

**FEDERAL STATE BUDGETARY  
EDUCATIONAL INSTITUTION OF HIGHER EDUCATION  
«AMUR STATE MEDICAL ACADEMY»  
MINISTRY OF HEALTH OF THE RUSSIAN FEDERATION**

AGREED

Vice-Rector for Academic Affairs,



N.V. Loskutova

April 17, 2025

Decision of the CCMC

April 17, 2025

Protocol No. 7

APPROVED

by decision of the Academic Council of the FSBEI  
HE Amur SMA of the Ministry of Health of the  
Russian Federation

April 22, 2025

Protocol No. 15

Acting Rector of the FSBEI HE Amur SMA of the  
Ministry of Health of the Russian Federation



I.V. Zhukovets

April 22, 2025

**EDUCATIONAL PROGRAM  
discipline «BIOLOGY»**

**Specialty: 31.05.01 General Medicine**

**Course: 1**

**Semester: 1, 2**

**Total hours: 216 hrs.**

**Total credits: 6 credit units**

**Control form: examination, 2 semester**

**Blagoveshchensk, 2025**

The educational program of the discipline is designed in accordance with the requirements of the Federal State Educational Standard of Higher Education - specialist in specialty 31.05.01 General Medicine, approved by the order of the Ministry of Education and Science of Russia dated 08.12.2020 No. 988 (registered with the Ministry of Justice of Russia on 08.26.2020 No. 59493), BPEP HE (2021).

**Author:**


**Professor of the Department of Histology and Biology, Holder of an Advanced Doctorate in Medical Sciences, Ph.D. of Medical Sciences, E.L. Gordienko**

**Reviewers:**

**Professor of the Department of Chemistry of the Federal State Budgetary Educational Institution of Higher Education «Far Eastern State Agrarian University», Holder of an Advanced Doctorate in Chemical Sciences, A.P. Pakusina**

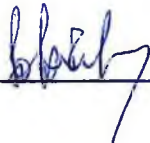
**Head of the Department of Physiology and Pathophysiology of the FSBEI HE Amur SMA, Holder of an Advanced Doctorate in Biological Sciences, Ph.D. of Chemical Sciences, Associate Professor, T.A. Batalova**

**APPROVED at the meeting of the Department of Histology and Biology, Protocol No. 17 dated April 3, 2025**

**Head of the Department, Holder of the Advanced Doctorate in Biological Sciences, Ph.D. of Medical Sciences, Associate Professor** \_\_\_\_\_  **I.Yu. Sayapina**

**Conclusion of the Expert Commission on the review of the Educational Programs: Protocol No. 3 dated April 9, 2025**

**Expert of the expert commission, Ph.D. of Medical Sciences**

\_\_\_\_\_  **Yu.A. Shakalo**

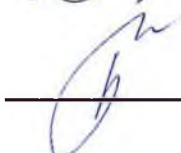
**APPROVED at the meeting of the CMC No.2: Protocol No. 7 dated April 10, 2025**

**Chairman of the CMC No. 2**

**Holder of the Advanced Doctorate in Biological Sciences, Associate Professor**

\_\_\_\_\_  **I.Yu. Sayapina**

**AGREED: Dean of the Faculty of Medicine, Ph.D. of Medical Sciences April 17, 2025**

\_\_\_\_\_  **N.G. Brush**

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## 1. EXPLANATORY NOTE

### 1.1 Brief description of the discipline

Biology is one of the priority natural science disciplines with the highest rating at the beginning of the 21st century. The main argument: the object of its study is Life. The fundamental discipline Biology in higher medical school defines the most important aspects of the study of life: the level principle of the organization of living systems; the principle of development in the aspects of historical (phylogenetic) and ontogenetic for individuals of various systematic groups; the principle of the unity of living systems, including true parasitism; symbiogenetic relationships: "parasite-host", "natural focus - components". Ecogenetic relationships involve the study of cause-and-effect relationships and interdependence of genetic, epigenetic, environmental factors in the life system, in the human body, in population variants. The essential object of biology for future doctors is a person at critical periods of ontogenesis in unity with the biological and social environments.

Biology is a fundamental natural science discipline of a medical university, the study and assimilation of which becomes one of the most important conditions for the methodological and methodical preparation of a medical student for theoretical, clinical and humanitarian disciplines of higher medical school. In this regard, it contributes to the acquisition of certain general cultural, general professional and professional competencies in connection with the goals of the Main Educational Program of Higher Medical School.

### 1.2. The purpose and educational objectives of the discipline

#### **The purpose of teaching the discipline:**

formation of the most important basic theoretical knowledge of medical students about the patterns, laws and categories of development, organization and vital activity of biological systems of different levels of life (genomic - cellular - organismic - parasitic communities). Acquisition of practical skills that prepare students to study the disciplines of morphophysiological and clinical profile, the basics of parasitism as a universal phenomenon. Biology develops the basics of bioethics, readiness to master modern bio- and gene technologies, to actively and competently solve human problems in nature and society. Biology contributes to introducing future doctors to the basics of evidence-based, predictive medicine.

#### **Learning objectives of the discipline:**

1. Formation of a systemic ideological approach in the student to the study of development (genesis), organization and life activity of a person in the system of nature based on the characteristics of life activity: integrity - universality - diversity - discreteness in the analysis of the level principle of organization of living systems (molecular - cellular - organismic - population - biogeocenotic) in life cycles and reproduction.

2. To instill interest in the in-depth study of the organization and properties of hereditary information in pro- and eukaryotic cells, the properties of DNA in the life cycle of cells and at the level of the organism; to master the basic concepts and categories of genetics, familiarization with the historical stages of its development, to study the phenomena of "heredity", "variability", the laws of inheritance of traits using examples, including pathological traits; to study the modern concept of the gene, its molecular organization in eukaryotic cells, with functional models of genes (expression - repression - elimination) and factors regulating their activity and effectiveness in ontogenesis.

3. Creation of conditions for acquisition of skills and abilities - applied knowledge in the study of heredity and variability: phenes in reaction norm variants, hereditary diseases, syndromes; to the study of environmental factors causing modifications, mutations, methods of genetic research, with their role in diagnostics of hereditary diseases, prognosis of manifestations of pathological signs in offspring, with modern methods of gene diagnostics, including prenatal diagnostics.

4. Formation of motivation for the study and application of the basic concepts and categories of the global phenomenon of Parasitism, familiarization with the taxonomy of parasites, mastering the biological and medical principle of studying the causative agents of invasions, carriers of infections and invasions - human parasites, found both everywhere and in natural focal areas; education of students in the basics of epidemiological and hygienic knowledge.

5. Motivation of competencies in the section "Phylogenetic and ontogenetic patterns and laws of human development", the advisability of familiarization with the modern model of ontogenesis, periodization and mechanisms of individual human development, factors controlling ontogenesis; causes, mechanisms of formation of congenital malformations.

6. Justification of the formation of moral and ethical principles in the study of nature - man - communities, natural and social; education of the attitude to study the "I" in the imperative: "Know yourself! - Create yourself!"

### 1.3. The place of the discipline in the structure of the main professional educational program of higher education

In accordance with the Federal State Educational Standard of Higher Education, the specialty 31.05.01 General Medicine (2020) the discipline "Biology" refers to block 1, the basic part. The total workload of the discipline is 216 hours (6 credits). The discipline is studied in the 1st and 2nd semesters of the 1st year. Type of control: exam in the 2nd semester.

Students are trained on the basis of continuity of knowledge and skills acquired in the school course of Biology of general educational institutions. To master the discipline "Biology", basic theoretical knowledge and skills in the following sections are required: Cytology, Fundamentals of Genetics, Zoology - Fundamentals of Parasitism, Fundamentals of Evolutionary Biology, Biology of Individual Development, practical skills in solving situational problems in the volume provided by the secondary school program.

The discipline "Biology" is a fundamental subject necessary for studying theoretical disciplines that are taught in parallel with Biology (Latin, anatomy, histology with embryology and regeneration, chemistry) or in subsequent courses (physiology and pathophysiology, biochemistry, microbiology and virology, hygiene with ecology). Therefore, mastering the discipline "Biology" accompanies or precedes their study. It should be emphasized that there is not a single theoretical-clinical or clinical (pharmacology, neurology with psychiatry, otolaryngology, ophthalmology, radiation diagnostics and radiation therapy with a course in oncology, traumatology, etc.) or humanitarian discipline, the basis of which would not be biological knowledge.

The discipline "Biology" consists of 4 sections, which present the most important and necessary information that determines theoretical and practical knowledge, skills and mastery of the educational process:

Section 1. Cell biology.

Section 2. General Genetics. Fundamentals of Human Genetics

Section 3. Parasitology. Fundamentals of medical parasitology.

Section 4. Evolutionary biology. Phylogenesis of organs and systems.

### 1.4. Requirements for students

To study the discipline "Biology", a student must have the necessary knowledge, skills and abilities developed in institutions of secondary (complete) general education:

<b>Chemistry</b>
<b>Knowledge:</b> physical and chemical properties of the cytoplasm, features of biomembranes , cell nuclei at stages of the life cycle; all properties of DNA, their implementation in the life cycle of cellular systems; protein synthesis - stages in eukaryotes, participants in the process: nucleus and cytoplasm.
<b>Skills:</b> explain the physicochemical properties of the cytoplasm, the features of biomembranes , the protein synthesis scheme using models of living systems, characterize the participants in physicochemical and biochemical processes at the molecular, submolecular and cellular levels
<b>Skills :</b> explanations on models of living systems, protein synthesis schemes, the roles of participants in physicochemical and biochemical processes at the molecular, submolecular , cellular levels, characteristics of the role of protein synthesis in the vital activity of cells with different genomic potentials.
<b>Latin</b>
<b>Knowledge:</b> biological terminology in Latin
<b>Skills:</b> apply acquired knowledge to understand and explain the organization of biological objects and processes, to understand the received educational and scientific information.
<b>Skills:</b> application of biological terminology in Latin to study biological objects and processes
<b>Professional foreign language</b>
<b>Knowledge:</b> English biological and medical terminology
<b>Skills:</b> apply acquired knowledge to obtain educational and scientific information on the subject
<b>Skills:</b> application of acquired knowledge to obtain educational and scientific information on the subject

<b>Social and humanitarian foundations of medicine. Bioethics</b>	
<b>Knowledge:</b> concepts of Life, properties of Life, sociobiological aspects of Life, the concept of Ontogenesis, its modern concepts and its functions from the standpoint of predictive medicine, the history of bioethics, its foundations	
<b>Skills:</b> critically understand the possibilities and forecasts of modern bio- , gene technologies ; use biological information for the benefit of health, including personal and future patients.	
<b>Skills:</b> critical thinking possibilities and forecasts of modern bio- , gene technologies , the use of biological information for the benefit of health, including personal and future patients	
<b>Physics, mathematics</b>	
<b>Knowledge:</b> properties of cell membranes, electrogenesis of nerve cells, basics of probabilistic mathematical statistics, variation statistics, concept of entropy	
<b>Skills:</b> be able to use a probabilistic assessment of the manifestation of a trait for a forecast in a generation; use methods of mathematical statistics in professional activities for processing and analyzing data from scientific and applied research	
<b>Skills:</b> be able to use a probabilistic assessment of the manifestation of a trait for a forecast in a generation; use methods of mathematical statistics in professional activities for processing and analyzing data from scientific and applied research	
<b>Anatomy</b>	
<b>Knowledge:</b> the basics of the development of organs and systems during critical periods of human ontogenesis, evolutionary aspects of the formation of organs and systems	
<b>Skills:</b> update the sources and stages of development of organs and systems of the body, use this knowledge to prevent the effects of mutagenic factors and prevent the formation of congenital malformations.	
<b>Skills:</b> updating the sources and stages of development of organs and systems of the body, using this knowledge to prevent the effects of mutagenic factors and prevent the formation of congenital malformations.	
<b>Histology, embryology, cytology</b>	
<b>Knowledge:</b> history of creation and modern significance of cell theory, substantiation of the cell as an open information system, classification and dynamics of stem cell populations in early ontogenesis, fundamentals of tissue evolution in the taxonomic classification of Invertebrates and Chordates.	
<b>Skills:</b> use knowledge about the role of the cellular and tissue levels of organization to substantiate the implementation of hereditary information, the process of inheritance and the characteristics of variability, apply knowledge about the vulnerability of cells, tissues, organs and systems to mutagenic factors, prevent ecogenetic problems.	
<b>Skills:</b> the use of knowledge about the role of the cellular and tissue levels of organization to substantiate the implementation of hereditary information, the process of inheritance and the characteristics of variability, skills in applying knowledge about the vulnerability of cells, tissues, organs and systems to prevent the impact of mutagenic factors and prevent ecogenetic problems.	

### 1.5. Interdisciplinary links with subsequent disciplines

Knowledge, skills and abilities necessary for studying subsequent disciplines:

No. p/p	Name of subsequent disciplines	Section numbers of the discipline required for studying subsequent disciplines	
		1	2
1	Latin	+	+
2	Bioorganic chemistry in medicine	+	+
3	Biophysical chemistry in medicine	+	+
4	Histology, embryology, cytology	+	+
5	Normal Physiology	+	+
6	Bioethics	+	+
7	Anatomy	+	+

8	Infectious diseases	+	+
9	Normal Physiology	+	+
10	Pharmacology	+	+
11	Hygiene with the basics of human ecology, hygiene of children and adolescents	+	+
12	Hospital therapy	+	+
13	Microbiology, virology	+	+
14	Neurology, neurosurgery	+	+
15	Psychiatry, medical psychology	+	+
16	Public health and healthcare, health economics	+	+
17	Oncology, radiation therapy	+	+

## 1. 6. Requirements for the results of mastering the discipline

The study of the discipline "Biology" is aimed at the formation/improvement of the following competencies: universal (UK), general professional (GPK)

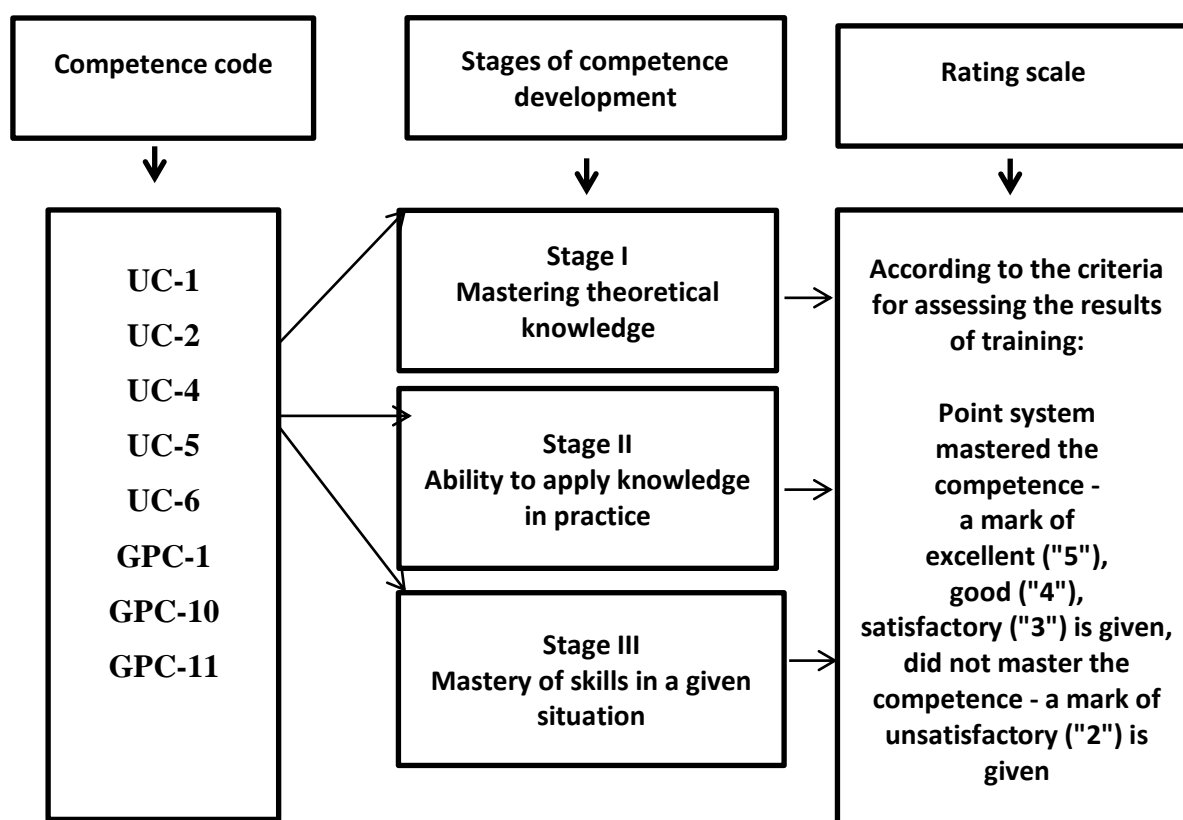
No. p/p	Code and name of competence	Code and name of the indicator of achievement of competence
<b>Universal competencies</b>		
1	UC-1. Capable of carrying out critical analysis of problematic situations based on a systems approach, to develop strategy of action	AI UC 1.1 Analyzes a problem situation based on a systems approach, identifying its components and the connections between them. AI UC 1.2 Identifies gaps in information needed to solve problem situations and designs processes to eliminate them. AI UC-1.3 Applies systems analysis to resolve problematic situations in professional work sphere.
	UC-2. Capable of managing a project at all stages of its life cycle	AI UC-2.1. Formulates, based on the stated problem, a project task and a method for solving it through the implementation of project management. AI UC-2.2. Applies design to solve professional issues, has knowledge of methods for developing project goals and objectives, methods for assessing the duration and cost of a project, as well as the need for resources, including taking into account their replaceability. AI UC-2.3. Identifies and analyzes alternative solutions to the tasks set to achieve the intended results.
	UC-4 Able to apply modern communication technologies, including in foreign language( s ), for academic and professional interaction	AI UC-4.2. Uses modern communication resources to search, process and transmit information necessary for the high-quality performance of professional tasks and the achievement of professionally significant goals

	UC-5. Able to analyze and take into account the diversity of cultures in the process of intercultural interaction	AI UC-5.1. Analyzes the most important ideological and value systems formed in the course of historical development, substantiates the relevance of their use in social and professional interaction. AI UK-5.2. Builds social and professional interaction taking into account the characteristics of the main forms of scientific and religious consciousness, business and general culture of representatives of other ethnic groups and faiths, and various social groups.
	UC-6. Able to define and implement priorities of own activity and ways of its improvement based on self-assessment and education throughout life	AI UC-6.1. Assesses his/her personal, situational, and time resources and uses them optimally to complete the assigned task. AI UC-6.3. Conducts critical self-analysis of the results of one's own activities.
<b>General professional competencies</b>		
2	GPC-1. Capable of implementing moral and legal norms, ethical and deontological principles in professional activities	AI GPC-1.3. Has the skills of presenting an independent point of view, analysis and logical thinking, public speaking, moral and ethical argumentation, conducting discussions and round tables, principles of medical deontology and medical ethics.
	GPC-10. Capable of solving standard tasks of professional activity using information, bibliographic resources, medical and biological terminology, information and communication technologies, taking into account the basic requirements of information security	AI GPC-10.2. Carries out effective search for information necessary for solving problems of professional activity, using legal reference systems and professional pharmaceutical databases. AI GPC-10.3. Uses specialized software for mathematical processing of observational and experimental data when solving problems in professional activities.
	GPC-11. Capable of preparing and applying scientific, applied, design, organizational and regulatory documentation in the system of biological knowledge, in the future for the healthcare system	AI GPC-11.1. Able to search for and select scientific, regulatory and organizational documentation in accordance with specified goals, their analysis and application to solve professional problems. AI GPC-11.2. Able to use evidence-based medicine methods when solving a given professional task. AI GPC-11.3. Can prepare information and analytical materials and reports, including for the public presentation of the results of scientific work (report, theses, article).

### Modules of the discipline and the code of the competence being formed

No. p/p	Section name	Code of the competence being formed
1	Section 1. Cell biology.	UC-1. UC-2. UK-C. UK-C. UC-6. GPC-1, GPC-10, GPC-11
2	Section 2. General Genetics. Basics of Human Genetics	UC-1. UC-2. UK-C. UK-C. UC-6. GPC-1, GPC-10, GPC-11
3	Section 3. Parasitology. Basics of medical parasitology.	UC-1. UC-2. UK-C. UK-C. UC-6. GPC-1, GPC-10, GPC-11
4	Section 4. Evolutionary biology. Phylogenesis of organs and systems.	UC-1. UC-2. UK-C. UK-C. UC-6. GPC-1, GPC-10, GPC-11

### 1.7 Stages of competencies development and description of assessment scales



### 1.8. Forms of training organization and types of control

Form of organization of students' training	Brief description
Lectures	The lecture material is based on fundamental historical and modern problematic issues of Biology, which are most significant in the training of a specialist.
Practical classes	They are intended to use theoretical knowledge in solving applied problems, assignments, analysis and diagnostics of proposed situations, and, thereby, to consolidate the theoretical foundations of the discipline, as well as to control their assimilation with the subsequent application of the acquired knowledge in the course of studying the topic.
Interactive forms of education	<ul style="list-style-type: none"> <li>- solving situational problems and assignments with subsequent discussion and defense of the answer</li> <li>- interactive survey;</li> <li>- performing creative tasks,</li> <li>- small group method,</li> </ul>

	<ul style="list-style-type: none"> <li>- discussions,</li> <li>- online course of the discipline in the Moodle system ,</li> <li>- testing in the Moodle system .</li> </ul>
Participation in the department's research work, student circle and conferences	<ul style="list-style-type: none"> <li>- preparation of oral presentations and poster reports for presentation at a student club or scientific conference;</li> <li>- writing theses and abstracts on the chosen biological and medical field;</li> <li>- preparation of a literature review using educational, scientific, reference literature and Internet sources.</li> </ul>
<b>Types of control</b>	<b>Brief description</b>
Incoming inspection	<p>Testing theoretical knowledge and practical skills developed by the Biology program in secondary (complete) general education institutions.</p> <p>The entrance knowledge control includes:</p> <ul style="list-style-type: none"> <li>- testing in the Moodle system (test of incoming knowledge control) <a href="https://educ-amursma.ru/mod/quiz/view.php?id=16599">https://educ-amursma.ru/mod/quiz/view.php?id=16599</a> ;</li> <li>- solving situational problems and exercises.</li> </ul> <p>The results of the incoming inspection are systematized, analyzed and used by the teaching staff of the department to develop measures to improve and update the teaching methods of the discipline.</p>
Current control	<ol style="list-style-type: none"> <li>1. Testing the entry level of students' knowledge (within the Unified State Exam program in biology) with assessment on a 5-point scale.</li> <li>2. In-class knowledge assessment during a practical lesson, including: <ul style="list-style-type: none"> <li>• control of the initial level of knowledge for each practical lesson in the form of express control (express test control system, response time is regulated);</li> <li>• theoretical survey (introduction of interactive forms (see above) based on the core problem of the lesson with the involvement of opponents who discuss the content of the answers and supplement them (no more than 20 minutes);</li> <li>• individual control during the lesson and at its completion. The following is carried out: <ul style="list-style-type: none"> <li>• checking the album, including self-study;</li> <li>• analysis of blind preparations, slides, diagrams,</li> <li>• solving situational problems,</li> <li>• test tasks prepared by teachers or</li> <li>• author's, compiled by students;</li> <li>• information messages on the issue under consideration (UIR).</li> </ul> </li> </ul> </li> </ol>
Midterm control: at control classes (diagnostic classes) after completing the study of a section of the discipline	<p>For control (diagnostic) classes, blocks of control tasks have been compiled for each student, containing:</p> <ul style="list-style-type: none"> <li>- illustrated task map;</li> <li>- situational tasks;</li> <li>- blind preparations, diagrams, microphotographs,</li> <li>- slides;</li> <li>- final test control.</li> </ul> <p>The final assessment on a 5-point scale is based on the acquisition of knowledge, skills, and abilities in this section.</p>
<b>Interim assessment - exam</b> 2nd semester	<p>From 3 parts:</p> <ul style="list-style-type: none"> <li>- remote testing in the Moodle system (<a href="https://educ-amursma.ru/mod/quiz/view.php?id=15714">https://educ-amursma.ru/mod/quiz/view.php?id=15714</a>)</li> <li>- passing practical skills: diagnostics of samples, solving situational problems;</li> <li>- oral interview on the ticket during the exam.</li> </ul>

## 2. CONTENT AND STRUCTURE OF THE DISCIPLINE

### 2.1. Scope of the discipline and types of educational activities

Types of educational work	Total hours	Semesters	
		1	2
Lectures	34	14	20
Practical classes	86	34	52
Independent work of students	60	24	36
Exam	36	-	36
<b>Total labor intensity in hours</b>	<b>216</b>	<b>72</b>	<b>144</b>
<b>Total workload in credit units</b>	<b>6</b>	<b>2</b>	<b>4</b>

### 2.2. Thematic plan of lectures and their brief content

№ №	Lecture topics	Codes of formed competencies	Labor intensity (in hours)
	<b>1st semester</b>		
1	Introduction to biology. The role of global science in the 21st century. Cell biology. Cytoplasm – organization, role in the cell as an open system. Introduction. Levels of life organization. Man in the system of nature. Dialectical-materialistic doctrine of the essence of life. Biosocial nature of man. Biology of the cell. The cell as an elementary genetic and structural-functional biological unit.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
2	Cell biology. Nucleus. Organization of the nuclear genome. Functions in the life cycle. Mitotic cycle. Contents of the MC stages. Significance. Realization of the properties of hereditary information. Factors governing the MC and the cell life cycle. Reproduction. A universal property of a living organism that ensures the continuity of the material basis in a series of generations. Sexual reproduction. Meiosis – spermatogenesis and oogenesis. The essence of the processes, factors controlling gametogenesis. Mitotic cycle. Reproduction is a property of living things. Meiosis. The significance of the phenomenon.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
3	Introduction to genetics. Genetics. Definition. Goals and objectives of science. Basic concepts of genetics: genotype, genome, phenotype, heredity, variability, inheritance. History of the development of science. Origins of science. Stage of classical genetics. Great names and discoveries. Domestic geneticists – dramatic pages of science, great teachers and students. Heredity and variability. The role of G. Mendel in the discovery of the laws of inheritance. The essence of the 1st, 2nd, 3rd laws of inheritance. Analyzing crossing. The first scientific method of probability statistics, an assessment of the merits of the great monk N.V. Timofeev-Resovsky. Role in the 21st century. Basic concepts. Laws of inheritance.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2

4	Interaction of genes. Characteristics of the phenomenon: genes that violate the manifestation of Mendel's laws. Classification of types of inheritance. Interaction of allelic genes: incomplete dominance, multiple alleles, codominance . Interaction of non-allelic genes: complementarity, epistasis , pleiotropy, polygenic interaction. Examples from human genetics. The significance of the phenomenon of gene interaction. Classification of types of inheritance. Examples, significance of the phenomenon.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
5	Chromosomal theory of heredity. History of discovery, great participants, their merits. Chromosome – organization at stages of cell life cycle, role. Gene – definition. Provisions of chromosome theory – basis of material nature of heredity and variability. Concept of “gene” – idea of organization – XX century . Traits linked with sex.  Molecular basis of heredity and variability. Modern concept of gene. Gene expression, epigenomic factors of its regulation. Structural and functional levels of hereditary material organization. Genotype. Phenotype. Genome. Patterns of inheritance. Molecular basis of heredity. Variability. Research methods. Organization of acceptor and structural zones. Gene functions in pro- and eukaryotes. Stages of polypeptide synthesis (primary protein structure). Historical dynamics of the GENE concept. Modern definition: transcriptome. Classification of genes. Significance.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
6	Variability. Definition. Classification of types and kinds of variability. Characteristics of phenotypic (modification) variability. Concepts: reaction norm, modifications, individual adaptation. The significance of phenomena in biology and medicine. Genotypic variability. Combinative variability – mechanisms of occurrence of combinatorial variability. Prospects for studying combinatorial variability. Mutational variability. Classification. Examples. Mutation mechanisms. Mutagens. Definition. Modern classification of factors causing mutations. Antimutational mechanisms. Classification of types and kinds. Examples. The significance of the phenomenon in biology and medicine.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
7	Methods of genetic research. History and modernity. History of discovery, content of methods: twin, genealogical, dermatoglyphics, cytological (method of determining sex chromatin, cytogenetic, biochemical, population-statistical). Information value of methods, method of application. Introduction to modern methods of gene diagnostics : PCR, DNA probe diagnostics.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
<b>Total: 14 hours.</b>			
<b>2nd semester</b>			
1	Global and private problems of Parasitism. The relevance of studying the phenomenon. Global and particular problems of Parasitism. Conceptual apparatus	UC-1. UC-2. UC-4. UC-5. UC-6.	2

