Ministry of Healthcare of Ukraine
Poltava State Medical University

Department of Biology

«AGREED»
by Guarantor of the academic and professional program
in specialty «Dentistry»
August, 29 2025

«APPROVED»
by Chairman of the Academic Council of the Faculty (Institute)

Minutes as of *August, 29* 2025 №*1*

SYLLABUS

M E D I C A L B I O L O G Y

compulsory discipline

level of higher education	the second (master's) level
field of knowledge	I Healthcare and social security
specialty	I1 Dentistry
academic qualification	Master of Dentistry
professional qualification	Dentist
academic and professional program	Dentistry
mode of study	full-time
course(s) and semester(s) of study of the discipline	I course, I–II semesters

«**RESOLVED»**
at the meeting
of the Biology Department
Minutes as of *August, 22* 2025 №*1*

Poltava – 2025

INFORMATION ABOUT LECTURERS WHO DELIVER THE ACADEMIC DISCIPLINE

Surname, name, patronymic of the lecturer (lecturers), scientific degree, academic title	**Yeroshenko Halyna Anatolijivna** – doctor of medicine, professor, head of the department **Perederii Nina Oleksandrivna** – candidate of medical sciences, assistant professor **Klepets Olena Viktorivna** – candidate of biological sciences, assistant professor
Profile of the lecturer (lecturers)	Yeroshenko H.A. https://scholar.google.com.ua/citations?hl=ru&user=Bd-9BW8AAAAJ Perederii N.O. https://scholar.google.com.ua/citations?hl=uk&user=IMztkR0AAAAJ Klepets O.V. https://scholar.google.com.ua/citations?hl=uk&user=WbKEIaUAAAAJ
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Page of the department on the PDMU website	https://med-biology.pdmu.edu.ua/

MAIN CHARACTERISTICS OF THE ACADEMIC DISCIPLINE

The scope of the academic discipline (module)

Number of credits / hours – **5.0/150**, of which:
Lectures (hours) – **20**
Practical classes (hours) – **60**
Self-directed work (hours) – **70**
Type of control – **exam**

Discipline policy

A student at the Department of Biology is obliged to:

- ✓ respect the dignity, rights, freedoms and legitimate interests of all participants in the educational process and adhere to ethical norms;
- ✓ comply with the requirements for labor protection, safety, industrial sanitation, fire safety, provided by the relevant rules and instructions;
- ✓ to take responsibility and care for one's own health, the health of others, the environment;
- ✓ comply with the requirements of the curriculum within the timeframe determined by the schedule of the educational process and the individual curriculum;
- ✓ come to classes on time, according to the schedule;
- ✓ work out all missed classes;

- ✓ not to allow loss, individual curriculum, to treat them properly;
- ✓ adhere to the professional style of clothing of a specialist, clothing items must be clean and ironed;
- ✓ maintain order in classrooms, educational premises, treat furniture, equipment, textbooks, books, etc. carefully and neatly;
- ✓ not to take things and equipment out of classrooms, laboratories without permission;
- ✓ not to allow illegal actions, immoral acts;
- ✓ adhere to academic integrity, and achieve learning outcomes defined for the appropriate level of higher education.

ACADEMIC INTEGRITY is a set of ethical principles and rules defined by law, during training and conducting scientific (creative) activities in order to ensure confidence in learning outcomes and / or scientific (creative) achievements. Observance of academic integrity by the student provides:

• independent performance of educational tasks, tasks of current and final control of learning outcomes;

• references to sources of information in case of use of ideas, developments, statements, information;

• compliance with the law on copyright and related rights;

• providing reliable information about the results of their own educational (scientific, creative) activities, used research methods and sources of information. ***Violation of academic integrity is:*** academic plagiarism, self-plagiarism, fabrication, falsification, write-off (forms of deception are, in particular, academic plagiarism, self-plagiarism, fabrication, falsification and write-off), bribery.

An important condition for a successful educational process at the Department of Biology is personal adherence to the rules of conduct adopted at the Academy and in society.

At the Department of Biology, the student as a future doctor must have a high level of culture of behavior, behave with dignity, tact, maintain endurance and self-control.

