGICAL MATERIALS DEFINING THE PROCEDURES FOR ASSESSING KNOWLEDGE, SKILLS AND ABILITIES AND WORK EXPERIENCE CHARACTERIZING THE STAGES OF COMPETENCE FORMATION

Criteria for evaluating students' knowledge during the colloquium:

- **Mark "excellent"** - the student clearly expresses his point of view on the issues under consideration, giving appropriate examples.
- **Mark "good"** - the student admits some errors in the answer
- **Mark "satisfactory"** - the student discovers gaps in knowledge of the basic educational and normative material.
- **Mark "unsatisfactory"** - the student discovers significant gaps in knowledge of the basic provisions of the discipline, inability to get the correct solution to a specific practical problem with the help of a teacher.

Criteria for evaluating students' knowledge during an interview:

- **Mark "excellent"** - the student clearly expresses his point of view on the issues under consideration, giving appropriate examples.
- **Mark "good"** - the student admits some errors in the answer
- **Mark "satisfactory"** - the student discovers gaps in knowledge of the basic educational and normative material.
- **Mark "unsatisfactory"** - the student discovers significant gaps in knowledge of the main provisions of the discipline.

Criteria for evaluating students' knowledge during testing:

The test result is evaluated on a percentage rating scale. Each student is offered a set of test tasks of 25 questions:

- **Mark "excellent"** – 25-22 correct answers.
- **Mark "good"** – 21-18 correct answers.
- **The mark "satisfactory"** is 17-13 correct answers.
- **Mark "unsatisfactory"** – less than 13 correct answers

Criteria of knowledge during the test:

- **The grade "credited"** must correspond to the parameters of any of the positive grades ("excellent", "good", "satisfactory").
- **The grade "not credited"** must correspond to the parameters of the grade "unsatisfactory".
- **Mark "excellent"** – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in situations of increased complexity. At the same time, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be allowed.
- **Mark "good"** – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in standard situations. At the same time, minor errors, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be made.
- **Mark "satisfactory"** – one or more types of educational work provided for in the curriculum have not been completed. The student demonstrates incomplete compliance of knowledge, skills, and abilities with the indicators given in the tables, significant errors are made, a partial lack of

knowledge, skills, and skills is manifested in a number of indicators, the student experiences significant difficulties in operating with knowledge and skills when transferring them to new situations. –

- **Mark "unsatisfactory"** – the types of educational work provided for in the curriculum have not been completed. demonstrates incomplete compliance of knowledge, skills, and abilities given in the tables of indicators, significant errors are made, a lack of knowledge, skills, and skills is manifested for a large number of indicators, the student experiences significant difficulties in operating knowledge and skills when transferring them to new situations

Criteria of knowledge during the examination:

- **Mark "excellent"** – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in various situations of increased complexity. At the same time, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be allowed. –

- **Mark "good"** – all types of educational work provided for in the curriculum have been completed. The student demonstrates the compliance of knowledge, skills, and abilities with the indicators given in the tables, operates with acquired knowledge, skills, and applies them in standard situations. At the same time, minor errors, inaccuracies, difficulties in analytical operations, transfer of knowledge and skills to new, non-standard situations may be made.

- **Mark "satisfactory"** – one or more types of educational work provided for in the curriculum have not been completed. The student demonstrates incomplete compliance of knowledge, skills, and abilities with the indicators given in the tables, significant errors are made, a partial lack of knowledge, skills, and skills is manifested in a number of indicators, the student experiences significant difficulties in operating with knowledge and skills when transferring them to new situations. –

- **Mark "unsatisfactory"** – the types of educational work provided for in the curriculum have not been completed. demonstrates incomplete compliance of knowledge, skills, and abilities given in the tables of indicators, significant errors are made, a lack of knowledge, skills, and skills is manifested for a large number of indicators, the student experiences significant difficulties in operating with knowledge and skills when transferring them to new situations.

ACCESSIBILITY AND QUALITY OF EDUCATION FOR PEOPLE WITH DISABILITIES

If necessary, persons with disabilities and persons with disabilities are given additional time to prepare an answer for the test.

When conducting the procedure for evaluating the learning outcomes of people with disabilities and persons with disabilities, their own technical means can be used.

The procedure for evaluating the learning outcomes of persons with disabilities and persons with disabilities in the discipline provides for the provision of information in forms adapted to the limitations of their health and perception of information:

For people with visual impairments:	– in printed form in enlarged font,
For people with hearing impairments:	– in the form of an electronic document.
For people with disorders of the musculoskeletal system	– in printed form,

When conducting the procedure for evaluating the learning outcomes of persons with disabilities and persons with disabilities in the discipline, it ensures that the following additional requirements are met, depending on the individual characteristics of the students:

- a) instructions on the procedure for conducting the assessment procedure are provided in an accessible form (orally, in writing);
- b) an accessible form of assignment of assessment tools (in printed form, in printed form in enlarged font, in the form of an electronic document, assignments are read out by the teacher);
- c) an accessible form of providing answers to tasks (written on paper, a set of answers on a computer, orally).

If necessary, for students with disabilities and the disabled, the procedure for evaluating the results of training in the discipline can be carried out in several stages.

The procedure for evaluating the learning outcomes of people with disabilities and persons with disabilities is allowed using distance learning technologies.