	<p>of science, contribution of scientists to the development of parasitology. Basic definitions of Parasitism, parasite, types of parasitism. Biological bases of parasitism and transmissible diseases. Distribution of parasitic forms in the animal world</p> <p>Main forms of biotic connections in anthro - biogeocenoses, transmissible and natural focal, parasitic diseases. Classification of parasites. Parasites of the types: Protozoa, Flatworms, Roundworms, Arthropods, their epidemiological significance. Algorithm for assimilation of biological and medical information on the characteristics of pathogens of invasions. Protozoa.</p>	GPC-1, GPC-10, GPC-11.	
2	<p>Parasitism. Special parasitology.</p> <p>Multicellular - representatives of the type Flatworms (trematodes, cestodes), type Roundworms (geohelminths, biohelminths), Arthropods - pathogens and carriers of invasions and infections. Relevance of the study, including in the Amur region on the examples of natural focal diseases (clonorchiasis, metagonimiasis, spring-summer encephalitis, etc.). Helminthiasis. Natural foci on the Amur - relevance of the study.</p>	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
3	<p>Ontogenesis. Modern concept of ontogenesis. Organism is the basic level of life organization. Ontogenesis theories – great scientists at the stages of development of the science of individual development. Modern concept of ontogenesis. Types of Ontogenesis. Classification. Examples in the Life system. Role of the organismic level of Life.</p> <p>Health criteria – arguments in the “I as an object of research” variant. Periodization of ontogenesis. Critical periods.</p>	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
4	<p>Mechanisms of individual development. MIR factors. Mechanisms of individual development – MIR at the stages of ontogenesis. Their universality and features of manifestation in the variant of human ontogenesis: fertilization, cell reproduction, cell differentiation, cell migration, embryonic induction, segmentation with the participation of homeotic genes, growth, regeneration. Genetic and epigenomic factors controlling MIR. Arguments. MIR disorders. Factors that disrupt individual development – congenital malformations. Modern technologies in the study of individual development. MIR disorders – factors and consequences.</p>	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
5	<p>Evolutionary biology – basic concepts, notions. Principles of evolution of systems and organs. Phylogenetic aspect. The importance of studying for understanding the patterns and features of human ontogenesis. Types of evolution. Mechanisms. Non-directional evolutionary factors.</p>	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
6	<p>Phylogenesis of the nervous system. Congenital malformations of the central nervous system. Principles</p>	UC-1. UC-2. UC-4. UC-5.	2

	of evolution of the nervous system in invertebrates. Role. Phylogenetic aspect of brain development in vertebrates, stages of formation of brain parts, cerebral cortex. Periods of brain development in humans. The importance of studying for understanding the patterns and features of human ontogenesis. Congenital malformations of the central nervous system – relevance of studying. Risk factors.	UC-6. GPC-1, GPC-10, GPC-11.	
<b>7</b>	Phylogenesis of circulatory systems, cardiovascular and respiratory systems. Substantiation of stages of the most important circulatory systems in the process of evolution of multicellular organisms. Stages of evolution of the cardiovascular system in vertebrates. Heart in human embryogenesis - critical periods. Congenital malformations of the cardiovascular system. Relevance of the study.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	<b>2</b>
<b>8</b>	Evolution of the urinary system. Stages of formation of excretory structures in invertebrates. Stages of kidney development in vertebrates. The role of the system. Stages of development of the urinary system in humans - repetition of phylogenesis. The significance of the stages of development. Congenital malformations of the urinary system.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	<b>2</b>
<b>9</b>	Phylogenesis of the reproductive system. Reproductive health issues. Phylogenesis of the urinary system. Stages and participants in the process. The role of all stages of development of the urinary system in the human body. Phylogenesis of the reproductive system. Stages. Stages of sexual differentiation. Pros and cons. Relevance of the study in the world, Russia, in the Amur region. ART.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	<b>2</b>
<b>10</b>	Geocology – the foundations of global science and health. Ecology, ecogenetics – in biology and medicine. Relationships between organisms and the environment, relationships between organisms in the phenomenon of “Parasitism”, in the relationship “Parasite - host”. Problems of human health. Efforts undertaken by the UN. Problems of Russia.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	<b>2</b>
<b>Total:</b>			<b>20 hours</b>

## 2.3 . Thematic plan of practical classes and their content

No · p/p	Name of the topics of practical classes	Contents of practical classes	Codes being formed competencies and indicators their achievements	Types control	We work hard bone (watch )
<b>1st semester</b>					
1.	Introduction to Cell Biology. Microscopic Method research. Structure of a microscope.	<p><b>Entrance control</b> (checking theoretical knowledge and practical skills developed by the Biology program in secondary (complete) general education institutions.</p> <p><b>Theoretical part:</b> Introduction to the subject. The role of biology in the system of medical knowledge. Basic concepts of biology. Objects of research. Research methods. Microscopic method of studying cells. Diversity of cells in the body of animals, humans. Relevance of studying the cellular level of organization of Life.</p> <p><b>Practical part:</b> Study of the structure of the microscope. Microscopy of plant and animal cells. Documentation in albums.</p>	UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- entrance testing - initial testing - frontal oral survey - checking the completion of practical tasks: results of work with a microscope, preparation of documentation (album)	2.0
2.	Cell biology. Cytoplasm. Organization. Role.	<p><b>Theoretical part</b> : Cell biology. Cytoplasm. Structure of the cytoplasm: cell membrane, matrix, organelles. Inclusions. General plan of structure, differences between plant and animal cells. Show a single plan of structure of the plant and animal world. Justification of the role of the cytoplasm, its systemic organization in the cell, as an open system.</p> <p><b>Practical part:</b> Microscopy of plant and animal cells. Study of electronograms, description, diagnostics of cellular structures. Documentation in albums.</p>	UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3.	- initial test control in the Moodle system - frontal oral survey - checking the completion of practical tasks: results of work with a microscope and electronograms, filling out documentation (album)	2.0

			GPC-11: AI 11.1. AI 11.2. AI 11.3.		
3.	Cell biology. Nucleus. Organization. Functions in the cell life cycle	<b>Theoretical part</b> : Biology of eukaryotic cells. Nucleus. Study of the general plan of the structure of the nucleus and its component unit, the chromosome, in the cell life cycle. Concepts: euchromatin and heterochromatin – meaning. Stages and phases of the life cycle. Cell division. Mitotic cycle, stages and periods. The essence of mitosis. Justification of the role of the nucleus in the cell life cycle. <b>Practical part:</b> Microscopy of cells at stages of the life cycle, identification of mitosis stages, diagnostics, description. Documentation in albums.	UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - frontal survey, - work on identifying the stages of the cell life cycle (checking the album) - documenting tasks in an album	2.0
4.	Reproduction is a property of living things. Organisms level . Meiosis: spermatogenesis , oogenesis. Fertilization	<b>Theoretical part</b> : Organismic level of life organization. Reproduction is a property that ensures the continuity of the existence of living things. Evolution of reproduction forms. Sexual reproduction. Gametogenesis. Meiosis. Show the stages of gametogenesis, meiosis. The essence of combinatorics of hereditary information and reduction of hereditary substance. <b>Practical part:</b> Microscopy of sex cells (roundworm egg, guinea pig, rooster sperm). Identification of meiosis stages at the stages of equine roundworm maturation – stage diagnostics. Documentation in albums.	UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing. - frontal oral survey - checking the completion of practical tasks in the album (structural and logical diagram of spermatogenesis, oogenesis)	2.0
5.	Control lesson on cell biology –	<b>Theoretical part</b> : Control lesson on Cell Biology (Diagnosticum-1). Test control in the Moodle system .	UC-1: AI 1.1. AI 1.2, AI 1.3. UK-2: AI 2.1. AI	- initial test control in the Moodle system .	2.0

	1 (diagnosticum)	Working with individual task cards, answering theoretical questions on the section. <b>Practical part:</b> Solving situational problems in cytology. Identification of schemes, micropreparations, electronograms .	2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- checking the results of work with individual task cards - assessment of the correctness of the solution of situational problems in cytology - identification of diagrams, micropreparations, electronograms .	
6.	Introduction to Genetics. Laws of Inheritance.	<b>Theoretical part</b> : Genetics – rating in the 21st century. Patterns of inheritance. Basic concepts in genetics. Mendel’s laws. Practical significance. <b>Practical part:</b> Show the types of inheritance when solving problems on Mendelian traits. Examples from human genetics. Independent (author's) compilation of the problem, protection of the content, solution - justification of the result.	UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- frontal survey - initial testing in the Moodle system - analysis of the results of solving problems compiled by students - analysis of the results of solving problems from the department's funds	2.0
7.	Gene interaction (GI). Classification. GI examples	<b>Theoretical part</b> : Interaction of genes. Concept. Classification of types of interaction of genes. Interaction of allelic, non-allelic genes. Examples from human genetics and medical genetics. <b>Practical part:</b> Solving problems on all types of interaction of allelic genes. On interactions of non-allelic genes: complementary type, epistasis , pleiotropy, polygenic interaction. Examples: signs within the reaction norm, hereditary diseases, syndromes ( Marfan , Van der Heve ), diseases with hereditary predisposition. The significance of the phenomenon in medical practice.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3.	- initial testing in the Moodle system . - control of the results of independent work - drawing up tasks on Human Genetics - solving problems for all types of VG, documentation of the solution in albums	2.0

			GPC-11: AI 11.1. AI 11.2. AI 11.3.		
8.	Chromosomal theory of heredity History of the study of heredity. Works of T.-H. Morgan and his associates. Provisions of HT	<b>Theoretical part</b> : Chromosomal theory of heredity. History of discovery, Participants. The role of the domestic school of geneticists (N.K. Koltsov). Material foundations of heredity - chromosomes - genes - gene linkage groups. Basic provisions of the chromosomal theory of heredity. Historical dynamics of gene study. Great patriots - contribution to Genetics. <b>Practical part:</b> Solving problems on sex-linked traits. Formulating conditions and solutions.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system . - compiling and solving problems on the VG on human genetics - solving and documenting situational problems in an album - interview on a block of control questions	2.0
9.	Modern concept of gene. Types and functions of gene.	<b>Theoretical part</b> : Modern concept of gene. Operon-transcriptome – concepts, models of organization. Gene functions. Stages and participants of protein synthesis in eukaryotes. Sex-linked inheritance . <b>Practical part:</b> Solving problems on the genetic code. Reading karyograms of <i>Drosophila</i> , humans and other species.	UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control over the compilation and solution of problems on the genetic code in the album - control of the design of the gene-transcription model	2.0
10.	Variability. Phenotypicity what variability. Genotypic variability . Arguments.	<b>Theoretical part</b> : Variability. Concept, classification. Phenotypic variability. Formulation of the concept of the main forms of variability and their role in ontogenesis. Practical actions, including solving problems illustrating modification variability, reproducing the limits of the reaction norm of human traits using examples. Know the concept of "adaptation", examples of individual adaptation. Genotypic variability. Types. Mechanisms of combinatorial variability. Mutational variability. Classification of mutation types. Mutagens.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3.	- initial testing in the Moodle system - control over the students' preparation of situational problems on different forms of variability in human genetics - checking independent solutions to problems from the department's collection - portrait diagnostics of hereditary diseases, syndromes	2.0

		<b>Practical part:</b> Proof of the role of mutagenic factors: SVZ – alcohol, nicotine, drugs, as mutagenic factors – arguments.	GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.		
11.	Introduction to Medical Genetics. Research Methods-1.	<b>Theoretical part :</b> Methods of studying human heredity and variability Genetic methods of human research: genealogical, twin, dermatoglyphics. <b>Practical part:</b> learn to analyze a pedigree using an algorithm; make and read dermatoglyphs . Use the Holzinger formula to justify the twin method and analyze the result. Solving problems of various types of hereditary diseases; on the analysis of the family tree in the variants of inheritance, sex-linked inheritance, penetrance and prognosis for the proband's children.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - analysis of the pedigree compiled by students with its analysis according to the algorithm - diagnostics of proposed genealogies - control of the created own glyphs and their analysis - control of diagnostics of proposed syndromic glyphs	2.0
12.	Introduction to Medical Genetics. Research methods – 2.	<b>Theoretical part :</b> Methods of studying human heredity and variability. Research methods in human genetics: cytological, cytogenetic, biochemical, population, PCR. <b>Practical part:</b> Learn to determine sex chromatin. Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome).	UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system . - frontal survey - analysis of students' diagnostics of sex chromatin - analysis of the work on determining the Holzinger coefficient and conclusions on it - diagnostics of karyograms	2.0
13.	<b>Control lesson on Genetics – 2 ( Diagnostics godfather-2)</b>	<b>Theoretical part :</b> Control lesson on genetics – 2 (diagnosticum). Includes test control with theoretical questions on all topics of practical lessons.	UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1.	- initial testing in the Moodle system - solving problems on all topics of genetics with analysis of design and output	2.0

		<b>Practical part:</b> solving situational problems of varying degrees of complexity, analysis of pedigrees, karyograms, portrait diagnostics, analysis of chromosome maps.	UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- control of identification of karyograms, glyphs ; karyotype formulas; results of portrait diagnostics	
14.	Protozoology – 1.	<b>Theoretical part :</b> Parasitology. Type Protozoa. Using microscopes, diagrams, for the purpose of diagnosis, study and substantiate the structural features, life cycle of the Sarcodaceae and Flagellates classes. Routes of infection and preventive measures for giardiasis, leishmaniasis, amebiasis, trypanosomiasis. Substantiate the relevance of studying these representatives, including in the Amur Region. <b>Practical part:</b> learn to solve and compose situational problems on invasions caused by representatives of the Sarcomastigophora type . Microscopy of Protozoa preparations, patterns of natural focal invasions (trypanosomiasis, leishmaniasis).	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - solving problems from the department's collection - analysis of filling information tables on the Simplest, according to the algorithm - control over verification and documentation of samples - analysis of the author's tasks and the correctness of their solution - assessment of protection projects: Biological and medical relevance of studying protozoonoses	2.0
15.	Protozoology – 2.	<b>Theoretical part :</b> Type Protozoa. Taxonomy. Study of the structure and life cycle of representatives of the classes Sporozoa and Ciliates using an algorithm. <b>Practical part:</b> identify on preparations. Justify in variants of problem tasks the routes of infection and measures of prevention of pathogens of malaria, toxoplasmosis, balantidiasis . Be able to justify the relevance of studying malaria and participants of a natural focus, the probability of its resumption in the territory of the Amur Region.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of the correctness of solving problems from the department's funds - analysis of filling information tables, according to the algorithm - control over verification and documentation of samples - analysis of the solution of the author's problems - project evaluation: Biological and medical relevance of studying protozoan invasions	2.0

16.	<b>Final lesson – certification for 1 semester</b>	<p><b>Theoretical part :</b> Certification based on the results of the 1st semester, including the level of knowledge acquisition, based on the results of control assignments, participation in educational and research work</p> <p><b>Practical part:</b> analysis of skills, possession of acquired knowledge;</p>	<p>UC-1: AI 1.1.  UC-2: AI 2.1.  UC-4: AI 4.2.  UC-5: AI 5.1.  UC-6: AI 6.1,  GPC-1: AI 1.3.  GPC-10: AI 10.2.  AI 10.3.  GPC-11: AI 11.1.  AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system  - control of the solution of problems on Protozoology from the funds of the department - analysis of the results of visual diagnostics of parasites</p>	4.0
				<b>Total hours:</b>	<b>34.0</b>
<b>2nd semester</b>					
1.	Parasitism. Type Flatworms. Trematodoses.	<p><b>Theoretical part :</b> Type Flatworms. Features of the structure of Flatworms. Features of the structure, life cycle of the class Flukes on micropreparations, diagrams, microphotographs. Routes of infection and preventive measures for fascioliasis , opisthorchiasis, dicrocoeliosis .</p> <p><b>Practical part:</b> Microscopy of preparations. Solving the proposed and compiling situational tasks on the specified parasites.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.  UK-2: AI 2.1.  ID 2.2. AI 2.3.  UK-4: AI 4.2.  UK-5: AI 5.1. AI 5.2.  UK-6: AI 6.3.  OPK-10: AI 10.2. AI 10.3.  OPK-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system  - control of the results of solving problems on Trematodoses  - analysis of the correctness of filling in information tables according to the algorithm  - verification and documentation of samples  - output test control</p>	3.00
2.	Far Eastern natural focal trematodosis. Relevance.	<p><b>Theoretical part :</b> Far Eastern trematodes. Biology of Far Eastern trematodes: clonorchis , metagonimus , paragonimus , nanophyetes , schistosomes. Life cycles.</p> <p><b>Practical part:</b> Microscopic analysis of endemics on preparations, microphotographs. Ability to differentiate from opisthorchis and other trematodes. Importance of the study.</p>	<p>UK-1: AI 1.1. AI 1.2, AI 1.3.  UC-4: AI 4.2.  UC-5: AI 5.1.  UC-6: AI 6.1,  GPC-1: AI 1.3.  GPC-10: AI 10.2. AI 10.3.  GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system  - quality control of solutions to problems on Far Eastern trematodes  - analysis of filling information tables  - verification and documentation of samples  - output test control  - analysis of research projects.</p>	3.00

3.	Cestodoses. Peculiarities of life cycles with specific examples: pork tapeworm, beef tapeworm.	<p><b>Theoretical part</b> : Class Tapeworms. General characteristics of tapeworms. Structure and life of pork and bovine tapeworms – on micropreparations, photo illustrations, macropreparations. Argumentation of the importance of studying taeniasis .</p> <p><b>Practical part:</b> Microscopic analysis of morphological features of cestodes in connection with the parasitic way of life. Solving situational problems.</p>	<p>UC-1: AI 1.1. AI 1.2, UC-2: AI 2.1. AI 2.2. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. ID 11.2. AI 11.3.</p>	<p>-- initial testing in the Moodle system - control of the results of solving problems on Cestodoses - analysis of filling information tables - verification and documentation of samples, life cycle schemes - output test control - analysis of research projects.</p>	3.00
4.	Cestodoses: broad tapeworm, echinococcus, alveococcus , dwarf tapeworm.	<p><b>Theoretical part</b> : Tapeworms - 2. Features of the structure and life cycle of the broad tapeworm, participants in the natural focus of diphyllbothriasis. Dwarf tapeworm - the danger of autoinvasion and autoreinvasion for a child's body. Fundamentals of pathogenesis. Endemics: echinococcus, alveococcus - participants in the life cycle - definitive and intermediate hosts. Danger of infection. <b>Practical part:</b> Microscopic analysis of morphological features of the listed cestodes. Solving situational problems. Justification of diagnostic methods.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system - control of the results of solving problems on Cestodoses, including the author's - analysis of filling information tables - verification and documentation of samples, life cycle schemes - output test control - protection and analysis of research projects</p>	3.00
5.	Nematodoses are geohelminths.	<p><b>Theoretical part</b> : Type Roundworms. Class – Nematodes. Geohelminths, relevant for the Amur region. Biological feature. Life cycles on the example of: roundworm, whipworm, pinworm, hookworm. Study of signs of adaptation to parasitism.</p> <p><b>Practical part:</b> Microscopic analysis of nematode morphology. Solving situational problems. Justification of diagnostic methods.</p>	<p>UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-5: AI 5.1. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3.</p>	<p>- initial testing in the Moodle system - control of the correctness of the solution of problems on Nematodoses , including the author's - analysis of work with information tables - verification and documentation of samples, life cycle schemes - output test control</p>	3.00

			GPC-11: AI 11.1. AI 11.2. AI 11.3.	- protection and analysis of research projects	
6.	Nematodoses are biohelminths.	<p><b>Theoretical part</b> : Roundworms – biohelminths. Peculiarities of the life cycle on the example of trichinella, guinea worm, filaria . Characteristics of endemic areas, natural foci. Relevance of studying trichinosis in the Amur region. Annelids. Aromorphoses in the characteristics of Annelids. The structure of the medicinal leech.</p> <p><b>Practical part:</b> Microscopic analysis of the morphology of biohelminth nematodes and Annelids. Solving situational problems.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.  UC-2: AI 2.1. AI 2.2. AI 2.3.  UC-4: AI 4.2.  UC-5: AI 5.1. AI 5.2.  UC-6: AI 6.1, AI 6.3.  GPC-1: AI 1.3.  GPC-10: AI 10.2. AI 10.3.  GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system  - control of the correctness of the solution of problems on Nematodoses , including the author's  - analysis of work with information tables  - verification and documentation of samples, life cycle schemes  - output test control  - protection and analysis of research projects</p>	3.00
7.	<b>Control lesson – 4 on helminthology (Diagnostics godfather-1)</b>	<p><b>Theoretical part</b> : Control tasks on Helminths (Diagnosticum-2).  <b>Practical part:</b> Diagnostic verification of helminths on preparations, microphotographs, diagrams. Solving situational problems.</p>	<p>UC-1: AI 1.1.  UC-2: AI 2.1.  UC-4: AI 4.2.  UC-5: AI 5.1.  GPC-1: AI 1.3.  GPC-10: AI 10.2. AI 10.3.  GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system  - control of the correctness of the solution of problems in Helminthology  - identification of parasites on preparations, microphotos , diagrams</p>	3.00
8.	Arthropods. Aromorphoses of the type. Representatives. Order Ticks. Features. Medical significance.	<p><b>Theoretical part</b> : Type Arthropoda. Taxonomy. Aromorphoses of representatives of the type Arthropoda. Classes: Crustacea, Arachnida. Characteristics of arthropods. Structure and medical significance of crustaceans and arachnids. Order Ticks. Taxonomy of the order. Features of structure, life cycle, its participants - on preparations, diagrams, microphotographs. Justification of the medical significance of all representatives.</p> <p><b>Practical part:</b> Identification on preparations: taiga tick, dog tick, dermacentor , village tick, scabies mite; life cycle</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.  UC-2: AI 2.1. AI 2.2. AI 2.3.  UC-4: AI 4.2.  UC-5: AI 5.1. AI 5.2.  UC-6: AI 6.1, AI 6.3.  GPC-1: AI 1.3.</p>	<p>- initial testing in the Moodle system  - control of the correctness of the solution of problems on Acarinoses , including the author's  - analysis of the results of work with information tables  - control of verification and documentation of tick preparations, life cycle schemes  - output test control</p>	3.00

		stages. Solving situational problems. Justification of the relevance of the study in the Amur Region.	GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. ID 11.2. AI 11.3.	- protection and analysis of research projects: a. KVLE – relevance of the study in the Amur region; b. vaccination against EVD.	
9.	Orders Lice, Fleas, Bedbugs, Cockroaches. Medical significance.	<b>Theoretical part</b> : Class Insects. Orders Lice and Fleas. Characteristics of insects - aromorphoses and idioadaptations. Features of the structure of the orders Lice and Fleas. Practical study of the order of lice, fleas on preparations. Diagnostics of features. Orders Bugs, Cockroaches . Features of the structure, life cycle. Justification of medical significance. Relevance of the study in the Amur Region. <b>Practical part:</b> Identification on preparations; life cycle stages. Solving situational problems. Justification of the relevance of the study in the Amur Region.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- Evaluation of testing results in the Moodle system . - Control of problem solving, including author's. - Analysis of work with information tables. - Control of verification and documentation of preparations of life cycle schemes. - Test control - day off. - Defense and analysis of R&D projects: a. pediculosis - relevance of study in the Amur region; b. Cockroaches: what is the threat?	3.00
10.	Order Diptera. Biological features, medical significance.	<b>Theoretical part</b> : Insects. Order Diptera. Characteristics of the class Insects. Diversity of families. Features of the structure, life cycle, habitat of representatives of the families Mosquitoes, Flies, Sandflies, Gadflies. Medical significance. <b>Practical part:</b> Study on preparations of the development cycle of representatives of the Order Diptera: families Mosquitoes; Flies; Sandflies; Gadflies; Horseflies. Identification on diagrams - carriers and pathogens of protozoan invasions. Relevance of the study.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- Evaluation of testing results in the Moodle system . - Control of problem solving, including author's. - Analysis of the results of work with information tables. - Control of verification and documentation of samples in life cycle schemes. - Test control - output. - Defense and analysis of research projects: a. Malaria – relevance of study in the Amur region; b. Trypanosomiasis - participants in the software?	3.00

11.	<b>Control lesson on Arachnoentomology ( Diagnostikum-2)</b>	<b>Theoretical part</b> : Test questions on the theory of Arachnoentomology and Protozoology – Arthropods. <b>Practical part:</b> diagnostics of samples, solving situational problems.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of the correctness of the solution of problems in Arachnoentomology and Protozoology - analysis of parasite identification on preparations, microphotographs, diagrams - protection of research projects	3.00
12.	Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.	<b>Theoretical part</b> : Chordata type. Characteristics of the type. Evaluation criteria. Lower Chordata – Amphioxus. Practical study of Amphioxus on preparations as a manifestation of the axialization stage in humans during embryogenesis. Taxonomy of Chordata type. Main aromorphoses of representatives of the Vertebrate subtype. Phylogenesis of the nervous system (NS). Models of NS evolution in invertebrates: diffuse, lattice types of nervous system; ganglionic-reticular type. Evolution of the reflex arc. Stages of CNS evolution in vertebrates. Phylogenesis of brain regions. Features of brain development and structure in human ontogenesis. Congenital malformations of the CNS. <b>Practical part:</b> Factors causing disruption of brain development mechanisms. Study of variants of congenital malformations of the human brain.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - frontal survey - vocabulary dictation (basic concepts of EB) - identification of stages of evolution using diagrams and dummies - protection of research projects – biological and medical substantiation of the relevance of studying the phylogenesis of the central nervous system and congenital malformations of humans. - output test control	3.00
13.	Evolution of circulatory systems. Phylogenesis of the cardiovascular and respiratory systems. VPR.	<b>Theoretical part</b> : Phylogenesis of the cardiovascular and respiratory systems. Objective: to form in students an understanding of the unity of development, the role in the evolution of the respiratory and circulatory systems of Invertebrates and Chordates. To substantiate the role of all stages of development of the cardiovascular and respiratory systems for human embryonic development, the	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2.	- initial testing in the Moodle system - frontal survey - vocabulary dictation (basic concepts of EB) - identification of stages of evolution using diagrams and dummies - protection of research projects - biological and medical substantiation	3.00

		<p>participation of the structures of the gill apparatus in the development of embryonic rudiments.</p> <p><b>Practical part:</b> Substantiation of the role of genetic and epigenomic factors in the development of these systems in human embryogenesis and the formation of congenital malformations of the cardiovascular and respiratory systems, prevention of developmental defects. Intrauterine diagnostics.</p>	<p>UC-6: AI 6.1, AI 6.3.</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>of the relevance of studying the phylogenesis of the cardiovascular and respiratory systems, and the congenital malformations of these human systems.</p> <p>- output test control</p>	
14.	<p>Evolution of the genitourinary system. Stages. Role.</p> <p>Arguments of the 21st century.</p>	<p><b>Theoretical part :</b> Phylogenesis of the genitourinary system. Stages of evolution in invertebrates and the role of systems. Unity of development of the urinary and reproductive systems.</p> <p><b>Practical part:</b> Justification of repetition of stages of MPS phylogenesis in human ontogenesis: pronephron , primary kidney, definitive kidney. The significance of each stage in the full development of the organism and systems. Practical identification of stages of MPS and MPS development on preparations and diagrams. MPS congenital malformations.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.</p> <p>UC-2: AI 2.1. AI 2.2. AI 2.3.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1. AI 5.2.</p> <p>UC-6: AI 6.1, AI 6.3.</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. ID 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system</p> <p>- frontal survey</p> <p>- vocabulary dictation (basic concepts of EB)</p> <p>- identification of stages of evolution according to schemes</p> <p>- protection of research projects "Reproductive Health - Pros and Cons"</p>	3.00
15.	<p><b>Control lesson on the phylogenesis of organs and systems (diagnostics)</b></p>	<p><b>Theoretical part :</b> Final lesson on phylo-, ontogenetics in the aspect of human health. Control forms of credit on lecture material and practical classes. Defense of research and development work on current problems of human ontogenesis.</p>	<p>UC-1: AI 1.1.</p> <p>UC-2: AI 2.1.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1.</p> <p>UC-6: AI 6.1,</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system</p> <p>- control of identification on diagrams of representatives (taxons), processes and participants</p> <p>- analysis of research projects</p>	3.00
16.	<p><b>Olympics</b></p>	<p><b>In the discipline Biology</b></p>		<p>All forms of control, project protection</p>	3.00

17.	Certification lesson at the end of the 2nd semester.	Certification lesson. Summing up the results of training. Results of the defense of research and development work by students	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- Intermediate distance testing in the Moodle system - Summing up the results of the Olympics - Analysis of training results	4.00
				<b>Total for the 2nd semester:</b>	<b>52,00</b>
				<b>Total hours in Biology:</b>	<b>86,00</b>

## 2.4 . Interactive forms of learning

interactive methods are widely used in practical classes. training (interactive survey, work in small groups, computer testing, etc.), participation in educational and research and scientific research work.