A student at the Department of Biology is prohibited from:

- ✓ violate the schedule of the educational process and allow non-compliance with the curriculum and individual curriculum without good reason;
- ✓ be late for class;
- ✓ miss classes without good reason;
- ✓ leave the classroom during the lesson without the permission of the teacher;
- ✓ use a mobile phone and other means of communication and information without the teacher's permission;
- ✓ engage in extraneous activities, distract other students and interfere with the teacher;
- ✓ use a medical form and its individual elements that do not meet sanitary and hygienic requirements;
- ✓ use drugs, psychotropic substances and their analogues, alcoholic beverages;
- ✓ be in a state of alcohol, drugs or other intoxication;
- ✓ smoke;
- ✓ commit immoral acts that degrade human dignity, use profanity;
- ✓ commit illegal acts;

- ✓ perform any actions that may create conditions dangerous to the health and / or life of others.

When organizing the educational process at PDMU, lecturers and students act in accordance with:

Regulation on the organization of the educational process at Poltava State Medical University

Regulation on the academic integrity of recipients of higher education and employees of Poltava State Medical University

Internal code of conduct for students of Poltava State Medical University

Regulation on the organization and methods for assessment of educational activities of higher education recipients at Poltava State Medical University

Regulation on the organization of self-directed work of students at Poltava State Medical University

Regulation on retaking missed classes and making up unsatisfactory grades by the recipients of higher education at Poltava State Medical University

Regulation on the procedure of forming the individual educational trajectories for the recipients of higher education at Poltava State Medical University

Regulation on rating the recipients of higher education at Poltava State Medical University

Acquaintance with the above provisions is available at the link: https://pdmu.edu.ua/n-process/department-npr/normativni-dokumenti

Description of the discipline (abstract)

Medical biology as an academic discipline provides a high level of general biological training and involves the study of the following sections: «Molecular-cellular level of life organization. Biology of individual human development», «Organismic level of life organization. Regularities of heredity and variation. Fundamentals of human genetics», «Medical and biological bases of parasitism. Medical protozoology, helminthology, arachnoentomology. The relationship between individual and historical development. Biosphere and man».

The study of the discipline «Medical Biology» is carried out by students of the first year, in the first and second semesters.

Prerequisites

The discipline «Medical Biology» is based on previously studied by students in secondary school such subjects as «General Biology», «Human Biology», «Animal Biology», «Plant Biology».

Postrequisites

«Medical Biology» lays the foundation for further mastering by students of knowledge and skills in specialized theoretical and clinical professional and practical disciplines (microbiology, virology and immunology, hygiene and ecology, as well as biological and bioorganic chemistry, histology, cytology and embryology, physiology,

clinical genetics, clinical immunology, infectious diseases with epidemiology, pediatrics, etc.).

The aim and objectives of the discipline

The purpose of teaching the discipline **is** the formation of knowledge and practical skills in human biology for further mastering by students of a block of disciplines that provide scientific and professional training.

The main tasks of studying the discipline are:

- Explain the patterns of manifestations of the human body at the molecular and cellular levels.
- To determine the biological nature and mechanisms of disease development arising from anthropogenic changes in the environment.
- To determine the manifestations of the general biological laws during human ontogenesis.
- Explain the nature and mechanisms of manifestation in the phenotype of hereditary human diseases.
- Make a preliminary conclusion about the presence of parasitic human infestations and determine disease prevention measures.

Competences and learning outcomes in accordance with the educational and professional program, the formation of which is facilitated by the discipline (integral, general, special)

Integral:

Ability to solve complex problems and problems in the field of health care in the specialty «Dentistry» in a professional activity or in the learning process, which involves research and / or innovation and is characterized by uncertainty of conditions and requirements.

General:

GC 1. Ability to think abstractly, analyze and synthesize.

GC 2. Knowledge and understanding of the subject area and understanding of professional activity.

GC 3. Ability to apply knowledge in practical activities.

GC 7. Ability to search, process and analyze information from various sources.

GC 9. Ability to identify, pose, and solve problems.

GC 16. Ability to make decisions and act, adhering to the principle of inadmissibility of corruption and any other manifestations of dishonesty.

Special:

SC 2. Ability to interpret the results of laboratory and instrumental studies.

SC 15. Processing of state, social and medical information.

Program learning outcomes of the discipline:

PLO 2. To collect information about the general condition of a patient, assess the psychomotor and physical development of a patient, the condition of the organs of the maxillofacial area, to assess information about the diagnosis based on the results of laboratory and instrumental studies.