No. p/p	Topic of practical lesson, lecture	Labor intensity per hour.	Interactive form of learning	Labor intensity in hours and % from the lesson
1.	Introduction to Cell Biology. Microscopic Method of Research	2.0	- Testing in the Moodle system - Mini-lectures on the history of cytology. - MMP on modern methods of studying cells.	20 min. (0.22 hours) 11%
2.	Cell biology. Cytoplasm. Organization. Role.	2.0	- Testing in the Moodle system - Video film: In the world of the cell. - Illustrated task maps – identification and motivation.	20 min. (0.22 hours) 11%
3.	Cell biology. Nucleus. Organization. Functions in the cell life cycle	2.0	- Testing in the Moodle system - MMP on the discovery of apoptosis. - Find the participants in the protein synthesis model - who has more?!	20 min. (0.22 hours) 11%
4.	Reproduction is a property of living things. Organismic level. Meiosis: spermatogenesis, oogenesis. Fertilization.	2.0	- Modeling a life situation (“effective parents”); - Implementation of role functions in order to justify negative effects; - MMP: illustration of pathospermia variants ; - ART – effect!?	20 min. (0.22 hours) 11%
5.	Control lesson on cell biology – 1 (diagnosticum)	2.0	- Testing in the Moodle system - protection of individual task cards with a set of visual and text tasks and assignments	
6.	Introduction to Genetics. Laws of Inheritance.	2.0	- Portrait diagnostics of great compatriots and foreigners.	20 min. (0.22 hours) 11%
7.	Interaction of genes. Classification. Examples of VG.	2.0	- Testing in the Moodle system - Discussion about the diversity of manifestations of VG; - Role play: "Crystal child - who is to blame?!" - MMP - "Crystal boy - who is to blame?!" - Briefing: "One humanity with different blood types!?"	20 min. (0.22 hours) 11%
8.	Chromosomal theory of heredity. History of the study of heredity.	2.0	- Testing in the Moodle system 1. Group discussion: on the role of genetics in biology and medicine. 2. MMP – about Morgan’s personality and his team.	20 min. (0.22 hours) 11%

<b>9.</b>	Modern concept of gene. Types and functions of gene.	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Protection of gene models, stages of protein synthesis.</li> <li>- Author's problems on the genetic code - competition.</li> </ul>	20 min. (0.22 hours) 11%
<b>10.</b>	Variability. Phenotypic variability. Genotypic variability. Arguments.	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Discussion (small groups) about life reserves.</li> <li>- Role play: diagnosis of a hereditary disease.</li> <li>- Discussion: the most terrible mutagens?!</li> </ul>	20 min. (0.22 hours) 11%
<b>11.</b>	Introduction to Medical Genetics. Research Methods- 1.	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Competition for the most capacious pedigree.</li> <li>- Discussion about twins.</li> <li>- Student glyphs - in correlation with other phenes.</li> <li>- Collective solutions to diagnostic problems.</li> </ul>	20 min. (0.22 hours) 11%
<b>12.</b>	Introduction to Medical Genetics. Research Methods – 2.	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Discussion (small groups) about the methods and effectiveness of gene diagnostics .</li> <li>- Identification of sex chromatin in patient smears.</li> <li>- Reading karyograms with diagnosis substantiation.</li> <li>- Collective solutions to situational problems.</li> </ul>	20 min. (0.22 hours) 11%
<b>13.</b>	Control lesson on Genetics – 2 (diagnosticum)	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Protection of individual task cards with a set of visual and text tasks and assignments.</li> <li>- Protection of personal projects in the form of annotations</li> </ul>	20 min. (0.22 hours) 11%
<b>14.</b>	Protozoology - 1	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Justification in variants of problem tasks of the routes of infection and measures for the prevention of amebiasis, trypanosomiasis, leishmaniasis, giardiasis, trichomoniasis.</li> </ul>	20 min. (0.22 hours) 11%
<b>15.</b>	Protozoology - 2	<b>2.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game - in role-playing performance: <ul style="list-style-type: none"> <li>- the patient's parent,</li> <li>- pediatrician,</li> <li>- infectious disease doctor,</li> <li>- geneticist - diagnostics:</li> <li>- malaria;</li> <li>- toxoplasmosis;</li> <li>- balantidiasis .</li> </ul> </li> </ul> <p>Applicable to all parasitic taxa with justification for the relevance of study.</p>	20 min. (0.22 hours) 11%

16.	Control lesson on Protozoology – 3 (diagnosticum)	2.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Abstract defense: tropical diseases – relevance of study.</li> <li>- Diagnostics of pathogens (MP) with justification according to the algorithm.</li> <li>- Defense of variants of problematic tasks on Protozoology.</li> </ul>	20 min. (0.22 hours) 11%
17.	Final lesson – certification for 1 semester	2.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>Systematization of the effectiveness of material acquisition at the end of the semester, taking into account forms of interactive learning.</li> </ul>	20 min. (0.22 hours) 11%
<b>2nd semester</b>				
1.	Parasitism. Type Flatworms. Trematodoses.	3.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Dictionary of terms in Helminthology.</li> <li>- Business game: substantiation of the diagnosis of trematodosis in role-playing variants.</li> </ul>	20 min. (0.44 hours) 13.5%
2.	Far Eastern trematodoses – pathogens. Relevance.	3.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game - in role-playing performance: <ul style="list-style-type: none"> <li>- pediatrician, - infectious disease specialist,</li> <li>- geneticist - diagnostics:</li> <li>- clonorchiasis, paragonimiasis with arguments for the relevance of the study.</li> </ul> </li> </ul>	20 min. (0.44 hours) 13.5%
3.	Cestodoses. Peculiarities of life cycles with specific examples: pork tapeworm, beef tapeworm.	3.0	<ul style="list-style-type: none"> <li>- Verify on preparations, microphotographs. - Justify in variants of problem tasks the routes of infection and measures of prevention of pathogens of cestodiasis.</li> </ul>	20 min. (0.44 hours) 13.5%
4.	Cestodoses: broad tapeworm, echinococcus, alveococcus, dwarf tapeworm.	3.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game – role-playing: <ul style="list-style-type: none"> <li>- pediatrician,</li> <li>- parasitologist,</li> <li>- laboratory doctor.</li> </ul> </li> <li>- Mini-lecture: argumentation of the relevance of studying cestodes.</li> </ul>	20 min. (0.44 hours) 13.5%
5.	Nematodoses are geohelminths.	3.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game – role-playing: <ul style="list-style-type: none"> <li>- pediatrician, - parasitologist,</li> <li>- laboratory doctor.</li> </ul> </li> <li>- Mini-lecture: argumentation of the relevance of studying geohelminth nematodes.</li> </ul>	20 min. (0.44 hours) 13.5%
6.	Nematodoses are biohelminths.	3.0	<ul style="list-style-type: none"> <li>1. Business game: in role-playing: <ul style="list-style-type: none"> <li>- pediatrician,</li> </ul> </li> </ul>	20 min. (0.44 hours) 13.5%

			<ul style="list-style-type: none"> <li>- parasitologist,</li> <li>- geneticist - diagnostics.</li> </ul> <p>2. Nematodes of hot countries and the Far Eastern Federal District - with arguments for the relevance of the study.</p> <p>3. Life cycles - ?</p>	
<b>7.</b>	Control lesson on helminthology – 4 (diagnosticum)	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Verification of parasites (in slide variants, MMP).</li> <li>- Discussion: the most terrible "beast" of the Amur region!?</li> </ul>	20 min. (0.44 hours) 13.5%
<b>8.</b>	Arthropods. Aromorphoses of the type. Representatives. Order Ticks. Features. Medical significance.	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> </ul> <p>1. Business game: role-playing: - pediatrician,</p> <ul style="list-style-type: none"> <li>- parasitologist,</li> <li>- geneticist - diagnostics.</li> </ul> <p>2. Ticks - diversity in the Far Eastern Federal District - with arguments for the relevance of the study.</p> <p>3. Protection of life cycle schemes, participants.</p>	20 min. (0.44 hours) 13.5%
<b>9.</b>	Orders Lice, Fleas, Bedbugs, Cockroaches. Medical significance.	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Press conference: The relevance of studying Lice and Fleas in the 21st century in Russia, Amur region.</li> <li>- MMP: life cycle of cockroaches</li> <li>- relevance of study in the world, Amur region.</li> </ul>	25 min. (0.55 hours) 17.2%
<b>10.</b>	Order Diptera. Biological features, medical significance.	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game: roles of doctors: - pediatrician,</li> <li>- infectious disease doctor,</li> <li>- geneticist - diagnostics: with argumentation of relevance.</li> <li>- Booklets (MMP) on malaria prevention and more.</li> </ul>	20 min. (0.44 hours) 13.5%
<b>11.</b>	Control lesson on Arachnoentomology – 5 (diagnosticum)	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Verification of parasites (in slide variants, MMP).</li> <li>- Discussion: the most terrible beast on our planet!?</li> </ul>	20 min. (0.44 hours) 13.5%
<b>12.</b>	Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Briefing: on the concepts of evolution and the role of Darwin.</li> <li>- Dictionary of terms of evolutionary biology – control dictation.</li> </ul>	20 min. (0.44 hours) 13.5%
<b>13.</b>	Evolution of circulatory systems.	<b>3.0</b>	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> </ul>	25 min.

	Phylogenesis of the cardiovascular and respiratory systems. VPR.		<ul style="list-style-type: none"> <li>- Case method : On the relevance of cardiovascular diseases.</li> <li>- Field situations (experience); (my problem),</li> <li>- armchair situation.</li> <li>- Express learning method: Why can't you smoke!?</li> <li>- Defense of booklets on the role of genetic and epigenomic factors in the development of systems in human embryogenesis and the formation of congenital malformations.</li> </ul>	(0.55 hours) 17.2%
14.	Evolution of the genitourinary system. Stages. Role. Arguments of the 21st century.	3.0	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Modeling a life situation ("effective parents");</li> <li>- Implementation of role functions in order to justify negative effects;</li> <li>- MMP – illustration of pathospermia ;</li> <li>- ART – effect!?</li> </ul>	20 min. (0.44 hours) 13.5%
15.	Control lesson on the phylogenesis of organs and systems - 6 (diagnosticum)	3.0	<ol style="list-style-type: none"> <li>1. Case method. On the relevance of the phylogenesis of vital systems: <ul style="list-style-type: none"> <li>- field situations (experience); (my problem),</li> <li>- armchair situation.</li> </ul> </li> <li>2. Express learning method: Why can't you smoke!?</li> <li>3. Defense of booklets on the role of genetic and epigenomic factors in human embryogenesis and the formation of congenital malformations.</li> </ol>	20 min. (0.44 hours) 13.5%
16.	Olympics	3.0	Individual task cards. Project protection.	3.25
17.	Certification lesson at the end of the 2nd semester.	4.0	<ul style="list-style-type: none"> <li>- Final midterm testing.</li> <li>- Press conference: The relevance of studying biological and medical problems in the 21st century in the world, in Russia, and the Amur region.</li> <li>- MMP: life cycle of cockroaches</li> <li>- relevance of study in the world, Amur region.</li> </ul>	20 min. (0.44 hours) 13.5%

### 2.5. Criteria for assessing students' knowledge

The assessment of learning outcomes is carried out in accordance with the “Regulations on the system for assessing the learning outcomes of students of the Federal State Budgetary Educational Institution of Higher Education Amur State Medical Academy of the Ministry of Health of Russia.

The basis for determining the level of knowledge, skills, and abilities are the assessment criteria - completeness and correctness:

- correct, precise answer;
- correct but incomplete or imprecise answer
- incorrect answer; no answer.

When assigning marks, the classification of errors and their quality are taken into account:

- gross errors;
- similar errors;
- minor errors; shortcomings.

The success of students in mastering the topics of the discipline "Medical Informatics" is determined by the quality of mastering knowledge, skills and practical abilities, the assessment is given on a five-point scale:

- "5" - excellent,
- "4" - good,
- "3" - satisfactory,
- "2" - unsatisfactory.

#### Evaluation criteria

Quality of development	Mark on a 5-point scale
90 - 100%	"5"
80 - 89%	"4"
70 - 79%	"3"
less than 70%	"2"

#### **Incoming inspection**

Conducted during the first lesson, includes: solving problems and exercises; testing in the Moodle system .

Access mode **for 1 semester:** <https://educ-amursma.ru/course/view.php?id=644>

**For 2nd semester:** <https://educ-amursma.ru/course/view.php?id=102>

The test control includes 40 questions on the subject of Biology, studied in institutions of secondary (complete) general education.

#### **Current control**

Current control includes initial and final knowledge control.

Initial control **is** carried out by the teacher at the beginning of each lesson in the form of a frontal survey, solving problems and exercises.

Final control – includes quality control of independent work and its design in an album , written work on options, testing in the Moodle system .

Access mode: <https://educ-amursma.ru/course/view.php?id=692>

The final grade during the current knowledge assessment is given on the day of the lesson, as the arithmetic mean result for all types of activities provided for in the given lesson of the discipline's work program.

#### **Criteria for assessing the oral response**

- **“5” (excellent)** – the student demonstrates deep and complete knowledge of the educational material, does not allow inaccuracies or distortions of facts when presenting, presents the material in a logical sequence, is well oriented in the presented material, and can provide justification for the judgments expressed.

- **“4” (good)** - the student has mastered the educational material in full, is well oriented in the educational material, presents the material in a logical sequence, but makes inaccuracies when answering.

- **“3” (satisfactory)** – the student has mastered the basic principles of the topic of the practical lesson, but when presenting the educational material, he/she makes inaccuracies, presents it incompletely and inconsistently, requires leading questions from the teacher to present it, and has difficulty substantiating the judgments expressed.

- **“2” (unsatisfactory)** – the student has fragmented and unsystematic knowledge of the educational material, is unable to distinguish between the main and the secondary, makes

mistakes in defining basic concepts, distorts their meaning, and cannot independently present the material.

**Assessment criteria for the practical part**

- **“5” (excellent)** – the student has fully mastered the practical skills and abilities provided for by the course work program.
- **“4” (good)** – the student has fully mastered the practical skills and abilities provided for in the course program, but makes some inaccuracies.
- **“3” (satisfactory)** – the student has only some practical skills and abilities.
- **“2” (unsatisfactory)** – the student demonstrates the performance of practical skills and abilities with gross errors.

**Criteria for assessing independent extracurricular work:**

- the level of student mastery of the educational material;
- the completeness and depth of general educational concepts, knowledge and skills on the topic being studied, to which this independent work relates;
- development of universal and general professional competencies (ability to apply theoretical knowledge in practice).
- the problems were solved correctly, the exercises were completed, and the test assignments were answered accurately – “passed”.
- not solved correctly, exercises were not completed correctly, test questions were not answered accurately – “failed”.

**Essay evaluation criteria:**

- **“5” (excellent)** – awarded to a student if he has prepared a complete, detailed, and formatted according to requirements, abstract on the chosen topic, presented his work in the form of a report with a computer presentation, and answered questions on the topic of the report;
- **“4” (good)** – awarded to a student for a complete, detailed essay that is formatted according to requirements, but poorly presented;
- **“3” (satisfactory)** – the abstract does not contain information on the issue being studied in full, is formatted with errors, and is poorly presented;
- **“2” (unsatisfactory)** – given to a student if the abstract is not written, or is written with gross errors, the report and computer presentation are not prepared, or their content does not correspond to the topic of the abstract.

**Working off disciplinary debts.**

1. If a student misses a class for a valid reason, he/she has the right to make it up and receive the maximum grade provided for by the course work program for that class. A valid reason must be documented.
2. If a student misses a class for an unjustified reason or receives a "2" mark for all activities in the class, he/she is required to make it up. In this case, the mark received for all activities is multiplied by 0.8.
3. If a student is excused from a class at the request of the dean's office (participation in sports, cultural and other events), then he is given a grade of "5" for this class, provided that he submits a report on the completion of mandatory extracurricular independent work on the topic of the missed class.

**2.5.1. Assessment scales for current knowledge control**

The success of students in mastering the discipline (topics/sections), practical skills and abilities is characterized by a qualitative assessment and is assessed on a 5-point system: “5” - excellent, “4” - good, “3” - satisfactory, “2” - unsatisfactory.

**Criteria for assessing the theoretical part**

**“5”** - for the depth and completeness of mastery of the content of the educational material, in which the student is freely oriented, for the ability to use theoretical knowledge when performing practical skills, for a convincing demonstration of skills, the ability to correctly express and argue judgments, correctly and logically present an answer; when testing, allows up to 10% of erroneous answers.

**“4”** - the student has fully mastered the educational material, is oriented in it, correctly presents facts and justifies their role, however, the content and form have some inaccuracies; during testing, allows up to 20% of erroneous answers.

"3" - the student has mastered the knowledge, demonstrates an understanding of the main provisions of the educational material, but presents it incompletely, inconsistently, does not know how to correctly express and convincingly substantiate his judgments; when testing, allows up to 30% of erroneous answers.

"2" - the student has incomplete, fragmented, unsystematic knowledge of the educational material, is unable to distinguish between the main and secondary, makes mistakes in defining concepts, distorts their meaning, presents the material in a disorderly and uncertain manner; when tested, makes more than 30% of erroneous answers.

#### **Assessment criteria for the practical part**

"5" - the student has fully mastered the practical skills and abilities provided by the course work program, is able to diagnose an object, and solve problems and assignments.

"4" – the student has fully mastered the practical skills and abilities provided for in the course's work program, but makes some inaccuracies.

"3" – the student has only some practical skills and abilities.

"2" - the student performs practical skills and abilities with gross errors.

#### **Essay evaluation criteria**

"5" – the abstract fully reflects the meaning of the project, is problematic in nature with respect to the material, is designed according to the requirements, and is well presented.

"4" - the abstract is complete, detailed, formatted according to requirements, but its main problem is not sufficiently substantiated; poorly presented during the defense.

"3" – the abstract is complete, but formatted with errors and poorly presented.

"2" – the abstract is not submitted or is written with serious errors.

#### **Album Design Evaluation Criteria**

"5" - the content of the self-study material and the amount of work completed in class are fully, creatively and competently presented.

"4" - mostly competent, but not fully presented self-study material, there are comments during the final check.

"3" - the material is not fully and not properly formatted, there are errors in its formatting; does not regularly complete the practical assignment.

"2" - there is no system for completing self-study, the practical part of the assignment is not completed regularly and incompletely, and the assignment is not properly designed .

#### **Working off disciplinary debts**

If a student misses a class for a valid reason, he/she has the right to make it up in the allotted time and receive the maximum grade provided by the course work program for that class. A valid reason must be documented.

If a student misses a class for an unjustified reason or receives a "2" mark for all activities in the class, he/she is required to make it up. In this case, the mark received for all activities is objective, taking into account the quality of the answer.

If a student is excused from a class at the request of the dean's office (participation in sports, cultural and other events), then he is given a grade of "5" for this class, provided that he submits a report on the completion of mandatory extracurricular independent work on the topic of the missed class.

A student can claim to receive an "excellent" grade automatically if he/she has won a prize in disciplinary (Biology) or interdisciplinary Olympiads (university, regional) and has an average grade for the current academic performance of at least 4.8 . A student can refuse the "automatic" grade and take the test together with the group on a general basis.

#### **Assessment criteria for midterm assessment**

Interim certification is carried out in 3 stages:

1. Intermediate test control in " Moodle "

<https://educ-amursma.ru/mod/quiz/view.php?id=15714>

2. Submission of practical skills (competencies) – individual task card.

3. Answers to the examination ticket (3 questions).

The success of students in mastering the discipline (topics/sections), practical skills and abilities is characterized by a qualitative assessment and is assessed on a 5-point system:

- **"5" - excellent** - the content of the self-study material and the completed volume of work in class are fully, creatively and competently presented - for the completeness and depth of assimilation of the educational material, the student's ability to easily navigate the content, the ability to competently use theoretical material in applied actions, argue their judgments, competently and logically analyze phenomena and facts when presenting an answer; competently and confidently diagnose samples, solve and justify the answers to problems and assignments with possibly one permissible mistake; when testing allows no more than 10% of erroneous answers.

- **"4" - good** - for the correct presentation of the content of the material, the correct solution of the problem or assignment; generally correct argumentation of the answer, demonstrated ability to independently and competently present the material, analyze phenomena and facts, make independent generalizations and conclusions, but allowing some inaccuracies when performing practical actions, allowing no more than 2 errors or typos; when performing test control, up to 20% of incorrect answers are allowed.

- **"3" - satisfactory** - is given to a student if he/she has presented the facts in general, tried to independently analyze phenomena and facts, make generalizations and conclusions, but when solving practical tasks had difficulty in answering and made up to 3 mistakes; when assessing the test control, "3" is given to a student if incorrect answers amounted to 30% ;

- **"2" - unsatisfactory** - is given to a student if the material is not fully and correctly covered, gross errors are made, there is no understanding of the main essence of the material, its analysis; problems or tasks are solved incorrectly, samples are not diagnosed, objects are not justified when describing; the student cannot independently answer the questions; shows an inability to analyze the material, makes more than 4 errors. During the test control, incorrect answers amounted to 30% or more.

The conversion of the mark into a point scale is carried out according to the following scheme:

Stages	Grade	Final assessment
1. Test control in the Moodle system	3 - 5	<b>Satisfactorily</b> <b>Fine</b> <b>Great</b>
2. Passing practical skills (competencies)	3 - 5	
3. Answers to ticket questions	3 - 5	
1. Test control in the Moodle system	2	<b>Unsatisfactory</b>
2. Passing practical skills (competencies)	2	
3. Answers to ticket questions	2	

## 2.6. Independent work of students: in-class and out-of-class.

### Independent classroom work of students

For each practical lesson there are methodological recommendations containing the goals and objectives of studying the topic, a list of theoretical questions, practical tasks and methods for conducting them, recommendations for presenting the results obtained, tasks for self-control with standard answers, a list of recommended literature.

Preparation for the lesson and formation of an idea of the content of the topic being studied takes place outside of class time.

For independent work of students, from 1/4 to 1/2 of the lesson time is allocated, which is intended for completing practical assignments, recording the results obtained in an album, completing individual assignments (for example, solving problems), etc. If necessary, the teacher consults the student and simultaneously analyzes the student's ability to apply the knowledge gained to solve practical problems.

For the discipline Biology, for each practical lesson a methodological development has been compiled for the student's independent work, which contains the following algorithm for independent activity:

**Goal-setting stages of independent work of students:**

- a. Personal work with ready-made didactic tools
- b. Individual work with complex teaching aids
- c. Collective activity based on independent work
- g. Individual independent work with elements of directed research search
- d. Using independent work for research creativity (in and out of class time).

**Types of personal work with ready-made didactic tools**

- a) Working with traditional sources of information:
  - educational literature
  - scientific literature (periodicals)
  - monographic literature
  - "live" source of information - teacher
- b) Working with educational teaching aids:
  - preparations (macro-, micro-preparations)
  - tables
  - dummies
- c) Working with control means:
  - "blind" preparations, slides
  - situational tasks
  - illustrations (options for lesson or test topics)
  - test tasks
  - task cards for tests on biology topics
- d) Acquisition of research skills
- d) Individual independent work with elements of research search.

**Specific forms of current independent individual work of students**

- a. Familiarization with literature containing additional information on a specific biological problem (monographs, scientific periodicals),
- b. including the use of modern information remote means (Internet, Moodle , others)
- g. Search for literature containing educational medical information on biological problems
- d. Reproduction of drawings, diagrams, tables reflecting the characteristics of a certain biological object of medical significance, its habitat (ecological niche), its organization, phenotypic characteristics and participants in life cycles, etc.
- e. Development of schemes, classifications, tables on any problem, their protection
- g. Study of an additional preparation (slide) on the topic of the lesson, discussion of distinctive features.
- z. "Reading" microphotographs, electronograms , structural-logical diagrams, which consolidates the assimilation of the textbook material, expands the information field.

**Organization of extracurricular independent work**

No . p/p	Topic practical lesson	Time to prepare student to class	Forms of extracurricular independent work student work	
			Mandatory and the same for all students	At the student's choice
1.	Introduction to Cell Biology. Microscopic Method	1.0	Study of theoretical material on the topic of the practical lesson (lecture material, reading of basic and additional	1. Arguments: on the role of biology in the system of natural scientific knowledge in the 21st century

	research		educational literature, writing notes, solving test tasks, preparing a workbook, working with Internet sources).	2. Production of MMP: portraits of “Great cytologists”. 3. The history of the creation of the microscope – great names. 3. Modern methods of studying cells. 4. Nuclear magnetic microscope – real possibilities and prospects for studying structures.
2.	Cell biology. Cytoplasm. Organization. Role.	<b>1.0</b>	Study of theoretical material on the topic of the practical lesson (lecture material, reading of basic and additional educational literature). Drawing up a structural and logical diagram of the “Organization of the cytoplasm”. Working with Internet sources)	1. <b>Stand</b> : “Modern cell model” - protection from possession. 2. Microscopy of additional preparations. 3. Methods in MMP: 2. 2. Electron microscope – operating principle, capabilities, prospects for improvement 3. Autoradiography is one of the options for studying the function
3.	Cell biology. Nucleus. Organization. Functions in the cell life cycle	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Scheme: the structure of the nucleus and its functional system - DNA-RNA in the life cycle of the cell. Contents of all stages of the mitotic cycle.	1. Competition: structural and logical scheme of oogenesis – comparative aspect. 2. MMP: History of the study of mitosis. 3. Stages of cell preparation for division – interesting facts about the main thing. 4. The core – in the levels of organization, the microscopic picture.
4.	Reproduction is a property of living things. Organismic level. Meiosis: spermatogenesis , oogenesis. Fertilization	<b>1.4</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Draw a diagram of spermatogenesis, cells at the stages of meiosis. Designate the mechanisms of combinatorial variability. Comparison with oogenesis.	1. Competition for the optimal structural and logical scheme of spermatogenesis - arguments. 2. Microscopy of rat testicle. Description, photo documentation. 3. Discussion : How to protect the reproductive system?!
5.	Control lesson on cell biology – 1 (diagnosticum)	<b>1.0</b>	Repetition of theoretical material: (lecture material, reading of basic and additional educational literature) on cell biology. Control tasks on Cell Biology – 1: Test control. Solving problems on cytology.	1. Defense of situational problems in cell biology. Defense of author's tasks in cytology. 2. Credit for completed versions of independent work.