PLO 3. To prescribe and analyze additional (mandatory and optional) examination methods (laboratory, radiological, functional and / or instrumental), for

patients with diseases of organs and tissues of the oral cavity and maxillofacial area to conduct differential diagnostics of diseases.

PLO 15. To analyze and evaluate governmental, social and medical information using standard approaches and computer information technology.

PLO 20. To comply with the requirements of ethics, bioethics and deontology in their professional activities.

Learning outcomes of the academic discipline:

Upon completion of the discipline «Medical Biology» students

must know:

- levels of organization of the living beings,
- life forms and its fundamental properties;
- structural and functional organization of the eukaryotic cell;
- stages of energy metabolism, the role of the oral cavity in this process;
- molecular basis of heredity;
- cell cycle and methods of cell division;
- the main patterns of inheritance of traits of the human dentition (in mono- and dihybrid crosses and linked inheritance);
- inheritance of human blood groups according to the AB0 system and rhesus factor;
- inheritance of human sex and sex-related traits;
- variability, its forms and manifestations;
- methods of studying human heredity: genealogical, twin, dermatoglyphic, cytogenetic, molecular genetic, biochemical and population-statistical;
- classification of hereditary diseases, principles of prenatal diagnosis of hereditary diseases;
- forms of reproduction of organisms;
- characteristics of gametogenesis, germ cell structure;
- determination of ontogenesis and its periodization;
- main stages of embryonic development, molecular and cellular mechanisms of differentiation;
- classification of congenital malformations, their manifestations at the level of the human dento-maxillary apparatus;
- types of regeneration;
- types of transplantation, causes of tissue incompatibility;
- forms of symbiosis, parasitism as a biological phenomenon;
- principles of classification of parasites and hosts;
- routes and mechanisms of transmission of parasitic diseases, the role of the oral cavity in their formation;
- natural focal diseases; the structure of natural focus;
- classification of congenital malformations; teratogenic factors;
- basics of prevention of parasitic diseases;
- pathogens of the most common protozoa, trematodes, cestodes, nematodes;
- clinical manifestations of human parasitic diseases at the level of the dentofacial apparatus;
- principles of laboratory diagnosis of helminthiasis;

- arthropods-carriers and pathogens of human diseases, the concept of mechanical and specific carriers;
- poisonous representatives of Arthropoda phylum;
- the concept of population as an elementary unit of evolution, the population structure of mankind;
- functional types of people's response to environmental factors («sprinter», «stayer», «mixt»);
- the concept of biological rhythms, their medical significance;
- subject of ecology; types of living environment, environmental factors;
- adaptive human ecotypes;
- the role of man as an environmental factor, the main directions and results of anthropogenic changes in the environment;
- examples of plants and animals poisonous to humans;
- the main provisions of the doctrine of Academician V.I. Vernadsky on the biosphere and noosphere;
- the position of the species *Homo sapiens* in the system of the animal world, the main stages of anthropogenesis;
- patterns of phylogeny of organ systems; ontophylogenetic preconditions of congenital malformations. Examples of atavistic defects in the development of human organs and systems on examples of the dentofacial apparatus.

be able to:

- to study micropreparations under a microscope at low and high magnification;
- to make temporary micropreparations;
- to differentiate the components of the animal cell on electronic microphotographs and drawings;
- to identify (schematically) the primary structure of the protein, the number of amino acids, the molecular weight of the polypeptide by the nucleotide sequence of the gene encoding it;
- to predict the genotypes and phenotypes of offspring by parental genotypes;
- to calculate the probability of giving birth to a sick child with monogenic diseases with known genotypes of parents:
- to exclude paternity when determining the blood groups of parents and children:
- to analyze the human karyotype and diagnose the most common chromosomal diseases;
- to build a pedigree and conduct its genealogical analysis;
- to calculate the role of heredity and environmental conditions in the development of traits (based on the results of twin analysis);
- to calculate the frequencies of genes and genotypes according to Hardy-Weinberg law;
- to distinguish between the concepts of teratogenic and hereditary congenital malformations;
- to determine the place of a biological object (pathogens of parasitic diseases) in the system of wildlife;
- to substantiate the belonging of human parasitic diseases to the group of transmissible and naturally focal;

- to diagnose the pathogens and vectors of parasitic diseases under study on macro- and micropreparations;
- to substantiate the methods of laboratory diagnosis of human parasitic diseases;
- to substantiate methods of prevention of parasitic diseases, based on the ways of their infection.

Thematic plan of lectures,
specifying the basic issues, which are considered at the lecture

№	Topic	Number of hours
	Content module 1. Molecular, cellular and ontogenetic bases of development of human dentofacial apparatus	
1	**Introduction to medical biology course. The human dentofacial apparatus in the concept of levels of life organization. Structural and functional organization of a eukaryotic cell.** 1. Introduction to the course of medical biology. 2. General characteristics of life. 3. Man in the system of nature. 4. Levels of life organization. The human dentofacial apparatus in the concept of levels of life organization. 5. Cellular and molecular-genetic levels. 6. Pro- and eukaryotic cells, their organization. 7. Structural and functional organization of eukaryotic cells. 8. Reproduction – a universal property of living organisms, its forms.	2
2	**Molecular and genetic mechanisms of ontogenesis. The main stages of human embryonic development. Ontogenesis disorders and their place in the pathology of the dentofacial system in humans.** 1. Ontogenesis, its periodization. 2. Embryonic (prenatal) period, its stages. 3. The concept of critical periods. 4. Postembryonic period of ontogenesis, its periodization. 5. Mechanisms of growth and morphogenesis. Genetic control of development. 6. Congenital malformations and their classification: classification and manifestations at the level of the dentofacial apparatus. Teratogenic factors.	2

3	**Molecular basis of heredity. Implementation of hereditary information. Organismal level of organization of genetic information. Gene interaction.** 1. Molecular basis of heredity. Genetic role of nucleic acids. 2. Characteristics of nucleic acids: DNA and RNA, spatial organization, properties. 3. DNA replication, DNA repair. 4. The structure of gene of pro- and eukaryotes. Genetic code, its properties. 5. Organization of information flow in a cell. Transcription. Processing, splicing. 6. Translation (initiation, elongation, termination). 7. Regulation of gene expression in prokaryotes. 8. Organization of the genome of eukaryotes. 9. Basic concepts of genetics. Patterns of inheritance of traits on the example of the dentofacial apparatus. 10. Interaction of allelic and non-allelic genes. The phenomenon of pleiotropy in the formation of traits of the oral cavity and dentofacial apparatus. 11. Interaction of genes (allelic and non-allelic). Pleiotropic action of genes. 12. Multiple alleles. Blood groups.	2
	Content module 2. Organismic level of life organization. Bases of human genetics. Regularities of heredity and variability in the functioning of the dento-maxillary apparatus	
4	**Chromosomal theory of heredity. Genetics of sex. Variability and its manifestations at the level of the dentofacial apparatus.** 1. The concept of sex and sexual characteristics. Types of sex determination. 2. Inheritance of sex in human. Traits, linked with sex, sex-limited and sex-influenced. 3. The concept of linked gene inheritance. Chromosomal theory of heredity. 4. Genetic maps of chromosomes. The human genome. 5. Nonchromosomal heredity. 6. Variability, its forms and manifestations at the level of the human dentofacial apparatus. 7. Modifications and reaction rate. Phenocopies, their manifestations at the level of the dentofacial apparatus. 8. Combinative variability, its sources. 9. Mutational variability Classification of mutations. Mutagenic factors.	2
5	**Bases of human genetics. Methods of studying human heredity. Hereditary human diseases. Medical and genetic counseling.** 1. Fundamentals of medical genetics. Features of human genetics. 2. Methods of studying human heredity: genealogical method, patterns of traits inheritance; cytogenetic method; biochemical method; population-genetic method; twin method; dermatoglyphic method; immunogenetic method; ontogenetic method. 3. Genetic (molecular) diseases, manifestations from the dentofacial apparatus. 4. Human chromosomal diseases, manifestations from the dentofacial apparatus. 5. Diseases with hereditary predisposition (multifactorial diseases). 6. Medical and genetic aspects of a family. Medical and genetic counseling (MGC). Purpose and objectives of the MGC. Prenatal diagnosis of hereditary pathology. Prospects for gene therapy.	2