6.	Introduction to Genetics. Laws of Inheritance.	1,2	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Protecting Inheritance Types when solving problems on Mendelian traits. Examples from human genetics. Independent problem solving.	- MMP – history of the development of genetics. - Compilation of tests. - Independent (author's) compilation of the task, defense. - Vocabulary dictation – compilation, implementation.
7.	Interaction of genes. Classification. Examples of VG	1,2	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Examples from human genetics and medical genetics according to VG, problem solving.	Presentations on inheritance: - blood groups, - codominance , - incomplete dominance, - Bombay Phenomenon, - polygeny (growth), - complementary type. Tasks, protection.
8.	Chromosomal Theory of Heredity. History of the Study of Heredity	1,2	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Basic principles of the chromosomal theory of heredity. Problem solving.	Presentations: History of the discovery of HT. Participants. - The role of the domestic school of geneticists ( N.K. Koltsov ). - Compiling problems on sex-linked traits. on human genetics. Solving situational (clinical) problems.
9.	Modern concept of gene. Types and functions of gene.	1,2	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Protein synthesis diagram in the album. Sex -linked inheritance . Practical problem solving. Independent problem solving: condition, solution, answers.	Presentation and defense: - Models of gene organization. - Participants in protein synthesis and their functions. - Enhancers, silencers and other "controllers" of protein synthesis. - Reading karyograms of the fruit fly Drosophila. - Hymn to the Drosophila fly?!
10.	Variability. Phenotypic variability. Genotypic variability. Arguments.	1,2	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Practical activities: solving problems illustrating modification variability, reproducing the limits of the reaction norm of human traits using examples. Knowing the concept of "adaptation", examples of individual adaptation. Genotypic variability. Types. Mechanisms of combinatorial variability. Mutational variability.	Presentations: - Genetic basis of adaptation. - Human vital activity reserves – examples. - Combinative variability and modern humanity. - Types of gene mutations. - Variants of chromosomal mutations. - Examples of genomic mutations. - Mutagens far and near – arguments of relevance. - Information: SVZ – alcohol, nicotine, drugs as mutagenic factors. Students' assessment.

			Classifications of mutation types in hereditary pathology.	
11.	Introduction to Medical Genetics. Research Methods-1.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Practical activities: learn how to analyze a pedigree using an algorithm, make and read dermatoglyphs . Use the Holzinger formula to justify the twin method. Solve problems on pedigrees in inheritance variants. penetrance and prognosis for the proband's children.	<ul style="list-style-type: none"> <li>- Compilation of a pedigree with its analysis using an algorithm.</li> <li>- Competition for the most interesting tree.</li> <li>- Diagnostics of proposed genealogies. Protection of the best.</li> <li>- Making your own glyphs and analyzing them.</li> <li>- Diagnostics of the proposed syndromic glyphs .</li> <li>- Presentations:</li> <li>- These amazing twins!?</li> </ul>
12.	Introduction to Medical Genetics. Research Methods-2.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Solving problems on determining sex chromatin; Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome).	1. Diagnostics of sex chromatin variants. Definition of the Holzinger coefficient , conclusion. Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome). Diagnostics of the proposed karyograms.
13.	Control lesson on Genetics – 2 (diagnosticum)	<b>1,2</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature). Test control, solving situational problems of varying degrees of complexity, analysis of pedigrees, karyograms, portrait diagnostics, analysis of chromosome maps.	<ul style="list-style-type: none"> <li>- Analysis of UIR activity.</li> <li>- Solving problematic issues in human genetics.</li> <li>- Identification of exclusive karyograms.</li> <li>- Portrait diagnostics of karyotypes of patients with different nosologies.</li> </ul>
14.	Protozoology – 1.	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Microscopy of parasites. - Problem solving for diagnostic purposes Drawing up situational tasks on invasions caused by representatives of the classes Flagellates and Sarcods.	<ul style="list-style-type: none"> <li>- Presentations of your choice: Amebiasis, leishmaniasis, trypanosomiasis, giardiasis, trichomoniasis.</li> <li>- Compilation of information tables of parasites according to the algorithm.</li> <li>- Evidence of the relevance of studying representatives in the Amur region.</li> </ul>
15.	Protozoology – 2.	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Microscopy of parasites. - Problem solving for diagnostic purposes	<ul style="list-style-type: none"> <li>- Presentations: Malaria plasmodium, toxoplasma, Balantidia intestinalis.</li> <li>- History of malaria in the Amur region.</li> </ul>

			Filling in information tables according to the algorithm. Drawing up situational tasks on invasions caused by representatives of the classes Sporozoa, Ciliates.	- Arguments for the relevance of studying the causative agents of malaria, toxoplasmosis, balantidiasis in variants of problematic tasks.
16	Control lesson on Protozoology Diagnostics - kum-3	1.5	Repetition of theoretical material: (lecture material, basic and additional educational literature). Control of assimilation of the problem Protozoology. Verification of preparations, schemes, situational tasks, problem assignments.	Analysis of UIR activity. - Solving problematic tasks on the simplest human. - Identification of exclusive photo documents. - Diagnosis of nosologies.
17	<b>Final lesson – certification for 1 semester</b>	1.5	Certification based on the results of the first semester, including the level of acquisition of knowledge and skills in practical classes; results of control classes, participation in educational and research work.	Defense of the UIR, quality analysis. Assessment of students in the 1st semester.
	<b>Total: 24.0</b>	<b>20.0</b>		<b>4.0</b>
<b>2nd semester</b>				
1.	Parasitism. Type Flatworms. Trematodoses.	2.0	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Features of the structure of flatworms, life cycle of the class Flukes on micropreparations, diagrams, microphotographs. Routes of infection and measures to prevent fascioliasis , opisthorchiasis, dicrocoeliosis .	- Presentations: Trematodes - causative agents of fascioliasis , opisthorchiasis, dicrocoeliosis - Competition of information tables (by algorithm). - Verification and documentation of d samples. - Test control. - Brochures on the prevention of trematodosis.
2.	Far Eastern trematodoses – pathogens. Relevance.	2.0	Study of theoretical material: (lecture material, reading of basic and additional educational literature): Far Eastern trematodoses. - Test control. - Practical analysis of endemics on preparations, microphotographs. Ability to differentiate from opisthorchis and other trematodes. Importance of study.	- Presentations: Far Eastern trematodes - causative agents of clonorchiasis , metagonimiasis , nanophyetosis . - Schistosomiasis is relevant! - Competition of information tables (by algorithm). - Verification and documentation of rare samples. - Brochures on the prevention of trematodosis.
3.	Cestodoses. Peculiarities of	2.0	Study of theoretical material: (lecture material, reading of	- Presentations:

	life cycles with specific examples: pork tapeworm, beef tapeworm.		basic and additional educational literature): cestodes. Test control. - Microscopic analysis. The importance of studying pork and beef tapeworm, in photo illustrations, diagrams.	Arguments for the importance of studying taeniasis ; cysticercosis. - Filling in information tables according to the algorithm. - Verification and documentation of rare samples.
4.	Cestodoses: broad tapeworm, echinococcus, alveococcus , dwarf tapeworm.	<b>2.0</b>	Study of theoretical material: reading basic and additional educational literature): cestodes. - Test control. - Microscopic analysis, - Diagnostics using photo illustrations and diagrams. Endemics - echinococcus, alveococcus - participants in the life cycle - definitive and intermediate hosts. Danger of infection.	Presentations: 1. Dwarf tapeworm – the danger of autoinvasion and autoreinvasion for children. 2. Arguments for the importance of studying echinococcosis; alveococcosis. 3. Participants in the natural focus of diphyllbothriasis. 4. Verification and documentation of rare samples. 5. Diagnostic methods
5.	Nematodoses are geohelminths.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): cestodes. Type Roundworms. Class - Nematodes. Microscopy of geohelminths. - Problem solving. - Test control. - Analysis of signs of adaptation to parasitism.	Presentation: - Biological peculiarity of ankylostomids. - Life cycles using the example of: roundworm, whipworm, pinworm. - Nematodes - relevant for the Amur region. - Competition of information tables (by algorithm).
6.	Nematodoses are biohelminths.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): roundworms – biohelminths. Microscopy of Trichinella. Filling in information tables according to the algorithm: - trichinella, guinea worm, - filariasis.	Presentation: - Characteristics of endemic areas, natural foci. - The relevance of studying trichinellosis in the Amur region. - Annelids. Aromorphoses - The structure of the medicinal leech, Use in medicine.
7.	Control lesson on helminthology gi-4 (diagnosticum)	<b>2.0</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature): cestodes. Verification of helminths by samples. Solving situational problems. Test control.	Analysis of UIR activity. - Protection of copyright tasks. - Identification of exclusive photo documents. - Diagnosis of helminthiasis.
8.	Arthropods. Aromorphoses of the type.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional	Presentations: - Arthropoda diversity. Classes: Crustacea,

	Representatives · Order Ticks. Features. Medical significance.		educational literature): cestodes. Type Arthropoda. Taxonomy. Aromorphoses of representatives of the type Arthropoda. Order Mites. Taxonomy of the order. Microscopic preparations: features of structure, life cycle, documentation of preparations. Problem solving. Filling in information tables according to the algorithm.	- Arachnids. - Justification of the medical significance of representatives of the order Ticks: taiga tick, dog tick, dermacentor , village tick. - Relevance of the study in the Amur region. - Outbreak of pediculosis in the Amur region.
9.	Orders Lice, Fleas, Bedbugs, Cockroaches. Meaning.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): microscopy of lice, fleas, bedbugs, cockroaches. Diagnostics of features. Problem solving. Test control. Justification of medical significance. Relevance of study in the Amur region.	Presentations: - Characteristics of the class Insects: aromorphoses, idioadaptations. Significance. Relevance of the study in the Amur region. - Cockroaches - epidemiology. - Protection of information tables (according to the algorithm).
10	Order Diptera. Biological features, medical significance.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): Order Diptera. Diversity of families. Microscopy of representatives: Mosquitoes, Flies, Sandflies, Gadflies - documentation of samples. - Problem solving. - Test control.	Presentations: - Components of a natural malaria focus. - Medical significance of mosquitoes. - Components of the natural focus of leishmaniasis. - Components of the natural focus of trypanosomiasis. - Medical significance. Midges of the genus Simulium .
11	Control lesson on Arachnoentomol ogy-5 (diagnosticum)	<b>2.0</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature). - diagnostics of samples, - solving situational problems, - test control of acquired knowledge.	Analysis of UIR activity. - Protection of copyright tasks. - Identification of exclusive photo documents. - Diagnostics of Diptera.

12	Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Taxonomy of the phylum Chordata, subphylum Vertebrata. Phylogenesis of the nervous system. Microscopy of lancelet preparations. Test control. Identification of stages of evolution using diagrams. - Vocabulary dictation (basic concepts of EB).	Presentations: - Concepts of the evolution of Life. - Basic concepts of evolutionary theory. - Types of evolution – including about humans. - Examples of aromaphoses . - Stages of evolution of the nervous system in invertebrates: - The stage of axialization in humans during embryogenesis. - Stages of development of the central nervous system in humans, mechanisms. - Great evolutionists. - Factors that cause congenital malformations of the central nervous system.
13	Evolution of circulatory systems. Phylogenesis of the cardiovascular and respiratory systems. VPR.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): phylogenesis of the cardiovascular and respiratory systems. - Vocabulary dictation (basic concepts of EL). Final control. - Identification of stages of evolution using diagrams.	Presentations: - Stages of heart development – mechanisms. - Variants of congenital malformations of the human heart - The role of genetic and epigenomic factors in the development of cardiovascular diseases. - On the unity of development, the role of the respiratory and circulatory systems of the branches of evolution.
14	Evolution of MPS, stages Role. Arguments of the 21st century.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): phylogenesis of the genitourinary system. Stages of evolution in invertebrates and the role of systems. The importance of each stage in the full development of the organism and systems. Identification of stages of development of the genitourinary system and the reproductive system on preparations and diagrams. Test control. Identification of stages of evolution using diagrams.	Presentations: Stages of MPS evolution in Invertebrates, the role of systems. MPS evolution in Vertebrates, the role of systems. - Unity of development of the MWS and PS. - The role of stages: probud , primary bud, definitive bud. Project defense: "Reproductive Health - Pros and Cons" - VPR MPS - factors.
15	Credit lesson on phylogenesis of	<b>2.0</b>	Repetition of theoretical material: (lecture material,	Project protection:

	organs and systems-6 (diagnosticum)		basic and additional educational literature): phylo-, ontogenetics in the aspect of human health. - Test control. - Answers to questions. - Identification of taxa and participants in phylo- and ontogenesis on diagrams.	- Problems of phylo-, ontogenetics in the aspect of human health. - The law of phylembryogenesis – A. N. Severtsov. - My choice of system and its protection from mutagens.
16	Certification lesson at the end of the 2nd semester.		Certification lesson. Summing up the results of training. Results of the defense of research and development work by students	Remote testing in the Moodle system . Analysis of results.
	Total:	<b>30.0</b>		<b>6.0</b>

## 2.7 Project (research) work students

Research (project) work (R&D) of students of the Faculty of Medicine is a mandatory section of the discipline and is aimed at the comprehensive formation of general cultural and professional competencies of students, provides for the study of specialized literature and other scientific and technical information on the achievements of domestic and foreign science and technology in the relevant field of knowledge, participation in scientific research, etc. The topics of R&D can be chosen by students independently in consultation with the teacher, or from the list below (taking into account the scientific directions of the department).

### Research areas in the discipline "Biology":

1. Parasitism. Far Eastern trematodoses. Natural focal and endemic diseases.
2. Ontogenetics – aspects and problems of individual human development.
3. Historical perspectives of the discipline Biology in Medicine. The role of domestic scientists and great foreigners.

### Examples of student work topics:

1. The Genetic Burden of Humanity and Ecogenetics – the Demand for Science in the 21st Century
2. The most vulnerable human system - its problems in the real world
3. Riddles of brain development and its problems: world, Russia, Amur region
4. Glorious sea, sacred Baikal - its health in the 21st century
5. Ecological values of our native land
6. Environmental issues in the variant of the capital of the Amur region
7. Amur River - Common Problems and Solutions
8. The Trouble of Small Rivers: Native Burkhanovka in Blagoveshchensk
9. Health education for the masses: participation of first-year students of Amur State Medical Academy in disease prevention
10. Comparative characteristics of schistosomes, relevance of the study
11. Magnificent aromorphoses on the example of actual helminths – statistics of humanity
12. "What does it mean to be great?" - about those who predicted our future.

Students go through stages of work during the year: - choosing a topic, - collecting scientific literature; - preparing a work project; - preparing for a problem conference and participating in it; - participating in the Olympiad on problems of biology and medicine.

Based on all criteria: high binary assessment, successful completion of all stages (SSS, Olympiad, distance assessment), a student can claim an “excellent” grade without an exam. The decision is made by the departmental meeting.

### Criteria for assessing students' research (project) work:

- the material on the results of the research in the report is presented in detail, the specialized literature is well-developed, scientific and technical information on the achievements of domestic and foreign science and technology in the relevant field of knowledge is studied - "passed".
- the material on the results of the research in the report is not presented accurately enough, the special literature is poorly studied, the scientific and technical information on the achievements of domestic and foreign science and technology in the relevant field of knowledge is not studied - "failed".

## 3. EDUCATIONAL, METHODOLOGICAL, MATERIAL, TECHNICAL AND INFORMATION SUPPORT OF THE DISCIPLINE

### 3.1. Primary literature

1. Pekhov A.P. Biology: medical biology, genetics and parasitology: textbook for universities / Moscow. - GEOTAR-Media. - 2014. - P. 656. - ISBN 978-5-9704-3072-9. - Access mode: <http://www.studmedlib.ru/book/ISBN9785970430729.html>
2. Yarygin V.N. Biology: textbook: in 2 volumes / Moscow: GEOTAR-Media. - 2020. - T. 2. - P. 560 p. - ISBN 978-5-9704-5308-7. Access mode: <http://www.studmedlib.ru/book/ISBN9785970453087.html>
3. Yarygin V.N. Biology. T. 1. / Moscow: GEOTAR-Media. - 2020. - P. 728. - ISBN 978-5-9704-5307-0. - Access mode: <http://www.studmedlib.ru/book/ISBN9785970453070.html>

### 3.2. Further reading

1. Gigani O.B. Biology: a guide to laboratory classes: a tutorial / Moscow: GEOTAR-Media. - 2016. - P. 272. - ISBN 978-5-9704-3726-1. - Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785970437261.html>
2. Markina V.V. Biology. Guide to practical classes: textbook / Markina V.V., Oborotistov Yu.D., Lisatova N.G. - Moscow: GEOTAR-Media. - 2015. - P. 448 - ISBN 978-5-9704-3415-4. - Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785970434154.html>
3. Chebyshev N.V. Biology. Guide to laboratory classes: textbook / Moscow: GEOTAR-Media. - 2015. - P. 384. - ISBN 978-5-9704-3411-6. - Access mode: <http://www.studmedlib.ru/ru/book/ISBN9785970434116.html>

### 3.3 Educational and methodological support for the discipline prepared by the department staff:

1. Tseluiko S.S., Chertov A.D., Grigoriev N.R., Smirnov V.A., Borodin E.A., Dorovskikh V.A. Histophysiology of the respiratory organs // Blagoveshchensk. – 2012 (UMO No. 189/05-20)
2. Zabolotskikh T. V., Grigorenko G. V., Medvedeva S. V., Gordienko E. N. Parasitic diseases in pediatric practice: a tutorial // Blagoveshchensk. - 2018, 92 p. (UMO No. 405 ECU. 05/17/2018)

#### Electronic and digital technologies

Electronic teaching aids have been developed and posted in the Electronic Information System of the Federal State Budgetary Educational Institution of Higher Education Amur State Medical Academy

Access mode for 1 semester: <https://educ-amursma.ru/course/view.php?id=644> ;

For 2nd semester: <https://educ-amursma.ru/course/view.php?id=102>

**Multimedia presentations** ( Microsoft Power Point ), to lecture-type classes, according to the thematic plan of lectures

Access mode for 1 semester: <https://educ-amursma.ru/course/view.php?id=644> ;

For 2nd semester: <https://educ-amursma.ru/course/view.php?id=102>

**Videos, photo materials for lectures and classes**

<b>Photo - video materials</b>		
1. Micrographs of cells at different stages of the life cycle - sets for diagnostic classes in the section "Cell Biology"	Sets by 32 cards	Video cassettes, CDs , DVDs  <b>Sets of micrographs for personal use</b>
2. Microphotographs on Genetics - sets for diagnostic classes in the section "General Genetics"	Sets by 32 cards	
3. Microphotographs on "Helminthology" - sets for diagnostic classes on the section "Parasitism"	Sets by 32 cards	
4. Microphotographs on " Arachnoentomology " - sets for diagnostic classes on the section "Parasitism"	Sets by 30 kart	
5. Microphotographs: "Congenital malformations" - topographic and anatomical variants.	Sets by 32 cards	
6. Microphotographs "Mechanisms of individual development"	Slides in MMP (20)	
7. Phylogenesis of organs and systems. a. Evolution of Chordates b. Phylogenesis of the central nervous system c. Phylogenesis of the cardiovascular system, respiratory systems g. Evolution of the urinary system systems d. Evolution of the reproductive system	Slides – MMP (30)  Slides MMP By 20 for the system	

**Stands, tables, tablets, handouts used for teaching students**

<b>Educational materials</b>	<b>Quantity</b>
Stands:	3
a. Genetics: "Great compatriots and foreigners – lessons for the future";	4
b. Parasitism: "Parasites - relevance and study algorithm"	3
Tables for practical work:	
a. Genetics: a set of lessons on the Fundamentals of Human Genetics;	20
b. Parasitism: a set of tables on human parasites.	25
Multimedia materials for practical classes:	6
- Parasitism - objects of study in medicine (for 5 lessons)	5

**Sets of tables, diagrams for practical classes**

**1. Cell biology.**

**1.1 Microscopic technique**

1. Structure of a light microscope
2. Electron microscope structure diagram

**1.2. Cell biology. Cell theory**

3. Comparative characteristics of plant and animal cells
4. Electron diffraction pattern of a eukaryotic cell
5. Volumetric diagram of the ultrastructure of a eukaryotic cell
6. Mitochondria (ultrastructure compared to chloroplasts)
7. Plate complex (light and electron microscopy)
8. Animal cell inclusions
  - fat, protein, carbohydrate;
  - pigment;
  - secretory.

**1.3. Life cycle of a cell:**

1. Mitotic cycle of eukaryotic cells (diagram)
2. Mitosis of plant cells. Stages of mitosis
3. Mitosis of animal cell. Stages of mitosis
4. Amitosis of epithelial cells.
5. Interphase cells – description. Meaning.

**1.4. Reproduction of organisms. Meiosis. Fertilization**

1. Classification of reproduction types (diagram)
2. Gametogenesis - oogenesis scheme
3. Gametogenesis - scheme of spermatogenesis
4. Meiosis in the egg of Ascaris
5. Fertilization of the roundworm egg
6. Sperm - Variations in Nature
7. Egg cells – structural features of female gametes.

**1.5. Providing diagnostics – 1.****2. Genetics General. Human Genetics**

**2.1.** Formal genetics: Hybridological method; inheritance patterns according to Mendel. Illustrations to Mendel's experiments.

**2.2. A set of tables on the topic "Interaction of genes"**

- Multiple alleles
- Pleiotropy
- Epistasis (animals)
- Epistasis (Bombay Phenomenon)
- Polymerization (options)
- Complementarity.

**2.3. Complex to the topic: Chromosomal theory of T. H. Morgan :**

- Karyotype of Drosophilamelanogaster
- Karyogram of Drosophila fly
- Sex-linked traits
- Map of chromosomes of Drosophila flies.

**2.4. Modern concept of gene :**

- Scheme of operon organization
- Human chromosome maps
- The phenomenon of transformation
- The phenomenon of transduction
- Phenomenon of lysogeny
- The spiral of life is the DNA molecule

**2.5. Modification variability :**

- illustrations of variants of modifying factors.

**2.6. Genotypic variability**

- Classification of mutations
- Illustrations of gene mutations
- Illustrations of chromosomal mutations
- Illustrations of genomic mutations
- Mechanisms of combinatorial variability.

**2.7. Methods of genetic research – 1**

- Twin Method (illustrations of the method)
- Concordance - discordance - determination of the variability index
- Genealogical method – variants of inheritance types on diagrams:
  - autosomal dominant; - autosomal recessive
  - X-linked dominant; - X-linked recessive
  - Holandric inheritance )
- Dermatoglyphics method:
  - finger patterns - principles of identification
  - palm patterns - "reading pictures"

- variants of dermatoglyphs in patients with hereditary pathology.

## **2.8. Methods of genetic research – 2**

- Cytological (determination of sex chromatin)
- Cytogenetic (compilation and analysis of karyogram)
- Variants of karyograms (using examples of syndromes - genomic mutations)
- Population statistical method (determination of allele frequencies in populations)
- Biochemical method (with specific examples)
- PCR – polymerase chain reaction.

## **2.9. Providing diagnosticum-2**

- Test tasks. - Illustrated task cards. - Sets of problems.

## **3. Fundamentals of parasitology. Parasitism.**

### **3.1. Protozoa – human parasites – general illustrations**

#### **Class Flagellates :**

- genus Leishmania. - genus Trypanosoma.
- genus Lamblia. - genus Trichomonas.

#### **Class Sarcodidae. Order Amoeba.**

- Dysenteric amoeba. Structure. Development cycle.

### **3.2. Class Sporozoans:**

- Genus Plasmodium. - Genus Coccidia.

#### **Class Infusoria :**

- Paramecium caudatum (model for study)
- Balantidium intestinalis (structure, development cycle)

## **3. 3. Providing diagnostics – 2**

### **3.4. Providing the final lesson of the 1st semester.**

#### **2nd semester**

### **3. Parasitism. Multicellular organisms are parasites of humans.**

#### **3. 1. Helminthiasis . Type Flatworms. Class Flukes:**

- Liver fluke - structure, development cycle
- Siberian fluke - structure, development cycle
- Lanceolate fluke - structure, development cycle
- Features of the structure of the reproductive system of trematodes.

#### **3.2. Far Eastern trematodoses:**

- Chinese fluke - structural features, development cycle
- Japanese fluke - structural features, development cycle
- Nanofiet Shikhobalova - structural features, development cycle
- Schistosomes. Classification. Structural features. Development cycle.

#### **3.3. Helminthiasis. Cestodoses:**

- Beef tapeworm. Structure.
- Beef tapeworm. Life cycle (larval stages)
- Pork tapeworm. Structure of segments. Differences.
- Pork tapeworm. Development cycle, features of larval stages.
- Features of the structure of the reproductive system of cestodes (comparison with trematodes).

#### **3.4. Helminthiasis. Cestodoses:**

- Echinococcus. Structure, development cycle
- Broad tapeworm. Features of a mature specimen.
- The development cycle of the broad tapeworm. Stages in comparison with cestodes

(above)

- Dwarf tapeworm. Features of the parasite's structure.
- The development cycle of the dwarf tapeworm. Methods of infection.

#### **3.5. Helminthiasis. Type Roundworms – geohelminths:**

- Human roundworm. Structure.
- Human roundworm. Development cycle - stage of migrating larva.
- Trichuris. Structural features. Development cycle.

- Pinworm. Structure. Development cycle.
- Roundworm eggs. Ovohelminth diagnostics .

### **3.6. Helminthiasis. Type Roundworms – biohelminths:**

- Trichinella. Structural features. Development cycle.
- Participants in the natural focus of trichinellosis.
- Guinea worm. Structure. Peculiarities of the life cycle in a natural focus.
- Invasion and migration of dracunculiasis in the human body. Prevention.
- Filariasis :
- Vuchereria Bancroft
- Brugiamalaya
- Loa - Loa
- Onchocerca
- Features of the structure of filariae .
- Development cycles, participants of life cycles. Prevention tropical natural focal helminthiasis.

### **3.7. Providing diagnostics – 3**

### **3. 8. Type Arthropoda. Features of structure, development cycle.**

#### **Taxonomy of the type. Class Crustacea, orders:**

- Crayfish - general structure, features and aromorphoses

#### **Class Arachnida, orders:**

- Scorpions - Salpugs . - Spiders. Structural features. Development cycle.

### **3.9. Class Arachnida, order Ticks**

- Systematics of the order. Main genera
- Genus Ixodidae Families: Dermatocentr , Ixodidae,
- Family: Argasidae - village tick
- Scabies mites
- Development cycle of ixodid ticks

### **3.10. Class Insects. General characteristics. Taxonomy**

#### **Secondarily wingless. Orders:**

- Lice. - Fleas. - Life cycle of Lice. - Life cycle of Fleas.

### **3.11. Class Insects. Order Diptera. Families:**

#### **Mosquitoes. Genera:**

- Anopheles. - Culex . - Aedes . - Features of the life cycle of mosquitoes.
- Mosquito heads (mouthparts). - Mosquito wings.