Content module 3. Medical and biological bases of parasitism. Manifestations of parasitism in the organs of the dentofacial system. The relationship between individual and historical development. Biosphere and man		
6	**Medical and biological bases of parasitism. The protozoans – human parasites.** 1. Introduction to Medical parasitology. 2. Basic concepts of parasitology. 3. The concept of transmissible diseases. 4. Natural focal diseases. 5. General characteristics of protozoans, their taxonomy. 6. The protozoans – human parasites: Latin names, cytological features, biological cycle of development, ways of infection, localization in the human body, the impact on the host, manifestations at the level of the dento-maxillary apparatus, diagnosis and prevention.	2
7	**Medical helminthology. Flat worms as human parasites.** 1. General characteristics of the Flat worms phylum (Plathelminthes). 2. Characteristics of the Trematoda class (Flukes). 3. Characteristics of the class Cestoidea (Tapeworms). 4. Trematodes and cestodes – human parasites: morphology and internal structure, Latin names, development cycles, routes of infection, localization in the human body, pathogenic effect of the parasite on the host organism, manifestations at the level of the dentofacial apparatus. 5. Diagnosis and prevention of diseases caused by representatives of the Flukes and Tapeworms.	2
8	**Medical helminthology. Roundworms as human parasites.** 1. General characteristics of the Roundworms (Nemathelminthes) phylum. 2. Characteristics of the class Nematoda. 3. Nematodes - human parasites: morphology and internal structure, Latin names, development cycles, routes of infection, localization in the human body, pathogenic effect of the parasite on the host's body, manifestations at the level of the dentofacial apparatus. 4. Diagnosis and prevention of diseases caused by parasitic nematodes.	
9	**Medical arachnoentomology. Arthropods as pathogens and vectors of infections and invasions.** 1. Phylum Arthropoda: characteristics, classification, medical significance. 2. Class Arachnoidea. Ticks (Acarina) – agents of human diseases and natural reservoirs of human pathogens. Parasitiformis and Acariformis ticks. 3. Itch mite (Sarcoptes scabiei), hair follicle mite (Demodex folliculorum). 4. Ixodes mites: morphological features, development cycles, mite control measures and bite prevention. 5. Class Insecta: lice (Anoplura), fleas (Aphaniptera), bugs (Hemiptera), cockroaches (Blattoidea), flies and mosquitoes (Diptera) – agents and vectors of human diseases.	2
10	**Evolution of the dento-maxillary system. Ontophylogenetically determined congenital malformations of human development. Synthetic theory of evolution.** 1. Evolution of the dento-maxillary system. Formation of the dento-maxillary apparatus. 2. Classification and localization of the most common anomalies of the development of the maxillofacial region. 3. Synthetic theory of evolution.	2

	4. Peculiarities of the action of evolutionary factors in human populations. 5. The doctrine of macro- and microevolution. Biogenetic law. 6. Population structure of humanity. 7. The origin of man. Human races as a reflection of adaptive patterns of human development. 8. Ontophylogenetically determined congenital malformations of human development, manifestations at the level of the dento-maxillary apparatus.	
	Total:	**20**

Thematic plan of practical classes, specifying the basic issues, which are considered at the practical class

№	Topic	Number of hours
	Content module 1. Molecular, cellular and ontogenetic bases of development of human dentofacial apparatus	
1	**Introduction to the course of medical biology. The human dento-maxillary apparatus in the concept of levels of organization of life. Research methods in biology.** Medical biology as a science of the foundations of human life. The current stage of development of general and medical biology. The place of biology in the system of training specialists in medical and dental profiles. The essence of life. Life forms, their fundamental properties and attributes. Evolutionarily determined structural levels of life organization; elementary structures of levels and the main biological phenomena that characterize them. The significance of ideas about the levels of organization of living things for medicine. The special place of man in the system of the organic world. Optical systems in biological research. The structure of a light microscope and the rules for working with it. Technique for making temporary micropreparations of the structures of the oral cavity organs.	**2**
2	**Cell morphology. Structural components of the cytoplasm. Structure and functions of biomembranes. Cytological bases of the functioning of the dento-maxillary apparatus.** Structural and functional organization of a eukaryotic cell. Chemical composition of the cell: macro- and microelements. Water, the importance of hydrogen bonds in the processes of cell life. Organic compounds - carbon-containing substances of living organisms. Cytoplasm and cytoskeleton. Cyclosis. Cytoplasmic organelles - membranous and non-membranous, their structure and functions. Inclusions in cells, their functions. The concept of lysosomal storage diseases, mitochondrial and peroxisomal diseases. The cell as an open system. Assimilation and dissimilation. Stages of energy metabolism, the role of the oral cavity in this process. Cell membranes, their structure and functions. The principle of compartmentalization. Cell receptors. Transport of substances through the plasmalemma.	**2**
3	**The genetic apparatus of the cell: the basis for understanding hereditary pathologies of the dentofacial apparatus.**	**2**

	The nucleus is the central information apparatus of the cell. The structure of the interphase nucleus. Chromosomal and genomic levels of organization of hereditary material. Chromatin: euchromatin, heterochromatin. Karyotype. Morphofunctional characteristics and classification of human chromosomes. Chromosome rules. Chromosomal analysis. The nucleolus as a derivative of chromosomes, the role in the formation of ribosomes. Idiogram. The role of the oral cavity in the study of individual features of the human karyotype.	
4	**Cell cycle and division: the foundations of growth and regeneration of dentofacial tissues.** Cell organization in time. Cell cycle. Concepts of apoptosis and necrosis. Methods of cell division. Endomitosis, polyteny. Changes in cells and their structures during the mitotic (cell) cycle (interphase and mitosis). Regulation of the mitotic cycle. Growth factors. Mitotic activity of tissues. Tumor growth. Disruption of mitosis, somatic mutations. Life of cells outside the body. Cloning of cells. Use of cell clones in medicine and dentistry.	
5	**Molecular basis of heredity. Properties of nucleic acids in ensuring the functioning of the dento-maxillary apparatus.** Molecular basis of heredity. Characteristics of nucleic acids: DNA, RNA; spatial organization, species specificity, role in the storage and transfer of hereditary information. Replication of the DNA molecule, its role in the regeneration of the structures of the oral cavity and dentofacial apparatus. Maintenance of genetic stability of cells; repair of the DNA molecule.	**2**
6	**The structure of the gene of prokaryotes and eukaryotes. The genetic code and its properties.** Gene as a unit of genetic function. Structural genes, regulatory genes, tRNA and rRNA genes. The structure of the gene of pro- and eukaryotes. The genetic code, its basic properties. Genetic engineering, biotechnology, gene therapy, their application in dentistry.	**2**
7	**Organization of information flow in the cell. Regulation of gene expression. Molecular mechanisms of variability in the formation of dentofacial structures.** Organization of information flow in the cell. Transcription. Processing, splicing. Translation (initiation, elongation, termination).. Post-translational modification of proteins. Regulation of gene expression in prokaryotes. Exon-intron organization of the eukaryotic genome. Levels of regulation of gene expression in eukaryotes. Molecular mechanisms of human variability in the formation of structures of the dentofacial apparatus.	**2**
8	**Biological features of human reproduction. Gametogenesis. The germinal period of embryo development.** Reproduction as a mechanism for ensuring genetic continuity in a number of generations. Biological features of human reproduction. Meiosis, its biological significance. Gametogenesis. Fertilization in humans - restoration of the diploid set of chromosomes, increasing the diversity of gene combinations in descendants. Cleavage.	**2**
9	**Embryonic period of development. Embryonic induction. Organogenesis and systemogenesis. Prerequisites for the formation of congenital defects of the oral cavity and dentofacial**	**2**

	apparatus. Stages of human embryonic development. Differentiation at the molecular-genetic, cellular and tissue levels. Regulation of gene function in ontogenesis. The problem of determination and interaction of blastomeres. Embryonic induction. Regulation in the process of fragmentation and its disruption (polyembryony, formation of monozygotic twins, developmental defects). Gastrulation. Provisional organs. Organo- and systemogenesis. Stem cells, prospects for their use in dentistry. Critical periods of development. Teratogenesis. Congenital malformations, their manifestations at the level of the dentofacial apparatus. Classification of congenital malformations: hereditary, exogenous (teratogenic), multifactorial, gametopathies, blastopathies, embryopathies, fetopathy. Teratogenic environmental factors.	
10	**Features of the postnatal period of human ontogenesis.** Features of the postnatal period of human ontogenesis in connection with its biosocial essence. Periods of postembryonic human development. Growth and differentiation processes in the postnatal period of individual human development, their manifestations at the level of the dentofacial apparatus. Old age as the final stage of human ontogenesis. Theories of aging. Clinical and biological death. Age-related features of the functioning of the dentofacial apparatus. Regeneration of organs and tissues. Types of regeneration. The significance of the problem of regeneration in biology and medicine. The problem of organ and tissue transplantation. Types of transplantations. Tissue incompatibility and ways to overcome it. The concept of homeostasis, biological mechanisms for maintaining homeostasis.	**2**
11	***Control of mastering content module 1*** *«Molecular, cellular and ontogenetic bases of development of human dentofacial apparatus»*.*	**2**
	Content module 2. Organismic level of life organization. Bases of human genetics. Regularities of heredity and variability in the functioning of the dento-maxillary apparatus	
12	**Peculiarities of human genetics. Manifestations of the main patterns of inheritance of Mendelian traits in humans using the example of their dentofacial apparatus.** Genetics: subject and tasks, stages of development; basic terms and concepts of genetics. Principles of hybridological analysis. Monohybrid crossing: the law of uniformity of first-generation hybrids, the law of cleavage. The law of "gamete purity". Cytological foundations of laws. Analytical crossing, its practical application. Lethal genes. Deviations from the expected cleavage. Di- and polyhybrid crossing: the law of independent combination of traits, its cytological foundations. Dominant and recessive types of inheritance of normal and pathological traits of a person, their manifestations at the level of the dentofacial apparatus.	**2**