#### **Orders: Bugs; Cockroaches :**

- Bed bug. - Bed bug mouthparts. - Cockroach mouthparts.

### **3.12. Class Insects. Order Diptera. Families:**

#### **Flies. Gadflies. Horseflies.**

- The mouthparts of the housefly. - The structure of the autumn stingray.
- Structure of the Tse-Tse fly . - Gadflies. Features of the development cycle.

### **3.13. Providing diagnostics – 3.**

### **4.5. Phylogenesis of organs and systems with the basics of Ontogenetics.**

#### **Mechanisms of individual development. Disorders - VPR**

#### **4.5.1. Phylogeny of organs and systems. Introduction to evolutionary biology.**

##### **Type Chordata. Lower Chordata:**

- Lancelet, total preparation
- Lancelet, cross section (pharynx, gill slits)
- Lancelet, transverse section (intestinal tube)
- Ascidia

#### **4.5.2. Phylogenesis of the nervous system. CNS congenital malformations**

- Variants of the structure of the nervous system of Invertebrates
- Neural tube of the Lancelet
- Neural tube of a chicken embryo

#### **4.5.3. Phylogenesis of the cardiovascular system organs. Congenital malformations of the heart.**

**Phylogeny of the respiratory system**

- Stages of evolution of circulatory systems in invertebrates
- Abdominal aorta of Lancelet
- Heart of the Pisces class representatives
- Stages of evolution of the respiratory system in invertebrates
- Gill apparatus of the Lancelet
- Stages of evolution of the respiratory system of Chordates
- Mammalian embryo lungs

**4.5.4. Phylogenesis of the genitourinary system. VPR**

- MPS variants in Invertebrates
- Lancelet Buds
- Lancelet gonads
- Stages of development of the mammalian MPS

**5. Semester test (sets of preparations, task cards, problems)****Multimedia materials, electronic library, electronic library systems (ELS), list of multimedia materials on electronic media**

No. p/p	Name of multimedia presentations	View	Number of copies
A.1.	<b>Section 1. Cell Biology</b> 1. Study of Cell Biology - Introduction to Genetics	CD-R	2
2.	<b>Section 2. Genetics</b> 2. Introduction to Genetics	CD-R	2
	3. History of the development of genetics - stages 3. History of the development of genetics – great compatriots and foreigners.	CD-R	2
3.	<b>Section 3. Fundamentals of parasitology.</b> 1. Parasitism – aspects of studying the problem. Protozoa – parasites of humans	CD-R	2
	2. Trematodoses. Relevance and aspects of study in the Far Eastern region	CD-R	2
	3. Cestodoses - pathogens, relevance	CD-R	2
4.	<b>Section 4. Phylogenesis of organs and systems. Human ontogenetics – basics.</b> 4. History of the development of ontogenetics - stages of creation of the concept of "Epigenetic Preformism".	CD-R	2
	1. Critical periods of ontogenesis.	CD-R	2
	2. Mechanisms of Ontogenesis. Factors, their regulating.	CD-R	2
	7. Introduction to the basics of evolutionary biology;	CD-R	2
	8. Phylogenesis of the nervous system – stages of evolution. Cephalization .	CD-R	2
	9. Phylogenesis of circulatory systems, cardiovascular system;	CD-R	2
10. Evolution of the urinary system – arguments of stages, their roles.	CD-R	2	
	11. Phylogenesis of the reproductive system. Floors sexual differentiation.	CD - R	2
	<b>B.</b> Presentations prepared based on research materials (scientific and educational conferences of teachers and students)	CD-R	1
	<b>B.</b> Presentations prepared based on materials from the department's methodological seminars and interdepartmental conferences.	CD-R	1

### 3.4 Equipment used for the educational process

No.	Name	Quantity	Form of use
<b>1</b>	<b>Audience #1</b>		<b>Work in practical classes</b>
	Microscopes	10	Working with microscopic objects
	Multimedia video projector	1	Demonstration of MMP - training, control
	Panel - History of Genetics	2	Educational and upbringing – acquaintance with the heroes of science and life
	Classroom board	1	During practical classes
	Preparations on various topics	25	During practical classes
	Slideshows by lesson topics	12	For independent classroom work of students during practical classes
	Sets of tables by lesson topics	12	For independent classroom work
	From the student tables	14	Work in practical classes
	Teacher's desk	1	For working with students in class
	Chairs	30	Work in practical classes
<b>2</b>	<b>Audience No. 2</b>		<b>Work in practical classes</b>
	Microscopes	10	Independent work of students with microscopic objects
	Stands - Parasitism - options.	4	Educational and upbringing role
	Classroom board	1	During practical classes
	Preparations on various topics	11	During practical classes
	Slide sets by topic	10	For independent classroom work
	Sets of tables by topic	10	For independent classroom work
	From the student tables	14	Students working in practical classes
	Teacher's desk	1	For working with students in class
	Chairs	36	Students working in practical classes
<b>3</b>	<b>Audience No. 3</b>		<b>Room for independent work of students</b>
	Microscopes	6	Independent work with objects
	A computer with Internet access	1	Independent work with Internet resources
	Classroom board	1	For independent work
	Sets of samples	12	To prepare for diagnostic classes
	Diagnostic card sets	16	For independent work of students
	Table sets	16	For independent extracurricular work
	Table lamps	6	Independent work of students with objects
	From the student tables	12	Independent work of students
	Teacher's desk	1	For extracurricular work with students
	Chairs	20	Students working in practical classes
<b>4</b>	<b>Audience No. 4</b>		<b>Work in practical classes</b>
	Microscopes	10	Practical work with microscopic objects
	Classroom board	1	During practical classes
	Sets of preparations on the topics of practical classes	24	In practical classes, to prepare for drug diagnostics
	Sets of tablets on practical training topics	24	For students' independent work in and out of class
	Sets of tables on the topics of practical classes	10	For students' independent work in and out of class
	From the student tables	9	Students working in practical classes
	Teacher's desk	-	For working with students in class
	Chairs	20	Students working in practical classes

<b>5.</b>	<b>Educational laboratory</b>		<b>Working with parasitic objects</b>
	Computer	1	Visualization of parasitic objects
	Microscopes	3	Microscopy of the parasites under study
	From the student tables	2	extracurricular work
	Teacher's desk	1	For work with students on parasitology
	Chairs	6	Students work individually

### 3.5. Professional databases, information and reference systems, electronic educational resources

Item No.	Name resource	Resource Description	Access	Resource address
<b>Electronic library systems</b>				
1.	"Student Consultant" Electronic library of the medical university.	For students and teachers of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids and periodicals.	library, individual access	<a href="http://www.studmedlib.ru/">http://www.studmedlib.ru/</a>
2.	"Doctor's Consultant" Electronic Medical Library.	The materials posted in the library have been developed by leading Russian specialists based on modern scientific knowledge (evidence-based medicine). The information has been prepared taking into account the position of the scientific and practical medical society (world, European and Russian) in the relevant specialty. All materials have undergone mandatory independent review.	library, individual access	<a href="http://www.rosmedlib.ru/cgi-bin/mb4x">http://www.rosmedlib.ru/cgi-bin/mb4x</a>
3.	PubMed	Free search engine in the largest medical bibliographic database MedLine . Documents medical and biological articles from the specialized literature, and also provides links to full-text articles.	library, free access	<a href="https://pubmed.ncbi.nlm.nih.gov/">https://pubmed.ncbi.nlm.nih.gov/</a>
4.	Oxford Medicine Online.	A collection of Oxford medical publications, bringing together over 350 titles into a single, cross-searchable resource. Publications include The Oxford Handbook of Clinical Medicine and The Oxford Textbook of Medicine , the electronic versions of which are constantly updated.	library, free access	<a href="http://www.oxfordmedicine.com">http://www.oxfordmedicine.com</a>
5.	Human Biology Knowledge Base	Reference information on physiology , cell biology , genetics , biochemistry , immunology , pathology . (Resource of the Institute of Molecular Genetics of the Russian Academy of Sciences .)	library, free access	<a href="http://humbio.ru/">http://humbio.ru/</a>
6.	Medical online library	Free reference books, encyclopedias, books, monographs, abstracts, English-language literature, tests.	library, free access	<a href="http://med-lib.ru/">http://med-lib.ru/</a>
<b>Information systems</b>				
7.	Russian Medical Association	Professional Internet resource. Objective: to facilitate the implementation of effective professional activities of medical personnel. Contains the charter, personalities,	library, free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>

		structure, rules of entry, information about the Russian Medical Union.		
8.	Web-medicine	The site presents a catalog of professional medical resources, including links to the most authoritative subject sites, journals, societies, as well as useful documents and programs. The site is intended for doctors, students, employees of medical universities and scientific institutions.	library, free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
<b>Databases</b>				
9.	Worldwide health care organization	The site contains news, statistics on countries that are members of the World Health Organization, fact sheets, reports, WHO publications and much more.	library, free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>
10.	Ministry of Science and Higher Education of the Russian Federation	The website of the Ministry of Science and Higher Education of the Russian Federation contains news, newsletters, reports, publications and more.	library, free access	<a href="http://www.minobrnauki.gov.ru">http://www.minobrnauki.gov.ru</a>
11.	Ministry of Education of the Russian Federation.	The website of the Ministry of Education of the Russian Federation contains news, newsletters, reports, publications and much more.	library, free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
12.	Federal portal "Russian education"	A single window for access to educational resources. This portal provides access to textbooks on all branches of medicine and health care.	library, free access	<a href="https://ikt.ipk74.ru/services/13/35/">https://ikt.ipk74.ru/services/13/35/</a>
<b>Bibliographic databases</b>				
13.	BD "Russian Medicine"	It is created in the Central Scientific and Methodological Library and covers the entire collection, starting from 1988. The database contains bibliographic descriptions of articles from domestic journals and collections, dissertations and their abstracts, as well as domestic and foreign books, collections of institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related areas of biology, biophysics, biochemistry, psychology, etc.	library, free access	<a href="http://www.scsml.rssi.ru/">http://www.scsml.rssi.ru/</a>
14.	eLIBRARY.RU	Russian information portal in the field of science, technology, medicine and education, containing abstracts and full texts of more than 13 million scientific articles and publications. The eLIBRARY.RU platform provides electronic versions of more than 2,000 Russian scientific and technical journals, including more than 1,000 open access journals.	library, free access	<a href="http://elibrary.ru/defaultx.asp">http://elibrary.ru/defaultx.asp</a>
15.	Portal Electronic library of dissertations	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	library, free access	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>
16.	Medline.ru	Medical and biological portal for specialists. Biomedical journal. Last updated February 7, 2021.	library, free access	<a href="http://www.medline.ru">http://www.medline.ru</a>

### 3.6. Licensed and freely distributed software used in the educational process

No. p/p	List of software (commercial software products)	Details of confirming documents documents
1.	MS Operating System Windows 7 Pro	License number 48381779
2.	MS Operating System Windows 10 Pro	CONTRACT No. UT-368 from 09.21.2021
3.	MS Office	License number: 43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security for business Extended	Agreement 326po/21-IB dated November 26, 2021
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022
6.	1C: PROF University	LICENSE AGREEMENT No. ИБ-1151 dated 01.14.2022
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated 11.11.2020
8.	Consultant Plus	Agreement No. 37/C dated 02/25/2022
9.	Aktion 360	Agreement No. 574 dated November 16, 2021
10.	E-learning environment 3 KL ( Russian Moodle )	Agreement No. 1362.2 dated November 15, 2021
11.	Astra Linux Common Edition	Agreement No. 142 A dated September 21, 2021
12.	Information system "Plans"	Agreement No. 8245 dated 06/07/2021
13.	1 C:Document flow	Agreement No. 2191 dated 10/15/2020
14.	R7-Office	Agreement No. 2 KS dated 12/18/2020

#### List of freely distributed software

No. p/p	The list is free distributed software	Links to license agreement
1.	Yandex Browser	Freely distributed License Agreement for Use programs Browser "Yandex" <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2.	Yandex.Telemost	Freely distributed License Agreement for Use programs <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3.	Dr.Web CureIt !	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>

5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
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### 3.7. Resources of the information and telecommunications network "Internet"

1. Ministry of Health of the Russian Federation. Standards of primary health care - <https://minzdrav.gov.ru/ministry/61/22/stranitsa-979/stranitsa-983/1-standarty-pervichnoy-mediko-sanitarnoy-pomoschi>
2. Ministry of Health of the Russian Federation. Standards of specialized medical care - <https://minzdrav.gov.ru/ministry/61/22/stranitsa-979/stranitsa-983/2-standarty-spetsializirovannoy-medsinskoy-pomoschi>
3. Ministry of Health of the Russian Federation. Procedures for the provision of medical care to the population of the Russian Federation - <https://minzdrav.gov.ru/ministry/61/4/stranitsa-857/poryadki-okazaniya-medsinskoy-pomoschi-naseleniyu-rossiyskoy-federatsii>
4. Clinical guidelines of the Ministry of Health of the Russian Federation - <https://medi.ru/klinicheskie-rekomendatsii/>
5. Website of the Russian Respiratory Society - <https://spulmo.ru/>
6. Website of the Russian Society of Cardiology - <http://scardio.ru>
7. Federal Electronic Medical Library. Ministry of Health of the Russian Federation - <http://www.femb.ru>
8. Amur State Medical Academy Library. Access mode: <https://amursma.ru/obuchenie/biblioteki/biblioteka-amurskoy-gma/>
9. Electronic library system "Student consultant". Access mode: <http://www.studmedlib.ru/cgi-bin/mb4x>
10. Electronic library of medical literature. Access mode: <https://www.books-up.ru/ru/entrance/97977feab00ecfbf9e15ca660ec129c0/>
11. Scientific and practical journal "Doctor and information technologies". Access mode: <http://www.studmedlib.ru/book/1811-0193-2010-01.html>
13. <http://www.studmedlib.ru/> - biology for medical universities
14. <http://www.ncbi.nlm.nih.gov/pubmed/> - biology in medicine

## 4. ASSESSMENT TOOLS FUND

### 4.1 Current test control (input, initial, output), final.

#### 4.1.1 Examples of test tasks for entrance control with a single-choice answer

Test assignments are located in the Moodle system .

Access mode **for 1 semester:** <https://educ-amursma.ru/local/crw/course.php?id=102;>

**For 2nd semester:** <https://educ-amursma.ru/local/crw/course.php?id=644>

Total number of tests – 40.

#### 4.1.2 Examples of test tasks of current control with a single-choice answer

20 tests for each lesson: <https://educ-amursma.ru/course/view.php?id=692>

### 1. THE CROSSING OVER PROCESS IS PRECEDED BY

- 1) equational division
- 2) metaphase of the 2nd division
- 3) spermatogenesis
- 4) conjugation

**2. WHAT IS THE CHROMOSOMAL SET OF SPERMATOGONIA**

- 1) diploid
- 2) tetraploid
- 3) octaploid
- 4) polyploid

**3. THE FIRST VARIANT OF THE SEXUAL PROCESS IN UNICELLULAR ORGANISMS**

- 1) mitosis
- 2) amitosis
- 3) conjugation
- 4) polyploidy

**4. THE VOLUME OF DNA IN A SPERMATOCYTE IS 1ST ORDER**

- 1) 1 c
- 2) 4 c
- 3) 2 c
- 4) 8 c

**Answers: 4, 1, 3, 2**

**4.1.3 Examples of final assessment test tasks with a single-choice answer**

In the Moodle system – **100 test tasks:**

<https://educ-amursma.ru/mod/quiz/view.php?id=15714>

**1. NAME THE NON-PATHOGENIC ORGANISM OF THE CLASS FLUKES**

- 1) nanofiet
- 2) ciliates
- 3) Echinococcus
- 4) planaria

**2. NAME THE PATHOGENIC ORGANISM OF THE CLASS TREMATODES**

- 1) Ascaris
- 2) ciliates
- 3) Echinococcus
- 4) liver fluke

**3. NAME THE PLACE OF PARASITISM OF FASCIOLA IN THE BODY CATTLE**

- 1) large veins of the abdominal cavity
- 2) bile ducts of the liver
- 3) intestines
- 4) ventricles of the brain

**4.2 INDICATE THE 2ND INTERMEDIATE HOST OF SIBERIAN SUCCESSFUL**

- 1) land mollusks
- 2) Cyclopes
- 3) ants
- 4) fish

**Answers: 4, 4, 2, 4**

## 4.2 Situational tasks (with standard answers)

### Task 1.

A person who regularly eats stroganina has an enlarged liver and chronic hepatitis symptoms. What trematodose can we talk about? How to confirm the diagnosis, prevention?

#### Sample answer:

The following diagnoses are possible: opisthorchiasis, clonorchiasis, since the second intermediate host is fish, in whose muscles is the invasive stage for humans - metacercaria . Microscopy of feces or duodenal contents is necessary to detect eggs. It is necessary to clarify in which region the patient lives.

### Task 2.

Is it possible to become infected with fascioliasis by eating unwashed lettuce leaves, other garden greens, watered with unfiltered water from a stagnant body of water? Provide arguments.

#### Sample answer:

Yes, it is possible if the reservoir is used for watering cattle. It acts as a definitive host (like humans). In case of fascioliasis invasion, it can introduce liver fluke eggs into the water with feces, which begin to develop in the water with the participation of the mollusk and plants, to which the invasive stage for the definitive host is fixed - adolescaria ( metacercaria ). When watering, these blades of grass together with the parasite get on the leaves and, in the absence of hygiene (washing), get into the human body.

### Task 3.

During duodenal intubation, the patient was found to have flukes measuring 6-10 mm. The patient completely excludes the use of fish. How to clarify the diagnosis of trematodosis, how did the infection occur, what general prophylactic significance does it have? Characteristics of the probable pathogen.

#### Sample answer:

Lancet fluke is possible. It is confirmed by detection of eggs in feces, or by endoscopy of the duodenum with detection of marita . Infection occurred when an infested ant of the genus Formika accidentally entered the body .

### Task 4.

A person has two forms of deaf-muteness, which are caused by recessive autosomal genes located unlinked . What is the probability of having children born deaf-mute in a family if it is known that the father and mother suffer from different forms of deaf-muteness, and for others they are heterozygous .

#### Sample answer:

1. Parents' genotypes: **PAaBb x aaBv**
2. Formatting the solution to the problem:

	<b>Aw</b>	<b>aw</b>
<b>aB</b>	AaBv	aaBv
<b>aw</b>	Aa ...	aaww

3. Probability (%) of having children with two forms of deaf-muteness – 25% ( aavv );
4. Probability (%) of having children with good hearing – 25% ( **AaBb** );
5. Probability (%) of having children with hearing loss – 50% ( **Aaab** ; **aaBb** );
6. The genetic method used is dihybrid crossing ( G. Mendel );
7. The law used in solving the problem? 3rd law or the law of independent combination;

### Task 5.

A child with hemophilia was born from parents with blood groups 1 and 2. The hemophilia gene is recessive. It is inherited linked to the X chromosome. The parents are healthy. What is the

probability of having another child with hemophilia? What are the blood groups of the children of the 1st generation? What does the allelic dominant gene “do”?

**Sample answer:**

1. Write down the line of genotypes of the parents:  $\mathbf{R\ O\ O\ X^H\ X^h \times A\ O\ X^H\ Y}$

	$\text{O}^{\text{H}}$	$\text{O}^{\text{h}}$
$\text{A}^{\text{H}}$	$\text{A O X}^{\text{H}} \text{X}^{\text{H}}$	$\text{A O X}^{\text{H}} \text{X}^{\text{h}}$
$\text{A}^{\text{U}}$	$\text{A O X}^{\text{H}} \text{U}$	$\text{A O X}^{\text{h}} \text{U}$
$\text{O}^{\text{H}}$	$\text{O O H}^{\text{H}} \text{H}^{\text{H}}$	$\text{O O H}^{\text{H}} \text{X}^{\text{h}}$
$\text{O}^{\text{U}}$	$\text{O O H}^{\text{H}} \text{U}$	$\text{O O H}^{\text{h}} \text{U}$

- The probability of having children with hemophilia is 25% and their blood type and gender are boys (the probability is 50% of all men);
- Their blood groups - group 1 -  $\text{O O X}^{\text{h}} \text{Y}$  - 12.5%, group 2 -  $\text{A O X}^{\text{h}} \text{Y}$  - 12.5%;
- Gender – boys (probability – 50% of all men);
- Probability (%) of having healthy children – 75%,
- Their gender is 50% girls, 25% boys;
- Blood groups of healthy children – 1 group -  $\text{O O X}^{\text{H}} \text{X}^{\text{H}}$ ,  $\text{O O X}^{\text{H}} \text{Y}$ ;  
Group 2 -  $\text{A O X}^{\text{H}} \text{X}^{\text{H}}$ ,  $\text{A O X}^{\text{H}} \text{Y}$ ;
- The manifestation of Mendel's laws is violated, since there is an X-linked trait - blood clotting?

### 4.3 List of practical skills that students should have after mastering the discipline

#### A. Cell biology.

- Microscope histological preparations (permanent).  
Find and describe objects (cell structures).
- Make your own temporary histological preparation.
- Know the rules for documenting samples in albums.  
Learn to analyze acquired skills and abilities and evaluate their role.

#### B. General Genetics. Human Genetics – Fundamentals.

- Analyze the conditions of the problem.  
Correctly formulate a solution to a problem based on Mendel's laws using human phenotype characteristics.  
Explain the essence of the solution and the answer when it is formulated and the prognosis for the proband's children!
- Compose your own problems on Mendelian traits and gene interaction variants. Solve them using your own phenotypic characteristics as a condition.  
Create and solve problems on sex-linked traits.
- “Read” the proposed chromosome maps. Determine the distance between genes based on the given crossing-over percentage.
- Use in practice the modern provisions of the gene concept:  
- Model the phenomena of “transformation”, “transduction”, “lysogeny” on independently constructed schemes.
- Using the chromosome map ( *Drosophyla melanogaster* , *Homo sapiens* s .) determine the phenotype from a given genotype.
- Solve problems using the properties of the genetic code, being fluent in them.
- Based on the proposed phenotype, diagnose a hereditary pathology (syndrome). Justify the conclusion.
- Confirm the diagnosis using specific research methods.
- Assume and justify the probability of inheritance (prognosis for the proband's children).
- Make a conclusion about the social and reproductive prognosis of the patient and his generation.

#### B. Parasitism.

- Be able to verify the parasite: microscopically; visually on a macropreparation.

2. Make a model of the parasite's life cycle (in the album).
3. Justify its belonging to a systematic group.
4. Have arguments to justify methods of diagnosing parasitic invasion.
5. Propose and defend rational methods of preventing invasion (infection).
6. Solve situational problems for all studied invasions.
7. Create your own version of the problem and justify its solution.
8. Know the terms and basic concepts of "Parasitism"

#### **G. Fundamentals of ontogenetics, phylogenetics.**

1. To model the development options of vital organs and systems at various stages of the evolution of organisms.
2. Identify the criteria of the Chordata type on microscopic preparations (lancelet) and substantiate their significance in human ontogenesis: notochord, neural tube, abdominal aorta.
3. Argue the importance of studying this section, the role of knowledge in managing one's own ontogenesis, and the prevention of congenital malformations in children.
4. Promote a healthy lifestyle, prevent the use of addictive substances among the population and their peers.

#### **4.4. List of questions for the exam**

1. Definition of biology as a science. The role of biology in the system of medical education. Relationship with other sciences. Development prospects in the 21st century.
2. Definition of the concept of life at the present stage of science. Criticism of metaphysical and idealistic ideas about the essence of life.
3. Level principle of life organization. Justification of the role of all levels of life organization.
4. Cell biology. The cell is the basic unit of living organisms. Definition. Principles of cell structural organization.
5. Cell theory. History of creation. Provisions of CT. Modern significance in the 21st century.
6. Pro- and eukaryotic types of organisms. Justification of structural features. Role.
7. The cell as an open system. Organization of flows of matter, energy and information in the cell. Specialization and integration of cells of a multicellular organism. Biologically active substances synthesized in cells and their importance for medicine.
8. Cell cycle. Its periodization. Characteristics of the heterosynthetic period.
9. Mitotic cycle, its characteristics. Biological meaning of the main cell division.
10. Basic principles of recording hereditary information. Genetic code. Its properties.
11. The mechanism of self-reproduction of biological information. Reduplication. The significance of the process.
12. Gene as a functional unit of hereditary material. Definition. Modern concept of gene.
13. Organization of hereditary material in pro- and eukaryotes. Main stages of realization of genetic information on examples. Role of process.
14. Structural organization of chromosomes in interphase and metaphase. Hetero- and Euchromatin . Importance in living organisms.
15. Functions of chromosomes at stages of the life cycle. Examples.
16. Karyotype and idiogram of human chromosomes. Methods of study. Significance.
17. Reproduction is a universal property of living things, ensuring material continuity in a series of generations. Evolution of reproduction. Forms of reproduction.
18. Gametogenesis. Meiosis: cytological and cytogenetic characteristics.
19. Oogenesis. Periods, significance of the process. Factors controlling the process.
20. Fertilization. Parthenogenesis. Forms, prevalence in nature. Sexual dimorphism.
21. Biological and social aspects of human reproduction at the turn of the 21st century .
22. **Subject, tasks and methods of genetics.** Stages of development of genetics. The role of domestic scientists (N.I. Vavilov, N.K. Koltsov, A.S. Serebrovsky, S.S. Chetverikov, I.V. Davydenkov and others). Dramatic pages in the history of domestic genetics.
23. Heredity and variability – definitions of fundamental properties of living things, their interrelation. General concept of genetic material. Its properties.
24. G. Mendel: merits of a great scientist. Arguments. Rediscovery of G. Mendel's laws.

25. Patterns of inheritance in monohybrid crossing. Examples.
26. Dihybrid and polyhybrid crossing. General formula for splitting with independent inheritance. Examples.
27. Conditions of Mendelian traits. Mendelian traits of humans. Examples.
28. Interaction of nonallelic genes: polygenic inheritance in human genetics. Examples.
29. Interaction of non-allelic genes: complementarity, epistasis , pleiotropic type of interaction.
30. Features of inheritance and manifestation of blood group affiliation. Role.
31. Quantitative and qualitative characteristics of the manifestation of genes in traits: penetrance, expressivity, geno- and phenocopies.
32. Chromosomal theory of heredity. History of creation. Object. Provisions.
33. Linkage of genes. Crossing over. The significance of the process.
34. Independent combination of non-allelic genes and its cytological basis. Examples.
35. Inheritance of sex-linked traits. Examples – object Human.
36. Development of chromosome theory. Modern concept of the gene.
37. Mechanisms of genotypic determination and differentiation of sex traits in development. Redetermination of sex.
38. Genome, genotype, phenotype. Definitions. Phenotype as a result of the realization of hereditary information in certain environmental conditions.
39. Interaction of alleles in the determination of traits: dominance, intermediate inheritance, recessiveness, codominance in human genetics.
40. Molecular structure of the gene in pro- and eukaryotes. Unique genes and repeats on the DNA strand. Structural genes. The hypothesis "one gene - one enzyme", its modern interpretation.
41. Modern classification of genes. Examples of their role.
42. Gene expression in the process of protein biosynthesis. Regulation of gene expression in pro- and eukaryotes.
43. Genetic engineering, its objectives, methods, possibilities, prospects of use. Biotechnology.
44. Variability. Definition. Classification of types of variability. Their importance in ontogenesis and evolution.
45. Modification variability. Reaction norm. Phenocopies. Adaptive nature of modification. The role of heredity and environment in human development, training and education.
46. Combinative variability. Its importance in ensuring genotypic diversity of people. Marriage system. Medical and genetic aspects of marriage.
47. Mutational variability. Classification of mutations. Mutations in germ and somatic cells. Concept of genomic, chromosomal and gene diseases. Examples.
48. Chromosomal mutation: types with examples in human genetics.
49. Genomic mutations. Types, mechanisms of their occurrence. Examples in human genetics.
50. Spontaneous and induced mutations. Mutagens. Mutagenesis and carcinogenesis. Genetic hazard of environmental pollution. Protective measures. Principles of testing potential mutagens (in manufactured products, food, medicines).
51. Reparation of genetic material. Photoreparation . Dark reparation. Mutations associated with impaired reparation and their role in pathology.
52. Cytoplasmic heredity. Participants. Significance of the phenomenon.
53. Man as a specific object of genetic analysis. The importance of genetics for medicine. Methods of medical genetics.
54. Methods of studying human heredity: justification of their role using examples.
55. Twin method. Justification of the method, its significance.
56. Dermatoglyphics. Methods of production and study. The significance of the method in medicine.
57. Genealogical method. Methodology for compiling genealogies. Analysis. Examples.
58. Cytogenetic method. Significance.
59. Method for determining sex chromatin (cytological). Significance. Examples.
60. The method of somatic cell hybridization and its application for mapping human genes in chromosomes.
61. Biochemical method in genetics. Indications for their use. Examples.
62. Population-static method. Significance in medicine.
63. Prenatal diagnostics of hereditary diseases. Justification of indications.