13	**Interaction of allelic and non-allelic genes, the phenomenon of pleiotropy in the formation of the oral cavity and dentofacial apparatus. Multiple allelism. Genetics of blood groups.** Interaction of allelic genes (complete dominance, incomplete dominance, overdominance or superdominance, codominance) and non-allelic genes (complementary interaction, epistasis, polymerism). Primary and secondary pleiotropy, its influence on the inheritance of signs of the oral cavity and dentofacial apparatus. Multiple allelism. Inheritance of human blood groups according to the antigenic systems AB0 and MN. Rhesus factor. Rhesus conflict. Immunogenetics. Tissue and species specificity of proteins, their antigenic properties.	**2**
14	**Linked inheritance. Genetics of sex.** Linked inheritance. Features of inheritance of linkage groups. Chromosomal theory of inheritance. Crossover mechanism, cytological evidence, biological significance. Non-chromosomal inheritance. Inheritance of human sex. Mechanisms of genetic determination of sex in humans and their disorders. Bisexual nature of man. The problem of sex redetermination, psychosocial aspects. Sex-linked traits, patterns of their inheritance on the example of the organs of the oral cavity and dentofacial apparatus. Hemizygosity. Inheritance of sex-linked human diseases. Sex-limited and sex-dependent traits. Genetic maps. Methods of mapping human chromosomes. Current state of research on the human genome.	**2**
15	**Hereditary and non-hereditary variability, its manifestations at the level of the dentofacial apparatus.** Variability, its forms and manifestations at the organismal level: phenotypic and genotypic variability. Modifications and reaction rate. Long-term modifications. Statistical patterns of modification variability. Phenocopies, their manifestations at the level of the dentofacial apparatus. Combinatorial variability, its sources. Mutational variability in humans, its phenotypic manifestations. Classification of mutations: genomic, chromosomal aberrations, gene. Epigenetic mutations. Natural and induced mutagenesis. Mutagens: physical, chemical, biological. Genetic monitoring. The law of homologous series of hereditary variability, its practical significance in dentistry.	**2**
16	**Bases of medical genetics. Methods of studying human heredity.** Fundamentals of medical genetics. Man as a specific object of genetic analysis. Methods of studying human heredity. Genealogical method, its application for the study of hereditary signs of the dentofacial apparatus. Rules for constructing pedigrees. Genetic analysis of pedigrees. Twin method. Determination of the influence of genotype and environment in the manifestation of pathological signs of a person, including signs of the dentofacial apparatus.	**2**
17	**Chromosomal diseases: cytogenetic method of diagnosis and changes in the dentofacial apparatus.** Classification of hereditary human diseases. Chromosomal diseases caused by a violation of the number or structure of chromosomes, cytogenetic mechanisms, essence. Cytogenetic methods. Karyotyping. Analysis of karyotypes of patients with	**2**