64. Medical and genetic counseling. Basic principles. Organization of the service.
- 65. Ontogenetics** . Aspects and problems of studying the genetics of individual development.
66. Organism. Definitions. The role of the organism as the most important level of organization of Life.
67. Theories of ontogenesis. Historical analysis. Modern thermodynamic model of individual development (I. R. Prigogine, 1947).
68. The goals and functions of ontogenesis. Evolutionary significance, content and role in human development.
69. Periodization of individual human development: pre-reproductive , reproductive and post-reproductive stages. Their significance.
70. Periods of intrauterine development (fertilization, blastogenesis , embryogenesis, fetogenesis ). Their significance.
71. Genetic and other mechanisms for the implementation of hereditary information of an individual in the intrauterine period (fertilization, cell reproduction, migration, differentiation).
72. Embryonic induction, segmentation, growth in the intrauterine period. The significance of these mechanisms of Ontogenesis.
73. The role of progenesis (gametogenesis) in the formation of the HEALTH of the organism. Regulatory factors in the male and female organism. The relationship between the mother's organism and the fetus.
64. The role of heredity and environment in ontogenesis. Critical periods of development. Teratogenic environmental factors.
65. Postnatal ontogenesis and its periods. The role of the endocrine glands: thyroid, pituitary, sex glands in regulating the body's vital functions in the postnatal period. The interaction of the biological and the social in childhood, youth, maturity and old age.
66. Biological and social aspects of aging and death. Genetic, molecular, cellular, systemic mechanisms of aging. The problem of longevity. The concept of gerontology and geriatrics.
67. Regeneration as a property of living things to self-renewal and restoration, physiological regeneration, its biological significance.
68. Reparative regeneration, methods of its implementation. Manifestation of regenerative capacity in phylogenesis. Somatic embryogenesis. Autotomy.
69. Biological and medical significance of the problem of regeneration. The emergence of regenerative abilities in humans, regeneration of pathologically altered organs and reversibility of pathological changes. Regeneration therapy.
70. The concept of homeostasis. General patterns of homeostasis of living systems, genetic, cellular, systemic bases of homeostatic reactions of the organism. The role of the endocrine and nervous systems in ensuring homeostasis.
71. The problem of organ and tissue transplantation. Auto-, allo- and heterotransplantation. Transplantation of vital organs. Tissue incompatibility and ways to overcome it. Artificial organs.
72. Biological rhythms. Medical significance of chronobiology.
73. Life of organs and systems outside the body. The importance of the tissue culture method in biology and medicine.
74. Clinical and biological death. Resuscitation.
- 75. Problems of evolutionary biology.** The essence of Darwin's ideas about organic evolution. The modern period of synthesis of Darwinism and genetics. Synthetic theory of evolution. Authors. Significance.
76. The concept of a biological species. The reality of a biological species, its structure.
77. Elementary evolutionary factors. Mutation process and genetic combinatorics. Population waves, isolators, gene drifts, natural selection. Interaction of elementary evolutionary factors.
78. Natural selection. Forms of natural selection. The creative role of natural selection in evolution.
79. Population structure of a species. Genetic structure of a population. Hardy-Weinberg rules: content and mathematical expression.
80. Environment as an evolutionary concept. Dialectical-materialistic solution to the question of biological expediency. The problem of inheritance of acquired characteristics in the history of evolutionary theory.

81. Population structure of humanity. Demes, Isolates. People as objects of action of evolutionary factors.
82. The influence of the mutation process, migration, isolation and genetic drift on the genetic constitution of people. The specificity of the action of natural selection in human populations.
83. Genetic load and its biological essence.
84. Genetic polymorphism of humanity: scale, factors of formation. The significance of genetic diversity in the past, present and future of humanity (medical-biological and social aspects).
85. Genetic polymorphism and adaptive potential of the population.
86. Micro- and macroevolution. Characteristics of mechanisms and main results.
87. Types, forms and rules of evolution. Basic principles of organ evolution.
88. Phylogenesis of the body integuments of chordates.
89. Phylogenesis of the nervous system of invertebrates. Stages of centralization.
90. Phylogenesis of the nervous system of chordates. Stages of cephalization .
91. Justification of the connection between the organization of the nervous system and adaptation to the environment and behavioral reactions in various classes of vertebrates.
92. The main stages of ontogenesis of the human central nervous system. Developmental defects.
93. The role of the organism's transport systems in the progressive evolution of invertebrates.
94. Phylogenesis of the circulatory and respiratory systems in representatives of the phylum "Chordata". Interrelations in evolution.
95. Stages of human heart development as a manifestation of the basic biological law. Developmental defects. Motivation for study.
96. Stages of progressive evolution of the excretory system in invertebrates.
97. Physiogenesis of the excretory system of "Chordates". Connection with the reproductive system.
98. Stages of development of the reproductive system in connection with the progressive evolution of invertebrates. Sexual behavior.
99. The main stages of development of the excretory system in humans during embryogenesis as a manifestation of the biogenetic law.
100. Evolution of defense systems in the historical development of invertebrates.
101. Phylogenesis of cellular and humoral immunity in representatives of the phylum "Chordata".
102. Phylogenesis of the digestive system.
103. Comparative review of the structure of the skeleton.
104. Ontophylogenetic determinacy of developmental defects of human organs and systems. The rule of correlation of morphophysiological organization in the evolutionary development of a specific type.
105. Individual and historical development. Biogenetic law. Phylogenesis as a process of evolution of ontogenesis. Cenogenesis and phylembryogenesis.
106. The origin and development of life on Earth. Chemical, prebiological, biological and social stages.
107. Dialecto-materialistic understanding of the problem of the direction of the evolutionary process. Progressive nature of evolution. Biological and morphophysiological progress: criteria, genetic foundations.
108. Ideological concepts on the problem of human origin. Criticism of biologization and sociologization in approaches to man.
109. Evidence of the natural origin of man. Its substantiation by comparative anatomical data.
110. The position of the species in the system of the animal state. Its qualitative uniqueness. Objective criteria.
111. The main directions of human evolution. Characteristics of the genealogical tree.
112. Driving forces of anthropogenesis. Justification of their role.
113. The concept of the unity of the human species. Races: theory of origin. Criticism of anti-scientific, anti-human theories of racism.
114. Biological and social patterns in the development of man and society at various stages of anthroposociogenesis .
115. The biosphere as a natural-historical environment. Modern concepts of the biosphere: biochemical, biogeocenological, thermodynamic, geophysical, cybernetic, socio-ecological.

116. Functions of the biosphere in the development of nature. The Earth and maintaining dynamic equilibrium in it (oxidation-reduction, gas exchange, concentration of elements dispersed in the geosphere, synthesis and decomposition of organic matter).
117. Living matter of the biosphere. Quantitative and qualitative characteristics. Role in the nature of the planet.
118. Evolution of the biosphere. The noosphere as the highest stage of the biosphere. The role of V. I. Vernadsky in the creation of the doctrine of the biosphere.
119. International and national programs for studying the biosphere. The contribution of Russian and Soviet scientists to the development of the study of the biosphere (V. V. Dokuchaev, V. I. Vernadsky, V. N. Sukachev).
120. Environmental protection issues and their reflection in the decisions of the Supreme Soviet of Russia. The role of health workers in environmental protection. Civic and professional position.
121. Definition of the science of ecology. Environment as an ecological concept, environmental factor. Ecosystem, biogeocenosis, anthropobiocenosis. Specifics of the environment of human life.
122. Subject of human ecology. Biological and social aspects of population adaptation to living conditions. Levels of human ecological connections (individual, group, global).
123. Man and the biosphere. Biotechnosphere. Medical and biological aspect of the noosphere.
124. Man as a creative ecological factor. Main directions and results of anthropogenic changes in the environment. Nature protection and rational use of natural resources.
125. Biological variability of people and biogeographic characteristics of the environment. Ecological differentiation of man. The concept of ecological stages of people and the conditions of their formation.
126. Anthropogenic ecosystems as a result of industrialization, chemicalization, urbanization, development of transport, and space exploration.
127. Ecology of cities and industrial centers. Nature of pollution of environmental objects.
128. Poisonous animals and plants. Medical and biological significance.
- 129. Parasitism.** Basic forms of biological connections in anthro-piogenocenoses. Parasitism as a biological phenomenon. Classification of parasitic forms of animals. Paths of origin of various groups of parasites.
130. Principles of interaction between parasite and host at the level of individuals. Paths of morphophysiological adaptation of the parasite.
131. Issues of ecological parasitology. Population level of interaction between parasites and hosts. Types, principles of regulation and mechanisms of stability of "parasite-host" systems.
132. Life cycles of parasites. Alternation of generations and the phenomenon of host change. Intermediate and main hosts. The concept of bio- and geohelminths.
133. Transmission and natural focal diseases. The concept of anthroponoses and zoonoses.
134. The doctrine of academician E.N. Pavlovsky on the natural focality of parasitic diseases. Biological principles of combating transmission and natural focal diseases.
135. Type "Protozoa". Classification, characteristic features of organization. Significance for medicine.
136. Dysenteric amoeba. Systematic position, morphology, development cycles. Justification of laboratory diagnostic methods, prevention.
137. Trichomonas, trypanosomes, lamblia. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods.
138. Taxonomy, morphology, biology of leishmaniasis pathogens. Justification of laboratory diagnostic methods and preventive measures.
139. Malarial plasmodia. Taxonomy, morphology, development cycles, species differences. Combating malaria. Tasks of the antimalarial service at the present stage.
140. Toxoplasma. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic and prevention methods.
141. Balantidium. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods.
142. Liver fluke. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic and prophylactic methods.

143. Cat fluke. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic and prophylactic methods. Opisthorchiasis foci in the CIS.
144. Tape fluke. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic and prophylactic methods. Distribution in the CIS.
145. Lung fluke. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic and prophylactic methods. Distribution in the CIS.
146. Schistosoma. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
147. Beef tapeworm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
148. Pork tapeworm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
149. Cysticercosis. Methods of disease occurrence, prevention.
150. Dwarf tapeworm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
151. Broad tapeworm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
152. Echinococcus, alveococcus . Taxonomy, morphology, development cycles, routes of infection. Diagnostics. Prevention. Differences in larval stages of development, distribution in the CIS.
153. Type "Flatworms". Classification, characteristic features of organization, adaptation to parasitism. Medical significance.
154. Ascaris. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention. Foci of ascariasis in the CIS.
155. Trichocephalus. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention.
156. Pinworm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention. Justification of drug-free treatment.
157. Ancylostomids. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention. Ancylostomiasis foci in the CIS, ways of their elimination.
158. Trichinella. Guinea worm. Taxonomy, morphology, development cycles, routes of infection. Justification of laboratory diagnostic methods. Prevention. Works of L.I. Isaev on the elimination of dracunculiasis in Central Asia.
159. Type "Roundworms". Classification, characteristic features of the organization. Medical significance. Adaptation to parasitism.
160. Methods of ovoid helminthoscopy . Use of the method.
161. Ticks. Systematics, classification, morphology, development of medical significance. Disease prevention.
162. Room fly, Tse-Tse fly , Wohlfart fly. Systematics, morphology. Epidemiological significance. Prevention methods.
163. Lice, fleas. Taxonomy, morphology, development, epidemiological significance. Control measures. Disease prevention.
164. Mosquitoes. Taxonomy, structure, development cycle. Medical significance. Control measures.
165. Mosquitoes. Taxonomy, morphology, structure, development. Medical significance. Control measures. Disease prevention.
166. Phylum "Arthropoda". Classification, characteristic features of organization. Medical significance. Adaptation to parasitism.
167. Class "Insects". Classification, characteristic features of organization. Medical significance.
168. Class "Arachnida". Classification, characteristic features of the organization. Medical significance.
169. The role of Russian scientists in the development of general and medical parasitology (V.E. Dogel , V.N. Beklemishev, E.N. Pavlovsky, K.I. Skryabin).
170. Phylum "Chordates". Taxonomy, morphology, justification of evaluation criteria.
171. Subphylum "Vertebrates". Systematic position, features of the subphylum.
172. Mammals as intermediate hosts and natural reservoirs of pathogens of humans and animals.

173. Medical and national economic significance of representatives of the phylum "chordates".
174. Origin and evolution of parasitism. Classification of parasites, hosts, ways of their infection.
175. The influence of the parasitic lifestyle of the parasite – adaptation to parasitism.

APPROVED  
at a meeting of the Department  
of Histology and Biology  
Protocol No. 10  
of May 14, 2026



Head of the Department

I. Yu. Sayapina

**ADDITIONS AND AMENDMENTS TO THE WORK PROGRAM FOR THE  
DISCIPLINE "BIOLOGY"  
SPECIALTY 31.05.01 GENERAL MEDICAL CARE (International Students)  
FOR THE 2026-2027 ACADEMIC YEAR**

1. The amount of contact work in this course has been reduced from 120 to 102 hours.
2. The amount of independent work in this course has been increased from 60 to 78 hours.
3. Amend Section 2.1. "Scope of the Course and Types of Academic Work" in Section 2 to read as follows

№	Types of educational work	Total hours	Semesters	
			1	2
1	Lectures	28	14	14
2	Practical classes	74	34	40
3	Independent work	78	24	54
4	Exam	36		36
Total labor intensity in hours		216	72	144
Total workload in credit units		6	2	4

4. Amend paragraph 2.2. "Thematic plan of lectures and their summary" of section 2 to read as follows:

№	Lecture topics	Codes of formed competencies	Labor intensity (in hours)
<b>1st semester</b>			
1	Introduction to biology. The role of global science in the 21st century. Cell biology. Cytoplasm – organization, role in the cell as an open system. Introduction. Levels of life organization. Man in the system of nature. Dialectical-materialistic doctrine of the essence of life. Biosocial nature of man. Biology of the cell. The cell as an elementary genetic and structural-functional biological unit.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
2	Cell biology. Nucleus. Organization of the nuclear genome. Functions in the life cycle. Mitotic cycle. Contents of the MC stages. Significance. Realization of the properties of hereditary information. Factors governing the MC and the cell life cycle.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2

	<p>Reproduction. A universal property of a living organism that ensures the continuity of the material basis in a series of generations.</p> <p>Sexual reproduction. Meiosis – spermatogenesis and oogenesis. The essence of the processes, factors controlling gametogenesis. Mitotic cycle. Reproduction is a property of living things. Meiosis. The significance of the phenomenon.</p>		
<b>3</b>	<p>Introduction to genetics. Genetics. Definition. Goals and objectives of science. Basic concepts of genetics: genotype, genome, phenotype, heredity, variability, inheritance. History of the development of science. Origins of science. Stage of classical genetics. Great names and discoveries. Domestic geneticists – dramatic pages of science, great teachers and students.</p> <p>Heredity and variability. The role of G. Mendel in the discovery of the laws of inheritance. The essence of the 1st, 2nd, 3rd laws of inheritance. Analyzing crossing. The first scientific method of probability statistics, an assessment of the merits of the great monk N.V. Timofeev-Resovsky. Role in the 21st century. Basic concepts. Laws of inheritance.</p>	<p>UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.</p>	<b>2</b>
<b>4</b>	<p>Interaction of genes. Characteristics of the phenomenon: genes that violate the manifestation of Mendel's laws. Classification of types of inheritance. Interaction of allelic genes: incomplete dominance, multiple alleles, codominance . Interaction of non-allelic genes: complementarity, epistasis , pleiotropy, polygenic interaction. Examples from human genetics. The significance of the phenomenon of gene interaction. Classification of types of inheritance. Examples, significance of the phenomenon.</p>	<p>UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.</p>	<b>2</b>
<b>5</b>	<p>Chromosomal theory of heredity. History of discovery, great participants, their merits. Chromosome – organization at stages of cell life cycle, role. Gene – definition. Provisions of chromosome theory – basis of material nature of heredity and variability. Concept of “gene” – idea of organization – XX century . Traits linked with sex.</p> <p>Molecular basis of heredity and variability. Modern concept of gene. Gene expression, epigenomic factors of its regulation. Structural and functional levels of hereditary material organization. Genotype. Phenotype. Genome. Patterns of inheritance. Molecular basis of heredity. Variability. Research methods. Organization of acceptor and structural zones. Gene functions in pro- and eukaryotes. Stages of polypeptide synthesis (primary protein structure). Historical dynamics of the GENE concept. Modern definition: transcriptome. Classification of genes. Significance.</p>	<p>UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.</p>	<b>2</b>
<b>6</b>	<p>Variability. Definition. Classification of types and kinds of variability. Characteristics of phenotypic (modification) variability. Concepts: reaction norm, modifications, individual adaptation. The significance of phenomena in biology and medicine. Genotypic</p>	<p>UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.</p>	<b>2</b>

	variability. Combinative variability – mechanisms of occurrence of combinatorial variability. Prospects for studying combinatorial variability. Mutational variability. Classification. Examples. Mutation mechanisms. Mutagens. Definition. Modern classification of factors causing mutations. Antimutational mechanisms. Classification of types and kinds. Examples. The significance of the phenomenon in biology and medicine.		
7	Methods of genetic research. History and modernity. History of discovery, content of methods: twin, genealogical, dermatoglyphics, cytological (method of determining sex chromatin, cytogenetic, biochemical, population-statistical). Information value of methods, method of application. Introduction to modern methods of gene diagnostics : PCR, DNA probe diagnostics.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
<b>2nd semester</b>			
8	Global and private problems of Parasitism. The relevance of studying the phenomenon. Global and particular problems of Parasitism. Conceptual apparatus of science, contribution of scientists to the development of parasitology. Basic definitions of Parasitism, parasite, types of parasitism. Biological bases of parasitism and transmissible diseases. Distribution of parasitic forms in the animal world Main forms of biotic connections in anthro - biogeocenoses, transmissible and natural focal, parasitic diseases. Classification of parasites. Parasites of the types: Protozoa, Flatworms, Roundworms, Arthropods, their epidemiological significance. Algorithm for assimilation of biological and medical information on the characteristics of pathogens of invasions. Protozoa.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
9	Parasitism. Special parasitology. Multicellular - representatives of the type Flatworms (trematodes, cestodes), type Roundworms ( geohelminths , biohelminths), Arthropods - pathogens and carriers of invasions and infections. Relevance of the study, including in the Amur region on the examples of natural focal diseases (clonorchiasis, metagonimiasis , spring-summer encephalitis, etc.). Helminthiasis. Natural foci on the Amur - relevance of the study.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
10	Evolutionary biology – basic concepts, notions. Principles of evolution of systems and organs. Phylogenesis of the nervous system. Congenital malformations of the central nervous system. Principles of evolution of the nervous system in invertebrates. Role. Phylogenetic aspect of brain development in vertebrates, stages of formation of brain parts, cerebral cortex. Periods of brain development in humans. The importance of studying for understanding the patterns and features of human ontogenesis. Congenital malformations of the central nervous system – relevance of studying. Risk factors.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2

11	Phylogenesis of circulatory systems, cardiovascular and respiratory systems. Substantiation of stages of the most important circulatory systems in the process of evolution of multicellular organisms. Stages of evolution of the cardiovascular system in vertebrates. Heart in human embryogenesis - critical periods. Congenital malformations of the cardiovascular system. Relevance of the study.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
12	Evolution of the urinary system. Stages of formation of excretory structures in invertebrates. Stages of kidney development in vertebrates. The role of the system. Stages of development of the urinary system in humans - repetition of phylogenesis. The significance of the stages of development. Congenital malformations of the urinary system.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
13	Phylogenesis of the reproductive system. Reproductive health issues. Phylogenesis of the urinary system. Stages and participants in the process. The role of all stages of development of the urinary system in the human body. Phylogenesis of the reproductive system. Stages. Stages of sexual differentiation. Pros and cons. Relevance of the study in the world, Russia, in the Amur region. ART.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
14	Geocology – the foundations of global science and health. Ecology, ecogenetics – in biology and medicine. Relationships between organisms and the environment, relationships between organisms in the phenomenon of “Parasitism”, in the relationship “Parasite - host”. Problems of human health. Efforts undertaken by the UN. Problems of Russia.	UC-1. UC-2. UC-4. UC-5. UC-6. GPC-1, GPC-10, GPC-11.	2
<b>Всего 1 сем</b>		14 часов	
<b>Всего 2 сем.</b>		14 часов	
<b>Итого:</b>		28 часов	

### 5. Amend Section 2.3. “Thematic Plan of Practical Classes” to read as follows:

№ п/п	Name of the topics of practical classes	Contents of practical classes	Codes of the formed competencies and indicators of their achievement	Types of control	Labor intensity (hours)
1	Introduction to Cell Biology. Microscopic Method research. Structure of a microscope.	<b>Entrance control</b> (checking theoretical knowledge and practical skills developed by the Biology program in secondary (complete) general education institutions.	UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2.	- entrance testing - initial testing - frontal oral survey - checking the completion of practical tasks: results of work with a microscope,	2,125

		<p><b>Theoretical part:</b> Introduction to the subject. The role of biology in the system of medical knowledge. Basic concepts of biology. Objects of research. Research methods. Microscopic method of studying cells. Diversity of cells in the body of animals, humans. Relevance of studying the cellular level of organization of Life.</p> <p><b>Practical part:</b> Study of the structure of the microscope. Microscopy of plant and animal cells. Documentation in albums.</p>	<p>UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>preparation of documentation (album)</p>	
2	<p>Cell biology. Cytoplasm. Organization. Role.</p>	<p><b>Theoretical part :</b> Cell biology. Cytoplasm. Structure of the cytoplasm: cell membrane, matrix, organelles. Inclusions. General plan of structure, differences between plant and animal cells. Show a single plan of structure of the plant and animal world. Justification of the role of the cytoplasm, its systemic organization in the cell, as an open system.</p> <p><b>Practical part:</b> Microscopy of plant and animal cells. Study of electronograms, description, diagnostics of cellular structures.</p>	<p>UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial test control in the Moodle system - frontal oral survey - checking the completion of practical tasks: results of work with a microscope and electronograms, filling out documentation (album)</p>	2,125

		Documentation in albums.			
3	Cell biology. Nucleus. Organization. Functions in the cell life cycle	<p><b>Theoretical part :</b> Biology of eukaryotic cells. Nucleus. Study of the general plan of the structure of the nucleus and its component unit, the chromosome, in the cell life cycle.</p> <p>Concepts: euchromatin and heterochromatin – meaning. Stages and phases of the life cycle. Cell division. Mitotic cycle, stages and periods. The essence of mitosis. Justification of the role of the nucleus in the cell life cycle.</p> <p><b>Practical part:</b> Microscopy of cells at stages of the life cycle, identification of mitosis stages, diagnostics, description. Documentation in albums.</p>	<p>UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1. AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system - frontal survey, - work on identifying the stages of the cell life cycle (checking the album) - documenting tasks in an album</p>	2,125
4	Reproduction is a property of living things. Organisms level . Meiosis: spermatogenesis, oogenesis. Fertilization	<p><b>Theoretical part :</b> Organismic level of life organization. Reproduction is a property that ensures the continuity of the existence of living things. Evolution of reproduction forms. Sexual reproduction. Gametogenesis. Meiosis. Show the stages of gametogenesis, meiosis. The essence of combinatorics of hereditary information and reduction of</p>	<p>UC-1: AI 1.1. AI 1.2. AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3.</p>	<p>- initial testing. - frontal oral survey - checking the completion of practical tasks in the album (structural and logical diagram of spermatogenesis, oogenesis)</p>	2,125

		<p>hereditary substance.</p> <p><b>Practical part:</b> Microscopy of sex cells (roundworm egg, guinea pig, rooster sperm). Identification of meiosis stages at the stages of equine roundworm maturation – stage diagnostics. Documentation in albums.</p>	<p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>		
5	Control lesson on cell biology – 1 (diagnosticum)	<p><b>Theoretical part :</b> Control lesson on Cell Biology (Diagnosticum-1). Test control in the Moodle system . Working with individual task cards, answering theoretical questions on the section.</p> <p><b>Practical part:</b> Solving situational problems in cytology. Identification of schemes, micropreparations, electronograms .</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UK-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial test control in the Moodle system . - checking the results of work with individual task cards - assessment of the correctness of the solution of situational problems in cytology - identification of diagrams, micropreparations, electronograms .</p>	2,125
6	Introduction to Genetics. Laws of Inheritance.	<p><b>Theoretical part :</b> Genetics – rating in the 21st century. Patterns of inheritance. Basic concepts in genetics. Mendel’s laws. Practical significance.</p> <p><b>Practical part:</b> Show the types of inheritance when solving problems on Mendelian traits. Examples from</p>	<p>UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3.</p>	<p>- frontal survey - initial testing in the Moodle system - analysis of the results of solving problems compiled by students - analysis of the results of solving problems from the department's funds</p>	2,125

		human genetics. Independent (author's) compilation of the problem, protection of the content, solution - justification of the result.	GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.		
7	Gene interaction (GI). Classification. GI examples	<p><b>Theoretical part :</b> Interaction of genes. Concept. Classification of types of interaction of genes. Interaction of allelic, non-allelic genes. Examples from human genetics and medical genetics.</p> <p><b>Practical part:</b> Solving problems on all types of interaction of allelic genes. On interactions of non-allelic genes: complementary type, epistasis, pleiotropy, polygenic interaction. Examples: signs within the reaction norm, hereditary diseases, syndromes ( Marfan, Van der Heve ), diseases with hereditary predisposition. The significance of the phenomenon in medical practice.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.</p> <p>UC-2: AI 2.1. AI 2.2. AI 2.3.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1. AI 5.2.</p> <p>UC-6: AI 6.1, AI 6.3.</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	- initial testing in the Moodle system . - control of the results of independent work - drawing up tasks on Human Genetics - solving problems for all types of VG, documentation of the solution in albums	2,125
8	Chromosomal theory of heredity sti . History of the study of heredity. Works of T.-H. Morgan and his associates. Provisions of HT	<p><b>Theoretical part :</b> Chromosomal theory of heredity. History of discovery, Participants. The role of the domestic school of geneticists (N.K. Koltsov). Material foundations of heredity - chromosomes -</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.</p> <p>UC-2: AI 2.1.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1.</p> <p>UC-6: AI 6.1,</p>	- initial testing in the Moodle system . - compiling and solving problems on the VG on human genetics - solving and documenting situational problems in an album	2,125

		genes - gene linkage groups. Basic provisions of the chromosomal theory of heredity. Historical dynamics of gene study. Great compatriots - contribution to Genetics. <b>Practical part:</b> Solving problems on sex-linked traits. Formulating conditions and solutions.	GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- interview on a block of control questions	
9	Modern concept of gene. Types and functions of gene.	<b>Theoretical part :</b> Modern concept of gene. Operon-transcriptome – concepts, models of organization. Gene functions. Stages and participants of protein synthesis in eukaryotes. Sex-linked inheritance . <b>Practical part:</b> Solving problems on the genetic code. Reading karyograms of Drosophila, humans and other species.	UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control over the compilation and solution of problems on the genetic code in the album - control of the design of the gene- transcripton model	2,125
10	Variability. Phenotypicity what variability. Genotypic variability . Arguments.	<b>Theoretical part :</b> Variability. Concept, classification. Phenotypic variability. Formulation of the concept of the main forms of variability and their role in ontogenesis. Practical actions, including solving problems illustrating modification variability, reproducing the limits of the reaction norm of human traits using examples. Know the concept of	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3.	- initial testing in the Moodle system - control over the students' preparation of situational problems on different forms of variability in human genetics - checking independent solutions to problems from the department's collection - portrait diagnostics of hereditary	2,125

		<p>"adaptation", examples of individual adaptation. Genotypic variability. Types. Mechanisms of combinatorial variability. Mutational variability. Classification of mutation types. Mutagens.</p> <p><b>Practical part:</b> Proof of the role of mutagenic factors: SVZ – alcohol, nicotine, drugs, as mutagenic factors – arguments.</p>	<p>GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	diseases, syndromes	
11	Introduction to Medical Genetics. Research Methods-1.	<p><b>Theoretical part :</b> Methods of studying human heredity and variability Genetic methods of human research: genealogical, twin, dermatoglyphics.</p> <p><b>Practical part:</b> learn to analyze a pedigree using an algorithm; make and read dermatoglyphs . Use the Holzinger formula to justify the twin method and analyze the result. Solving problems of various types of hereditary diseases; on the analysis of the family tree in the variants of inheritance, sex-linked inheritance, penetrance and prognosis for the proband's children.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system - analysis of the pedigree compiled by students with its analysis according to the algorithm - diagnostics of proposed genealogies - control of the created own glyphs and their analysis - control of diagnostics of proposed syndromic glyphs</p>	2,125
12	Introduction to Medical Genetics. Research methods – 2.	<p><b>Theoretical part :</b> Methods of studying human heredity and variability. Research methods in human</p>	<p>UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI</p>	<p>- initial testing in the Moodle system . - frontal survey</p>	2,125

		<p>genetics: cytological, cytogenetic, biochemical, population, PCR. <b>Practical part:</b> Learn to determine sex chromatin. Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome).</p>	<p>2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- analysis of students' diagnostics of sex chromatin - analysis of the work on determining the Holzinger coefficient and conclusions on it - diagnostics of karyograms</p>	
13	<p><b>Control lesson on Genetics – 2 (Diagnostics godfather-2)</b></p>	<p><b>Theoretical part :</b> Control lesson on genetics – 2 (diagnosticum). Includes test control with theoretical questions on all topics of practical lessons. <b>Practical part:</b> solving situational problems of varying degrees of complexity, analysis of pedigrees, karyograms, portrait diagnostics, analysis of chromosome maps.</p>	<p>UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system - solving problems on all topics of genetics with analysis of design and output - control of identification of karyograms, glyphs ; karyotype formulas; results of portrait diagnostics</p>	2,125
14	<p>Protozoology – 1.</p>	<p><b>Theoretical part :</b> Parasitology. Type Protozoa. Using microscopes, diagrams, for the purpose of diagnosis, study and substantiate the structural features, life cycle of the Sarcodaceae and Flagellates classes. Routes of infection and preventive measures for giardiasis, leishmaniasis, amebiasis, trypanosomiasis. Substantiate the</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3.</p>	<p>- initial testing in the Moodle system - solving problems from the department's collection - analysis of filling information tables on the Simplest, according to the algorithm - control over verification and documentation of samples - analysis of the author's tasks and</p>	2,125

		<p>relevance of studying these representatives, including in the Amur Region.</p> <p><b>Practical part:</b> learn to solve and compose situational problems on invasions caused by representatives of the Sarcomastigophora type .</p> <p>Microscopy of Protozoa preparations, patterns of natural focal invasions (trypanosomiasis, leishmaniasis).</p>	<p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>the correctness of their solution</p> <p>- assessment of protection projects:</p> <p>Biological and medical relevance of studying protozoonoses</p>	
15	Protozoology – 2.	<p><b>Theoretical part :</b> Type Protozoa. Taxonomy. Study of the structure and life cycle of representatives of the classes Sporozoa and Ciliates using an algorithm.</p> <p><b>Practical part:</b> identify on preparations. Justify in variants of problem tasks the routes of infection and measures of prevention of pathogens of malaria, toxoplasmosis, balantidiasis . Be able to justify the relevance of studying malaria and participants of a natural focus, the probability of its resumption in the territory of the Amur Region.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.</p> <p>UC-2: AI 2.1. AI 2.2. AI 2.3.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1. AI 5.2.</p> <p>UC-6: AI 6.1,</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2. AI 10.3.</p> <p>GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system</p> <p>- control of the correctness of solving problems from the department's funds</p> <p>- analysis of filling information tables, according to the algorithm</p> <p>- control over verification and documentation of samples</p> <p>- analysis of the solution of the author's problems</p> <p>- project evaluation:</p> <p>Biological and medical relevance of studying protozoan invasions</p>	2,125
16	<b>Final lesson – certification for 1 semester</b>	<p><b>Theoretical part :</b> Certification based on the results of the 1st semester,</p>	<p>UC-1: AI 1.1.</p> <p>UC-2: AI 2.1.</p>	<p>- initial testing in the Moodle system</p>	2,125

		including the level of knowledge acquisition, based on the results of control assignments, participation in educational and research work <b>Practical part:</b> analysis of skills, possession of acquired knowledge;	UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- control of the solution of problems on Protozoology from the funds of the department - analysis of the results of visual diagnostics of parasites	
<b>2nd semester</b>					
17	Parasitism. Type Flatworms. Trematodoses.	<b>Theoretical part :</b> Type Flatworms. Features of the structure of Flatworms. Features of the structure, life cycle of the class Flukes on micropreparations, diagrams, microphotographs. Routes of infection and preventive measures for fascioliasis , opisthorchiasis, dicrocoeliosis . <b>Practical part:</b> Microscopy of preparations. Solving the proposed and compiling situational tasks on the specified parasites.	UC-1: AI 1.1. AI 1.2, AI 1.3. UK-2: AI 2.1. ID 2.2. AI 2.3. UK-4: AI 4.2. UK-5: AI 5.1. AI 5.2. UK-6: AI 6.3. OPK-10: AI 10.2. AI 10.3. OPK-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of the results of solving problems on Trematodoses - analysis of the correctness of filling in information tables according to the algorithm - verification and documentation of samples - output test control	2,5
18	Far Eastern natural focal trematodoses. Relevance.	<b>Theoretical part :</b> Far Eastern trematodes. Biology of Far Eastern trematodes: clonorchis , metagonimus , paragonimus , nanophyetes , schistosomes. Life cycles. <b>Practical part:</b> Microscopic	UK-1: AI 1.1. AI 1.2, AI 1.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3.	- initial testing in the Moodle system - quality control of solutions to problems on Far Eastern trematodes - analysis of filling information tables	2,5

		analysis of endemics on preparations, microphotographs. Ability to differentiate from opisthorchis and other trematodes. Importance of the study.	GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- verification and documentation of samples - output test control - analysis of research projects.	
19	Cestodoses. Peculiarities of life cycles with specific examples: pork tapeworm, beef tapeworm.	<b>Theoretical part :</b> Class Tapeworms. General characteristics of tapeworms. Structure and life of pork and bovine tapeworms – on micropreparations, photo illustrations, macropreparations. Argumentation of the importance of studying taeniasis . <b>Practical part:</b> Microscopic analysis of morphological features of cestodes in connection with the parasitic way of life. Solving situational problems.	UC-1: AI 1.1. AI 1.2, UC-2: AI 2.1. AI 2.2. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. ID 11.2. AI 11.3.	-- initial testing in the Moodle system - control of the results of solving problems on Cestodoses - analysis of filling information tables - verification and documentation of samples, life cycle schemes - output test control - analysis of research projects.	2,5
20	Cestodoses: broad tapeworm, echinococcus, alveococcus , dwarf tapeworm.	<b>Theoretical part :</b> Tapeworms - 2. Features of the structure and life cycle of the broad tapeworm, participants in the natural focus of diphyllbothriasis. Dwarf tapeworm - the danger of autoinvasion and autoreinvasion for a child's body. Fundamentals of pathogenesis. Endemics: echinococcus, alveococcus - participants in the life cycle - definitive and intermediate	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-: AI 1.3. GPC-10: AI 10.2. AI 10.3.	- initial testing in the Moodle system - control of the results of solving problems on Cestodoses, including the author's - analysis of filling information tables - verification and documentation of samples, life cycle schemes - output test control - protection and analysis of research projects	2,5

		hosts. Danger of infection. <b>Practical part:</b> Microscopic analysis of morphological features of the listed cestodes. Solving situational problems. Justification of diagnostic methods.	GPC-11: AI 11.1. AI 11.2. AI 11.3.		
21	Nematodoses are geohelminths.	<b>Theoretical part :</b> Type Roundworms. Class – Nematodes. Geohelminths, relevant for the Amur region. Biological feature. Life cycles on the example of: roundworm, whipworm, pinworm, hookworm. Study of signs of adaptation to parasitism. <b>Practical part:</b> Microscopic analysis of nematode morphology. Solving situational problems. Justification of diagnostic methods.	UC-1: AI 1.1. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-5: AI 5.1. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of the correctness of the solution of problems on Nematodoses , including the author's - analysis of work with information tables - verification and documentation of samples, life cycle schemes - output test control - protection and analysis of research projects	2,5
22	Nematodoses are biohelminths.	<b>Theoretical part :</b> Roundworms – biohelminths. Peculiarities of the life cycle on the example of trichinella, guinea worm, filaria . Characteristics of endemic areas, natural foci. Relevance of studying trichinosis in the Amur region. Annelids. Aromorphoses in the characteristics of Annelids. The structure of the medicinal leech.	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3.	- initial testing in the Moodle system - control of the correctness of the solution of problems on Nematodoses , including the author's - analysis of work with information tables - verification and documentation of samples, life cycle schemes - output test control	2,5

		<b>Practical part:</b> Microscopic analysis of the morphology of biohelminth nematodes and Annelids. Solving situational problems.	GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- protection and analysis of research projects	
23	<b>Control lesson – 4 on helminthology (Diagnostics godfather-1)</b>	<b>Theoretical part :</b> Control tasks on Helminths (Diagnosticum-2). <b>Practical part:</b> Diagnostic verification of helminths on preparations, microphotographs, diagrams. Solving situational problems.	UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of the correctness of the solution of problems in Helminthology - identification of parasites on preparations, microphotos , diagrams	2,5
24	Arthropods. Aromorphoses of the type. Representatives. Order Ticks. Features. Medical significance.	<b>Theoretical part :</b> Type Arthropoda. Taxonomy. Aromorphoses of representatives of the type Arthropoda. Classes: Crustacea, Arachnida. Characteristics of arthropods. Structure and medical significance of crustaceans and arachnids. Order Ticks. Taxonomy of the order. Features of structure, life cycle, its participants - on preparations, diagrams, microphotographs. Justification of the medical significance of all representatives. <b>Practical part:</b> Identification on preparations: taiga	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. ID 11.2. AI 11.3.	- initial testing in the Moodle system - control of the correctness of the solution of problems on Acarinoses , including the author's - analysis of the results of work with information tables - control of verification and documentation of tick preparations, life cycle schemes - output test control - protection and analysis of research projects: a. KVLE – relevance of the study in the Amur region;	2,5

		tick, dog tick, dermacentor , village tick, scabies mite; life cycle stages. Solving situational problems. Justification of the relevance of the study in the Amur Region.		b. vaccination against EVD.	
25	Orders Lice, Fleas, Bedbugs, Cockroaches. Medical significance.	<p><b>Theoretical part :</b> Class Insects. Orders Lice and Fleas. Characteristics of insects - aromorphoses and idioadaptations. Features of the structure of the orders Lice and Fleas. Practical study of the order of lice, fleas on preparations. Diagnostics of features. Orders Bugs, Cockroaches . Features of the structure, life cycle. Justification of medical significance. Relevance of the study in the Amur Region.</p> <p><b>Practical part:</b> Identification on preparations; life cycle stages. Solving situational problems. Justification of the relevance of the study in the Amur Region.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	- Evaluation of testing results in the Moodle system . - Control of problem solving, including author's. - Analysis of work with information tables. - Control of verification and documentation of preparations of life cycle schemes. - Test control - day off. - Defense and analysis of R&D projects: a. pediculosis - relevance of study in the Amur region; b. Cockroaches: what is the threat?	2,5
26	Order Diptera. Biological features, medical significance.	<p><b>Theoretical part :</b> Insects. Order Diptera. Characteristics of the class Insects. Diversity of families. Features of the structure, life</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3.</p>	- Evaluation of testing results in the Moodle system . - Control of problem solving, including author's. - Analysis of the	2,5

		<p>cycle, habitat of representatives of the families Mosquitoes, Flies, Sandflies, Gadflies. Medical significance.</p> <p><b>Practical part:</b> Study on preparations of the development cycle of representatives of the Order Diptera: families Mosquitoes; Flies; Sandflies; Gadflies; Horseflies. Identification on diagrams - carriers and pathogens of protozoan invasions. Relevance of the study.</p>	<p>UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>results of work with information tables. - Control of verification and documentation of samples in life cycle schemes. - Test control - output. - Defense and analysis of research projects: a. Malaria – relevance of study in the Amur region; b. Trypanosomiasis - participants in the software?</p>	
27	<p><b>Control lesson on Arachnoentomology ( Diagnostikum-2)</b></p>	<p><b>Theoretical part :</b> Test questions on the theory of Arachnoentomology and Protozoology – Arthropods. <b>Practical part:</b> diagnostics of samples, solving situational problems.</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>- initial testing in the Moodle system - control of the correctness of the solution of problems in Arachnoentomology and Protozoology - analysis of parasite identification on preparations, microphotographs, diagrams - protection of research projects</p>	2,5
28	<p>Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.</p>	<p><b>Theoretical part :</b> Chordata type. Characteristics of the type. Evaluation criteria. Lower Chordata – Amphioxus. Practical study of Amphioxus on</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3.</p>	<p>- initial testing in the Moodle system - frontal survey - vocabulary dictation (basic concepts of EB) - identification of stages of evolution</p>	2,5

		<p>preparations as a manifestation of the axialization stage in humans during embryogenesis.</p> <p>Taxonomy of Chordata type. Main aromorphoses of representatives of the Vertebrate subtype.</p> <p>Phylogenesis of the nervous system (NS). Models of NS evolution in invertebrates: diffuse, lattice types of nervous system; ganglionic-reticular type. Evolution of the reflex arc.</p> <p>Stages of CNS evolution in vertebrates.</p> <p>Phylogenesis of brain regions.</p> <p>Features of brain development and structure in human ontogenesis.</p> <p>Congenital malformations of the CNS.</p> <p><b>Practical part:</b> Factors causing disruption of brain development mechanisms. Study of variants of congenital malformations of the human brain.</p>	<p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1.</p> <p>AI 5.2.</p> <p>UC-6: AI 6.1, AI 6.3.</p> <p>GPC-1: AI 1.3.</p> <p>GPC-10: AI 10.2.</p> <p>AI 10.3.</p> <p>GPC-11: AI 11.1.</p> <p>AI 11.2.</p> <p>AI 11.3.</p>	<p>using diagrams and dummies</p> <p>- protection of research projects – biological and medical</p> <p>substantiation of the relevance of studying the phylogenesis of the central nervous system and congenital malformations of humans.</p> <p>- output test control</p>	
29	<p>Evolution of circulatory systems. Phylogenesis of the cardiovascular and respiratory systems. VPR.</p>	<p><b>Theoretical part :</b> Phylogenesis of the cardiovascular and respiratory systems.</p> <p>Objective: to form in students an understanding of the unity of development, the role in the evolution of the respiratory and circulatory systems of</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3.</p> <p>UC-2: AI 2.1. AI 2.2. AI 2.3.</p> <p>UC-4: AI 4.2.</p> <p>UC-5: AI 5.1.</p> <p>AI 5.2.</p>	<p>- initial testing in the Moodle system</p> <p>- frontal survey</p> <p>- vocabulary dictation (basic concepts of EB)</p> <p>- identification of stages of evolution using diagrams and dummies</p> <p>- protection of research projects -</p>	2,5

		<p>Invertebrates and Chordates. To substantiate the role of all stages of development of the cardiovascular and respiratory systems for human embryonic development, the participation of the structures of the gill apparatus in the development of embryonic rudiments.</p> <p><b>Practical part:</b> Substantiation of the role of genetic and epigenomic factors in the development of these systems in human embryogenesis and the formation of congenital malformations of the cardiovascular and respiratory systems, prevention of developmental defects. Intrauterine diagnostics.</p>	<p>UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.</p>	<p>biological and medical substantiation of the relevance of studying the phylogenesis of the cardiovascular and respiratory systems, and the congenital malformations of these human systems. - output test control</p>	
30	<p>Evolution of the genitourinary system. Stages. Role. Arguments of the 21st century.</p>	<p><b>Theoretical part :</b> Phylogenesis of the genitourinary system. Stages of evolution in invertebrates and the role of systems. Unity of development of the urinary and reproductive systems.</p> <p><b>Practical part:</b> Justification of repetition of stages of MPS phylogenesis in human ontogenesis: pronephron , primary kidney, definitive kidney. The significance of</p>	<p>UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. AI 5.2. UC-6: AI 6.1, AI 6.3. GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3.</p>	<p>- initial testing in the Moodle system - frontal survey - vocabulary dictation (basic concepts of EB) - identification of stages of evolution according to schemes - protection of research projects "Reproductive Health - Pros and Cons"</p>	2,5

		each stage in the full development of the organism and systems. Practical identification of stages of MPS and MPS development on preparations and diagrams. MPS congenital malformations.	GPC-11: AI 11.1. ID 11.2. AI 11.3.		
31	<b>Control lesson on the phylogenesis of organs and systems (diagnostics)</b>	<b>Theoretical part :</b> Final lesson on phylo-, ontogenetics in the aspect of human health. Control forms of credit on lecture material and practical classes. Defense of research and development work on current problems of human ontogenesis.	UC-1: AI 1.1. UC-2: AI 2.1. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- initial testing in the Moodle system - control of identification on diagrams of representatives (taxons), processes and participants - analysis of research projects	2,5
32	Certification lesson at the end of the 2nd semester.	Certification lesson. Summing up the results of training. Results of the defense of research and development work by students	UC-1: AI 1.1. AI 1.2, AI 1.3. UC-2: AI 2.1. AI 2.2. AI 2.3. UC-4: AI 4.2. UC-5: AI 5.1. UC-6: AI 6.1, GPC-1: AI 1.3. GPC-10: AI 10.2. AI 10.3. GPC-11: AI 11.1. AI 11.2. AI 11.3.	- Intermediate distance testing in the Moodle system - Summing up the results of the Olympics - Analysis of training results	2,5
	Всего 1 сем.:	34 часа			
	Всего 2 сем.:	40 часов			

Итого:	74 часа			
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**6. 2.4. To amend the "Interactive Forms of Teaching" section and present the table in the following edition:**

<b>No. p/p</b>	<b>Topic of practical lesson, lecture</b>	<b>Labor intensity per hour.</b>	<b>Interactive form of learning</b>	<b>Labor intensity in hours and % from the lesson</b>
1.	Introduction to Cell Biology. Microscopic Method of Research	2,125	- Testing in the Moodle system - Mini-lectures on the history of cytology. - MMP on modern methods of studying cells.	20 min. (0.21 h) 9.9%
2.	Cell biology. Cytoplasm. Organization. Role.	2,125	- Testing in the Moodle system - Video film: In the world of the cell. - Illustrated task maps – identification and motivation.	20 min. (0.21 h) 9.9%
3.	Cell biology. Nucleus. Organization. Functions in the cell life cycle	2,125	- Testing in the Moodle system - MMP on the discovery of apoptosis. - Find the participants in the protein synthesis model - who has more?!	20 min. (0.21 h) 9.9%
4.	Reproduction is a property of living things. Organismic level. Meiosis: spermatogenesis, oogenesis. Fertilization.	2,125	- Modeling a life situation ("effective parents"); - Implementation of role functions in order to justify negative effects; - MMP: illustration of pathospermia variants ; - ART – effect!?	20 min. (0.21 h) 9.9%
5.	Control lesson on cell biology – 1 (diagnosticum)	2,125	- Testing in the Moodle system - protection of individual task cards with a set of visual and text tasks and assignments	20 min. (0.21 h) 9.9%
6.	Introduction to Genetics. Laws of Inheritance.	2,125	- Portrait diagnostics of great compatriots and foreigners.	20 min. (0.21 h) 9.9%
7.	Interaction of genes. Classification. Examples of VG.	2,125	- Testing in the Moodle system - Discussion about the diversity of manifestations of VG; - Role play: "Crystal child - who is to blame?!" - MMP - "Crystal boy - who is to blame?!" - Briefing: "One humanity with different blood types!?"	20 min. (0.21 h) 9.9%
8.	Chromosomal theory of heredity. History of the study of heredity.	2,125	- Testing in the Moodle system 1. Group discussion: on the role of genetics in biology and medicine. 2. MMP – about Morgan’s personality and his team.	20 min. (0.21 h) 9.9%

9.	Modern concept of gene. Types and functions of gene.	2,125	<ul style="list-style-type: none"> <li>- Protection of gene models, stages of protein synthesis.</li> <li>- Author's problems on the genetic code - competition.</li> </ul>	20 min. (0.21 h) 9.9%
10.	Variability. Phenotypic variability. Genotypic variability. Arguments.	2,125	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Discussion (small groups) about life reserves.</li> <li>- Role play: diagnosis of a hereditary disease.</li> <li>- Discussion: the most terrible mutagens?!</li> </ul>	20 min. (0.21 h) 9.9%
11.	Introduction to Medical Genetics. Research Methods- 1.	2,125	<ul style="list-style-type: none"> <li>- Competition for the most capacious pedigree.</li> <li>- Discussion about twins.</li> <li>- Student glyphs - in correlation with other phenes.</li> <li>- Collective solutions to diagnostic problems.</li> </ul>	20 min. (0.21 h) 9.9%
12.	Introduction to Medical Genetics. Research Methods – 2.	2,125	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Discussion (small groups) about the methods and effectiveness of gene diagnostics .</li> <li>- Identification of sex chromatin in patient smears.</li> <li>- Reading karyograms with diagnosis substantiation.</li> <li>- Collective solutions to situational problems.</li> </ul>	20 min. (0.21 h) 9.9%
13.	Control lesson on Genetics – 2 (diagnosticum)	2,125	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Protection of individual task cards with a set of visual and text tasks and assignments.</li> <li>- Protection of personal projects in the form of annotations</li> </ul>	20 min. (0.21 h) 9.9%
14.	Protozoology - 1	2,125	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Justification in variants of problem tasks of the routes of infection and measures for the prevention of amebiasis, trypanosomiasis, leishmaniasis, giardiasis, trichomoniasis.</li> </ul>	20 min. (0.21 h) 9.9%
15.	Protozoology - 2	2,125	<ul style="list-style-type: none"> <li>- Testing in the Moodle system</li> <li>- Business game - in role-playing performance: <ul style="list-style-type: none"> <li>- the patient's parent,</li> <li>- pediatrician,</li> <li>- infectious disease doctor,</li> <li>- geneticist - diagnostics:</li> <li>- malaria;</li> <li>- toxoplasmosis;</li> <li>- balantidiasis .</li> </ul> </li> </ul> <p>Applicable to all parasitic taxa with justification for the relevance of study.</p>	20 min. (0.21 h) 9.9%

<b>16.</b>	Control lesson on Protozoology – 3 (diagnosticum)	2,125	- Testing in the Moodle system - Abstract defense: tropical diseases – relevance of study. - Diagnostics of pathogens (MP) with justification according to the algorithm. - Defense of variants of problematic tasks on Protozoology.	20 min. (0.21 h) 9.9%
<b>2nd semester</b>				
<b>17.</b>	Parasitism. Type Flatworms. Trematodoses.	<b>3.0</b>	- Testing in the Moodle system - Dictionary of terms in Helminthology. - Business game: substantiation of the diagnosis of trematodosis in role-playing variants.	20 min. (0.44 hours) 13.5%
<b>18.</b>	Far Eastern trematodoses – pathogens. Relevance.	<b>3.0</b>	- Testing in the Moodle system - Business game - in role-playing performance: - pediatrician, - infectious disease specialist, - geneticist - diagnostics: - clonorchiasis, paragonimiasis with arguments for the relevance of the study.	20 min. (0.44 hours) 13.5%
<b>19.</b>	Cestodoses. Peculiarities of life cycles with specific examples: pork tapeworm, beef tapeworm.	<b>3.0</b>	- Verify on preparations, microphotographs. - Justify in variants of problem tasks the routes of infection and measures of prevention of pathogens of cestodiasis.	20 min. (0.44 hours) 13.5%
<b>20.</b>	Cestodoses: broad tapeworm, echinococcus, alveococcus, dwarf tapeworm.	<b>3.0</b>	- Testing in the Moodle system - Business game – role-playing: - pediatrician, - parasitologist, - laboratory doctor. - Mini-lecture: argumentation of the relevance of studying cestodes.	20 min. (0.44 hours) 13.5%
<b>21.</b>	Nematodoses are geohelminths.	<b>3.0</b>	- Testing in the Moodle system - Business game – role-playing: - pediatrician, - parasitologist, - laboratory doctor. - Mini-lecture: argumentation of the relevance of studying geohelminth nematodes.	20 min. (0.44 hours) 13.5%
<b>22.</b>	Nematodoses are biohelminths.	<b>3.0</b>	1. Business game: in role-playing: - pediatrician, - parasitologist, - geneticist - diagnostics. 2. Nematodes of hot countries and the Far Eastern Federal District - with arguments for the relevance of the study.	20 min. (0.44 hours) 13.5%

			3. Life cycles - ?	
23.	Control lesson on helminthology – 4 (diagnosticum)	3.0	- Testing in the Moodle system - Verification of parasites (in slide variants, MMP). - Discussion: the most terrible "beast" of the Amur region!?	20 min. (0.44 hours) 13.5%
24.	Arthropods. Aromorphoses of the type. Representatives. Order Ticks. Features. Medical significance.	3.0	- Testing in the Moodle system 1. Business game: role-playing: - pediatrician, - parasitologist, - geneticist - diagnostics. 2. Ticks - diversity in the Far Eastern Federal District - with arguments for the relevance of the study. 3. Protection of life cycle schemes, participants.	20 min. (0.44 hours) 13.5%
25.	Orders Lice, Fleas, Bedbugs, Cockroaches. Medical significance.	3.0	- Testing in the Moodle system - Press conference: The relevance of studying Lice and Fleas in the 21st century in Russia, Amur region. - MMP: life cycle of cockroaches - relevance of study in the world, Amur region.	25 min. (0.55 hours) 17.2%
26.	Order Diptera. Biological features, medical significance.	3.0	- Testing in the Moodle system - Business game: roles of doctors: - pediatrician, - infectious disease doctor, - geneticist - diagnostics: with argumentation of relevance. - Booklets (MMP) on malaria prevention and more.	20 min. (0.44 hours) 13.5%
27.	Control lesson on Arachnoentomology – 5 (diagnosticum)	3.0	- Testing in the Moodle system - Verification of parasites (in slide variants, MMP). - Discussion: the most terrible beast on our planet!?	20 min. (0.44 hours) 13.5%
28.	Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.	3.0	- Briefing: on the concepts of evolution and the role of Darwin. - Dictionary of terms of evolutionary biology – control dictation.	20 min. (0.44 hours) 13.5%
29.	Evolution of circulatory systems. Phylogenesis of the cardiovascular and respiratory systems. VPR.	3.0	- Testing in the Moodle system - Case method : On the relevance of cardiovascular diseases. - Field situations (experience); (my problem), - armchair situation. - Express learning method: Why can't you smoke!?	25 min. (0.55 hours) 17.2%

			- Defense of booklets on the role of genetic and epigenomic factors in the development of systems in human embryogenesis and the formation of congenital malformations.	
30.	Evolution of the genitourinary system. Stages. Role. Arguments of the 21st century.	3.0	- Testing in the Moodle system - Modeling a life situation ("effective parents"); - Implementation of role functions in order to justify negative effects; - MMP – illustration of pathospermia ; - ART – effect!?	20 min. (0.44 hours) 13.5%
31.	Control lesson on the phylogenesis of organs and systems - 6 (diagnosticum)	3.0	1. Case method. On the relevance of the phylogenesis of vital systems: - field situations (experience); (my problem), - armchair situation. 2. Express learning method: Why can't you smoke!? 3. Defense of booklets on the role of genetic and epigenomic factors in human embryogenesis and the formation of congenital malformations.	20 min. (0.44 hours) 13.5%
32.	Certification lesson at the end of the 2nd semester.	4.0	- Final midterm testing. - Press conference: The relevance of studying biological and medical problems in the 21st century in the world, in Russia, and the Amur region. - MMP: life cycle of cockroaches - relevance of study in the world, Amur region.	20 min. (0.44 hours) 13.5%

**7. Amend paragraph 2.6. "Independent Student Work: In-Class, Out-of-Class." The table shall be presented as follows:**

**Organization of extracurricular independent work**

No . p/p	Topic practical lesson	Time to prepare student to class	Forms of extracurricular independent work student work	
			Mandatory and the same for all students	At the student's choice
1.	Introduction to Cell Biology. Microscopic Method research	1.0	Study of theoretical material on the topic of the practical lesson (lecture material, reading of basic and additional educational literature, writing notes, solving test tasks,	1. Arguments: on the role of biology in the system of natural scientific knowledge in the 21st century 2. Production of MMP: portraits of "Great cytologists".

			preparing a workbook, working with Internet sources).	3. The history of the creation of the microscope – great names. 3. Modern methods of studying cells. 4. Nuclear magnetic microscope – real possibilities and prospects for studying structures.
2.	Cell biology. Cytoplasm. Organization. Role.	<b>1.0</b>	Study of theoretical material on the topic of the practical lesson (lecture material, reading of basic and additional educational literature). Drawing up a structural and logical diagram of the “Organization of the cytoplasm”. Working with Internet sources)	1. <b>Stand</b> : “Modern cell model” - protection from possession. 2. Microscopy of additional preparations. 3. Methods in MMP: . Electron microscope – operating principle, capabilities, prospects for improvement 4. Autoradiography is one of the options for studying the function
3.	Cell biology. Nucleus. Organization. Functions in the cell life cycle	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Scheme: the structure of the nucleus and its functional system - DNA-RNA in the life cycle of the cell. Contents of all stages of the mitotic cycle.	1. Competition: structural and logical scheme of oogenesis – comparative aspect. 2. MMP: History of the study of mitosis. 3. Stages of cell preparation for division – interesting facts about the main thing. 4. The core – in the levels of organization, the microscopic picture.
4.	Reproduction is a property of living things. Organismic level. Meiosis: spermatogenesis , oogenesis. Fertilization	<b>1.4</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Draw a diagram of spermatogenesis, cells at the stages of meiosis. Designate the mechanisms of combinatorial variability. Comparison with oogenesis.	1. Competition for the optimal structural and logical scheme of spermatogenesis - arguments. 2. Microscopy of rat testicle. Description, photo documentation. 3. Discussion : How to protect the reproductive system?!
5.	Control lesson on cell biology – 1 (diagnosticum)	<b>1.0</b>	Repetition of theoretical material: (lecture material, reading of basic and additional educational literature) on cell biology. Control tasks on Cell Biology – 1: Test control. Solving problems on cytology.	1. Defense of situational problems in cell biology. Defense of author's tasks in cytology. 2. Credit for completed versions of independent work.
6.	Introduction to Genetics. Laws of Inheritance.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of	- MMP – history of the development of genetics.

			basic and additional educational literature). Protecting Inheritance Types when solving problems on Mendelian traits. Examples from human genetics. Independent problem solving.	- Compilation of tests. - Independent (author's) compilation of the task, defense. - Vocabulary dictation – compilation, implementation.
7.	Interaction of genes. Classification. Examples of VG	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Examples from human genetics and medical genetics according to VG, problem solving.	Presentations on inheritance: - blood groups, - codominance , - incomplete dominance, - Bombay Phenomenon, - polygeny (growth), - complementary type. Tasks, protection.
8.	Chromosomal Theory of Heredity. History of the Study of Heredity	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Basic principles of the chromosomal theory of heredity. Problem solving.	Presentations: History of the discovery of HT. Participants. - The role of the domestic school of geneticists ( N.K. Koltsov ). - Compiling problems on sex-linked traits. on human genetics. Solving situational (clinical) problems.
9.	Modern concept of gene. Types and functions of gene.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Protein synthesis diagram in the album. Sex -linked inheritance . Practical problem solving. Independent problem solving: condition, solution, answers.	Presentation and defense: - Models of gene organization. - Participants in protein synthesis and their functions. - Enhancers, silencers and other "controllers" of protein synthesis. - Reading karyograms of the fruit fly <i>Drosophila</i> . - Hymn to the <i>Drosophila</i> fly?!
10.	Variability. Phenotypic variability. Genotypic variability. Arguments.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Practical activities: solving problems illustrating modification variability, reproducing the limits of the reaction norm of human traits using examples. Knowing the concept of "adaptation", examples of individual adaptation. Genotypic variability. Types. Mechanisms of combinatorial variability. Mutational variability. Classifications of mutation types in hereditary pathology.	Presentations: - Genetic basis of adaptation. - Human vital activity reserves – examples. - Combinative variability and modern humanity. - Types of gene mutations. - Variants of chromosomal mutations. - Examples of genomic mutations. - Mutagens far and near – arguments of relevance. - Information: SVZ – alcohol, nicotine, drugs as mutagenic factors. Students' assessment.

11.	Introduction to Medical Genetics. Research Methods-1.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Practical activities: learn how to analyze a pedigree using an algorithm, make and read dermatoglyphs . Use the Holzinger formula to justify the twin method. Solve problems on pedigrees in inheritance variants. penetrance and prognosis for the proband's children.	<ul style="list-style-type: none"> <li>- Compilation of a pedigree with its analysis using an algorithm.</li> <li>- Competition for the most interesting tree.</li> <li>- Diagnostics of proposed genealogies. Protection of the best.</li> <li>- Making your own glyphs and analyzing them.</li> <li>- Diagnostics of the proposed syndromic glyphs .</li> <li>- Presentations:</li> <li>- These amazing twins!?</li> </ul>
12.	Introduction to Medical Genetics. Research Methods-2.	<b>1,2</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Solving problems on determining sex chromatin; Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome).	<ul style="list-style-type: none"> <li>1. Diagnostics of sex chromatin variants.</li> <li>Definition of the Holzinger coefficient , conclusion.</li> <li>Reading karyograms with substantiation of the karyotype formula, hereditary disease (syndrome). Diagnostics of the proposed karyograms.</li> </ul>
13.	Control lesson on Genetics – 2 (diagnosticum)	<b>1,2</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature). Test control, solving situational problems of varying degrees of complexity, analysis of pedigrees, karyograms, portrait diagnostics, analysis of chromosome maps.	<ul style="list-style-type: none"> <li>- Analysis of UIR activity.</li> <li>- Solving problematic issues in human genetics.</li> <li>- Identification of exclusive karyograms.</li> <li>- Portrait diagnostics of karyotypes of patients with different nosologies.</li> </ul>
14.	Protozoology – 1.	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Microscopy of parasites. - Problem solving for diagnostic purposes Drawing up situational tasks on invasions caused by representatives of the classes Flagellates and Sarcods.	<ul style="list-style-type: none"> <li>- Presentations of your choice: Amebiasis, leishmaniasis, trypanosomiasis, giardiasis, trichomoniasis.</li> <li>- Compilation of information tables of parasites according to the algorithm.</li> <li>- Evidence of the relevance of studying representatives in the Amur region.</li> </ul>
15.	Protozoology – 2.	<b>1.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Microscopy of parasites. - Problem solving for diagnostic purposes Filling in information tables according to the algorithm.	<ul style="list-style-type: none"> <li>- Presentations: Malaria plasmodium, toxoplasma, Balantidia intestinalis.</li> <li>- History of malaria in the Amur region.</li> <li>- Arguments for the relevance of studying the causative agents of malaria,</li> </ul>

			Drawing up situational tasks on invasions caused by representatives of the classes Sporozoa, Ciliates.	toxoplasmosis, balantidiasis in variants of problematic tasks.
<b>16</b>	<b>Final lesson – certification for 1 semester</b> Control lesson on Protozoology Diagnostics - kum-3	<b>1.5</b>	Certification based on the results of the first semester, including the level of acquisition of knowledge and skills in practical classes; results of control classes, participation in educational and research work.	Defense of the UIR, quality analysis. Assessment of students in the 1st semester.
<b>2nd semester</b>				
17	Parasitism. Type Flatworms. Trematodoses.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Features of the structure of flatworms, life cycle of the class Flukes on micropreparations, diagrams, microphotographs. Routes of infection and measures to prevent fascioliasis , opisthorchiasis, dicrocoeliosis .	<ul style="list-style-type: none"> <li>- Presentations: Trematodes - causative agents of fascioliasis , opisthorchiasis, dicrocoeliosis</li> <li>- Competition of information tables (by algorithm).</li> <li>- Verification and documentation of d samples.</li> <li>- Test control.</li> <li>- Brochures on the prevention of trematodosis.</li> </ul>
18	Far Eastern trematodoses – pathogens. Relevance.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): Far Eastern trematodoses. - Test control. - Practical analysis of endemics on preparations, microphotographs. Ability to differentiate from opisthorchis and other trematodes. Importance of study.	<ul style="list-style-type: none"> <li>- Presentations: Far Eastern trematodes - causative agents of clonorchiasis , metagonimiasis , nanophyetosis .</li> <li>- Schistosomiasis is relevant!</li> <li>- Competition of information tables (by algorithm).</li> <li>- Verification and documentation of rare samples.</li> <li>- Brochures on the prevention of trematodosis.</li> </ul>
19	Cestodoses. Peculiarities of life cycles with specific examples: pork tapeworm, beef tapeworm.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): cestodes. Test control. - Microscopic analysis. The importance of studying pork and beef tapeworm, in photo illustrations, diagrams.	<ul style="list-style-type: none"> <li>- Presentations: Arguments for the importance of studying taeniasis ; cysticercosis.</li> <li>- Filling in information tables according to the algorithm.</li> <li>- Verification and documentation of rare samples.</li> </ul>
20	Cestodoses: broad tapeworm, echinococcus, alveococcus , dwarf tapeworm.	<b>2.0</b>	Study of theoretical material: reading basic and additional educational literature): cestodes. - Test control.	Presentations: 1. Dwarf tapeworm – the danger of autoinvasion and autoreinvasion for children.

			- Microscopic analysis, - Diagnostics using photo illustrations and diagrams. Endemics - echinococcus, alveococcus - participants in the life cycle - definitive and intermediate hosts. Danger of infection.	2. Arguments for the importance of studying echinococcosis; alveococcosis. 3. Participants in the natural focus of diphyllbothriasis. 4. Verification and documentation of rare samples. 5. Diagnostic methods
21	Nematodes are geohelminths.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): cestodes. Type Roundworms. Class - Nematodes. Microscopy of geohelminths. - Problem solving. - Test control. - Analysis of signs of adaptation to parasitism.	Presentation: - Biological peculiarity of ankylostomids. - Life cycles using the example of: roundworm, whipworm, pinworm. - Nematodes - relevant for the Amur region. - Competition of information tables (by algorithm).
22	Nematodes are biohelminths.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): roundworms – biohelminths. Microscopy of Trichinella. Filling in information tables according to the algorithm: - trichinella, guinea worm, - filariasis.	Presentation: - Characteristics of endemic areas, natural foci. - The relevance of studying trichinellosis in the Amur region. - Annelids. Aromorphoses - The structure of the medicinal leech, Use in medicine.
23	Control lesson on helminthology gi-4 (diagnosticum)	<b>2.0</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature): cestodes. Verification of helminths by samples. Solving situational problems. Test control.	Analysis of UIR activity. - Protection of copyright tasks. - Identification of exclusive photo documents. - Diagnosis of helminthiasis.
24	Arthropods. Aromorphoses of the type. Representatives . Order Ticks. Features. Medical significance.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): cestodes. Type Arthropoda. Taxonomy. Aromorphoses of representatives of the type Arthropoda. Order Mites. Taxonomy of the order. Microscopic preparations: features of structure, life cycle, documentation of preparations. Problem solving. Filling in information tables according to the algorithm.	Presentations: - Arthropoda diversity. Classes: Crustacea, - Arachnids. - Justification of the medical significance of representatives of the order Ticks: taiga tick, dog tick, dermacentor , village tick. - Relevance of the study in the Amur region. - Outbreak of pediculosis in the Amur region.

25	Orders Lice, Fleas, Bedbugs, Cockroaches. Meaning.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): microscopy of lice, fleas, bedbugs, cockroaches. Diagnostics of features. Problem solving. Test control. Justification of medical significance. Relevance of study in the Amur region.	Presentations: - Characteristics of the class Insects: aromorphoses, idioadaptations. Significance. Relevance of the study in the Amur region. - Cockroaches - epidemiology. - Protection of information tables (according to the algorithm).
26	Order Diptera. Biological features, medical significance.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): Order Diptera. Diversity of families. Microscopy of representatives: Mosquitoes, Flies, Sandflies, Gadflies - documentation of samples. - Problem solving. - Test control.	Presentations: - Components of a natural malaria focus. - Medical significance of mosquitoes. - Components of the natural focus of leishmaniasis. - Components of the natural focus of trypanosomiasis. - Medical significance. Midges of the genus Simulium .
27	Control lesson on Arachnoentomology-5 (diagnosticum)	<b>2.0</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature). - diagnostics of samples, - solving situational problems, - test control of acquired knowledge.	Analysis of UIR activity. - Protection of copyright tasks. - Identification of exclusive photo documents. - Diagnostics of Diptera.
28	Evolutionary biology. Regularities. Laws. Mechanisms of evolution. Evolution of the central nervous system. VPR.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature). Taxonomy of the phylum Chordata, subphylum Vertebrata. Phylogenesis of the nervous system. Microscopy of lancelet preparations. Test control. Identification of stages of evolution using diagrams. - Vocabulary dictation (basic concepts of EB).	Presentations: - Concepts of the evolution of Life. - Basic concepts of evolutionary theory. - Types of evolution – including about humans. - Examples of aromorphoses . - Stages of evolution of the nervous system in invertebrates: - The stage of axialization in humans during embryogenesis. - Stages of development of the central nervous system in humans, mechanisms. - Great evolutionists. - Factors that cause congenital malformations of the central nervous system.
29	Evolution of circulatory	<b>2.0</b>	Study of theoretical material: (lecture material, reading of	Presentations:

	systems. Phylogenesis of the cardiovascular and respiratory systems. VPR.		basic and additional educational literature): phylogenesis of the cardiovascular and respiratory systems. - Vocabulary dictation (basic concepts of EL). Final control. - Identification of stages of evolution using diagrams.	- Stages of heart development – mechanisms. - Variants of congenital malformations of the human heart - The role of genetic and epigenomic factors in the development of cardiovascular diseases. - On the unity of development, the role of the respiratory and circulatory systems of the branches of evolution.
30	Evolution of MPS, stages Role. Arguments of the 21st century.	<b>2.0</b>	Study of theoretical material: (lecture material, reading of basic and additional educational literature): phylogenesis of the genitourinary system. Stages of evolution in invertebrates and the role of systems. The importance of each stage in the full development of the organism and systems. Identification of stages of development of the genitourinary system and the reproductive system on preparations and diagrams. Test control. Identification of stages of evolution using diagrams.	Presentations: Stages of MPS evolution in Invertebrates, the role of systems. MPS evolution in Vertebrates, the role of systems. - Unity of development of the MWS and PS. - The role of stages: probud , primary bud, definitive bud. Project defense: "Reproductive Health - Pros and Cons" - VPR MPS - factors.
31	Credit lesson on phylogenesis of organs and systems-6 (diagnosticum)	<b>2.0</b>	Repetition of theoretical material: (lecture material, basic and additional educational literature): phylo-, ontogenetics in the aspect of human health. - Test control. - Answers to questions. - Identification of taxa and participants in phylo- and ontogenesis on diagrams.	Project protection: - Problems of phylo-, ontogenetics in the aspect of human health. - The law of phylembryogenesis – A. N. Severtsov. - My choice of system and its protection from mutagens.
32	Certification lesson at the end of the 2nd semester.		Certification lesson. Summing up the results of training. Results of the defense of research and development work by students	Remote testing in the Moodle system . Analysis of results.
Total for Sem. 1:		<b>20</b>		<b>4</b>
Total for Sem. 2:		<b>30,0</b>		<b>24,0</b>
Total:		<b>78</b>		

8. Update the tables in section 3.5 “Professional databases, information reference systems, electronic educational resources”, “List of software (commercial software products)”, and set out as follows:

**3.5. Professional databases, information and reference systems, electronic educational resources**

Resource name	Resource Description	Access	Resource address
Electronic library systems			
Student Consultant. Medical University Electronic Library	For students and faculty of medical and pharmaceutical universities. Provides access to electronic versions of textbooks, teaching aids, and periodicals.	Remote access after registration under the university profile	<a href="https://www.studentlibrary.ru/">https://www.studentlibrary.ru/</a>
Reference and information system " MedBaseGeotar "	The MedBaseGeotar reference and information system is designed for practicing medical specialists, researchers, teachers, postgraduate students, residents, senior students, and healthcare managers to quickly search, select, and read the medical literature they need for their work in a single data source.	Remote access after registration under the university profile	<a href="https://mbasegeotar.ru/pages/index.html">https://mbasegeotar.ru/pages/index.html</a>
Electronic Library System " Bookup "	A large medical library is an information and educational platform for the shared use of electronic educational and methodological publications from medical universities in Russia and the CIS countries.	Remote access after registration under the university profile	<a href="https://www.books-up.ru/">https://www.books-up.ru/</a>
Electronic Block System "Lan"	Network electronic library of medical universities - an electronic database of educational and scientific works on medical topics, created for the purpose of implementing network forms of professional educational programs, open access to educational materials for partner universities	Remote access after registration under the university profile	<a href="https://e.lanbook.com/">https://e.lanbook.com/</a>
Scientific electronic library "	CyberLeninka is a scientific electronic library built on the paradigm of open science ( Open Science ), whose main goals are the popularization of science and scientific activity, public oversight	free access	<a href="https://cyberleninka.ru/">https://cyberleninka.ru/</a>

CyberLeninka "	of the quality of scientific publications, the development of interdisciplinary research, a modern institution of scientific review, increasing the citation rate of Russian science, and building a knowledge infrastructure. It contains over 2.3 million scientific articles.		
Human Biology Knowledge Base	Reference information on <u>physiology</u> , <u>cell biology</u> , <u>genetics</u> , <u>biochemistry</u> , <u>immunology</u> , <u>pathology</u> . (Resource of the <u>Institute of Molecular Genetics of the Russian Academy of Sciences</u> .)	free access	<a href="http://humbio.ru/">http://humbio.ru/</a>
State Register of Medicines	The State Register of Medicines website contains information about medications: indications, contraindications, mechanism of action, side effects, dosages, and methods of administration.	free access	<a href="https://grls.rosminzdrav.ru/GR/LS.aspx">https://grls.rosminzdrav.ru/GR/LS.aspx</a>
Information systems			
Clinical Guidelines Index	A resource of the Russian Ministry of Health that contains clinical guidelines developed and approved by medical professional non-profit organizations of the Russian Federation, as well as methodological manuals, nomenclatures, and other reference materials.	Link to download the application	<a href="https://cr.minzdrav.gov.ru/#/">https://cr.minzdrav.gov.ru/#/</a>
Federal Electronic Medical Library (FEMB)	The Federal Electronic Medical Library is part of the unified state information system in the field of healthcare as a reference system . <b>The FEMB was created on the basis of the funds of the Central Scientific Medical Library named after I.M. Sechenov.</b>	free access	<a href="https://femb.ru/">https://femb.ru/</a>
Russian State Library (RSL)	<b>Collection size:</b> approximately 3 million titles <b>Period covered:</b> from the 11th century to the present The Russian State Library's Electronic Library is a collection of electronic copies of valuable and frequently requested publications from the Russian State Library's collections,	Registration on the website	<a href="https://www.rsl.ru/">https://www.rsl.ru/</a>

	from external sources, as well as documents originally created in electronic form.		
Russian Medical Association	A professional online resource . Purpose: to promote effective professional activity among medical personnel. Contains the charter, personnel, structure, membership rules, and information about the Russian Medical Union.	free access	<a href="http://www.rmass.ru/">http://www.rmass.ru/</a>
Web medicine	The website provides a directory of professional medical resources, including links to the most authoritative specialized websites, journals, societies, as well as useful documents and programs. It is intended for physicians, students, and staff of medical universities and research institutions.	free access	<a href="http://webmed.irkutsk.ru/">http://webmed.irkutsk.ru/</a>
Databases			
World Health Organization	The site contains news, statistics on countries that are members of the World Health Organization, fact sheets, reports, WHO publications, and much more.	free access	<a href="http://www.who.int/ru/">http://www.who.int/ru/</a>
Ministry of Science and Higher Education of the Russian Federation	The website of the Ministry of Science and Higher Education of the Russian Federation contains news, newsletters, reports, publications, and much more.	free access	<a href="http://www.minobrnauki.gov.ru/">http://www.minobrnauki.gov.ru/</a>
Ministry of Education of the Russian Federation	The website of the Ministry of Education of the Russian Federation contains news, newsletters, reports, publications, and much more.	free access	<a href="https://edu.gov.ru/">https://edu.gov.ru/</a>
<a href="https://polpred.com/">Polpred.com</a>	Electronic library system Business media. Media review	free access	<a href="https://polpred.com/news">https://polpred.com/news</a>
Bibliographic databases			

Database "Russian Medicine"	Created at the Central Scientific and Methodological Library, it covers the entire collection since 1988. The database contains bibliographic descriptions of articles from Russian journals and collections, dissertations and their abstracts, as well as Russian and foreign books, institute proceedings, conference materials, etc. Thematically, the database covers all areas of medicine and related fields of biology, biophysics, biochemistry, psychology, etc.	free access	<a href="https://rucml.ru/">https://rucml.ru/</a>
PubMed	A text <a href="#">database</a> of medical and biological publications in English. PubMed is an electronic search engine with free access to 30 million publications from 4,800 indexed medical journals. The database contains articles published from 1960 to the present, including information from MEDLINE, PreMEDLINE, and NLM. Each year, the portal is updated with more than 500,000 new papers.	free access	<a href="https://pubmed.ncbi.nlm.nih.gov/">https://pubmed.ncbi.nlm.nih.gov/</a>
eLIBRARY.RU	A Russian information portal in science, technology, medicine, and education, containing abstracts and full texts of over 13 million scientific articles and publications. The eLIBRARY.RU platform offers electronic versions of over 2,000 Russian scientific and technical journals, including over 1,000 open-access journals.	Full functionality of the site is available after registration.	<a href="http://elibrary.ru/defaultx.asp">http://elibrary.ru/defaultx.asp</a>
Electronic library of dissertations (RSL)	Currently, the Electronic Library of Dissertations of the Russian State Library contains more than 919,000 full texts of dissertations and abstracts.	free access	<a href="http://diss.rsl.ru/?menu=disscatalog/">http://diss.rsl.ru/?menu=disscatalog/</a>
Medline .r u	Medical and biological portal for specialists. Biomedical journal.	free access	<a href="https://journal.scbmt.ru/jour/index">https://journal.scbmt.ru/jour/index</a>
Official Internet portal of legal information	The single official state information and legal resource in Russia	free access	<a href="http://pravo.gov.ru/">http://pravo.gov.ru/</a>

#### List of software (commercial software products)

№	List of software (commercial software products)	Details of supporting documents
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1.	operating system MS Windows 7 Pro	License number 48381779
2.	operating system MS Windows 10 Pro	CONTRACT No. UT-368 от 21.09.2021
3.	MS Office	License number:43234783, 67810502, 67580703, 64399692, 62795141, 61350919
4.	Kaspersky Endpoint Security для бизнеса – Стандартный Russian Edition. 50-99 Node 1-year Educational Renewal License	Agreement № 7 АА от 07.02.2025
5.	1C Accounting and 1C Salary	LICENSE AGREEMENT 612/L dated 02.02.2022 (additional licenses)
6.	1C: PROF University	LICENSE AGREEMENT No. KrTsB-004537 dated December 19, 2023
7.	1C: PROF Library	LICENSE AGREEMENT No. 2281 dated November 11, 2020
8.	Consultant Plus	Contract No. 41AA от 27.12.2024
9.	Kontur.Tolk	Agreement № K213753/24 от 13.08.2024
10.	3KL e-learning environment (Russian Moodle)	Agreement № 1362.5 от 20.11.2024
11.	Astra Linux Common Edition	Agreement № 142 А от 21.09.2021
12.	Information system "Plans"	Agreement № 2873-24 от 28.06.2024
13.	1C: Document Management	Agreement № 2191 от 15.10.2020
14.	R7-Office	Agreement № 2 КС от 18.12.2020
15.	License for the "ROSA CHROME OS Workstation"	Agreement № 88А от 22.08.2024
16.	Alt Virtualization Server 10 (for secondary and higher vocational education)	Agreement № 14AK от 27.09.2024
17.	Dr.Web Desktop Security Suite Comprehensive protection + Control Center for 12 months.	Agreement № 8 от 21.10.2024
18.	"Schedule for Educational Institutions" software	Agreement № 82А от 30.07.2024

**9.Update the table in section 3.5 “Licensed and freely distributed software used in the educational process” as follows.**

№	List of freely distributed software	Links to the license agreement
1.	Yandex Browser	Freely distributed License Agreement for the use of Yandex Browser software <a href="https://yandex.ru/legal/browser_agreement/">https://yandex.ru/legal/browser_agreement/</a>
2.	Yandex.Telemost	Freely distributed Software License Agreement <a href="https://yandex.ru/legal/telemost_mobile_agreement/">https://yandex.ru/legal/telemost_mobile_agreement/</a>
3.	Dr.Web CureIt!	Freely distributed License Agreement: <a href="https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf">https://st.drweb.com/static/new-www/files/license_CureIt_ru.pdf</a>
4.	OpenOffice	Freely distributed License: <a href="http://www.gnu.org/copyleft/lesser.html">http://www.gnu.org/copyleft/lesser.html</a>
5.	LibreOffice	Freely distributed License: <a href="https://ru.libreoffice.org/about-us/license/">https://ru.libreoffice.org/about-us/license/</a>
6.	VK Calls	Freely distributed <a href="https://vk.com/licence">https://vk.com/licence</a>
7.	Kaspersky Free Antivirus	Freely distributed <a href="https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt">https://products.s.kaspersky-labs.com/homeuser/Kaspersky4Win2021/21.16.6.467/english-0.207.0/3830343439337c44454c7c4e554c4c/kis_eula_en-in.txt</a>