	hereditary diseases. Determination of X- and Y-sex chromatin as an express method for the diagnosis of hereditary human diseases. Molecular-cytogenetic methods.	
18	**Molecular diseases: biochemical method and DNA diagnostics, changes in the dentofacial apparatus. Medical genetic counseling.** Monogenic (molecular) human diseases caused by changes in the molecular structure of the gene. Classification of monogenic diseases (disorders of carbohydrate, amino acid, lipid, mineral metabolism) and their manifestations in the dentofacial apparatus. Mechanism of their occurrence and principles of laboratory diagnostics. Biochemical diagnostic methods. Molecular genetic diagnostic methods. Polymerase chain reaction. Population and statistical method. Types of human populations. Law of constancy of the genetic structure of ideal populations. Use of the Hardy-Weinberg law formula in medicine to determine the genetic structure of human populations. Medical genetic aspects of the family. Medical genetic counseling. Prenatal diagnosis and prevention of hereditary and congenital pathologies, including pathologies of the dentofacial apparatus.	**2**
19	***Control of mastering of Content module 2*** *«Organismic level of life organization. Bases of human genetics. Regularities of heredity and variability in the functioning of the dento-maxillary apparatus»*.*	**2**
	Content module 3. *Medical and biological bases of parasitism.* *Manifestations of parasitism in the organs of the dentofacial system.* *The relationship between individual and historical development. Biosphere and man*	
20	**Medical and biological bases of parasitism. Medical protozoology. Subkingdom Protozoa. Phylum Sarcomastigophora. Class Lobosea, the influence of its representatives on the functioning of the oral cavity.** Introduction to medical parasitology. Origin and evolution of parasitism. Principles of parasite classification. Principles of parasite-host interaction. Morphophysiological adaptation of parasites. The role of the oral cavity in the formation of pathways and mechanisms of parasitic invasions. The concept of intensity and extensiveness of invasion. Historical aspects of the development of medical parasitology. Characteristic features and systematics of the subkingdom Protozoa. Phylum Sarcomastigophora. Class Lobosea. Dysenteric amoeba: medical geography, morphofunctional features, development cycles, infection pathways, laboratory diagnostics, prevention of amebiasis. Intestinal amoeba. Oral amoeba, its relationship with the functioning of the oral cavity organs. Free-living pathogenic amoebae are facultative human parasites.	**2**
21	**The representatives of class Zoomastigophorea – human parasites. The influence of Zoomastigophora representatives on the condition of the oral cavity organs.** General characteristics of the class Zoomastigophora (Zoomastigophora). Giardia. The role of the oral cavity in the formation of transmission routes and mechanisms of infection with giardiasis. The representatives of Trichomonas genus, having medical significance for human: vaginal, intestinal, oral. The concept of natural focal and transmissible diseases.	**2**

	Leishmania, trypanosomes. Medical geography, morphofunctional features, development cycles, infection routes, laboratory diagnostics and prevention of giardiasis, urogenital trichomoniasis, leishmaniasis and trypanosomiasis.	
22	**Phylum Apicomplexa. The representatives of class Sporozoea – human parasites. Phylum Ciliophora. The representatives of class Rimostomatea – human parasites.** Phylum Apicomplexa. Class Sporozoea. Malaria plasmodia: morphofunctional features, development cycles. Toxoplasma: morphofunctional features, development cycle. The role of the oral cavity in the formation of transmission routes and infection mechanisms for toxoplasmosis. The influence of Toxoplasma on the formation of the dentofacial apparatus in the embryonic stage. Phylum Ciliophora. Class Rimostomatea – human parasites. Balantidiasis. Medical geography, morphofunctional features, development cycles. Balantidiasis: the role of the oral cavity in the formation of transmission routes and infection mechanisms, laboratory diagnostics and prevention.	**2**
23	**Medical helminthology. Phylum Flat worms (Plathelminthes). Class Flukes (Trematoda) – causative agents of human diseases: fascioliasis, opisthorchiasis, dicrocoeliasis, paraganonimiasis and schistosomiasis.** Phylum Flatworms (Plathelminthes). Class Trematoda. Liver fluke, cat fluke, lanceolate fluke, lung fluke, Chinese fluke, blood flukes. Medical geography, morphofunctional features, development cycles, infection routes, pathogenic influence, laboratory diagnostics and prevention of fasciolosis, opisthorchiasis, dicrocoelosis, paragonimiasis, schistosomiasis. The role of the oral cavity in the formation of transmission routes and mechanisms of infection with trematodes.	**2**
24	**Phylum Flat worms (Plathelminthes). Class Tapeworms (Cestoidea) – beef tapeworm, pork tapeworm, dwarf tapeworm, broad fish tapeworm, echinococcus, alveococcus – human parasites.** Class Tapeworms (*Cestoidea*). Beef tapeworm, pork tapeworm, dwarf tapeworm, broad fish tapeworm, echinococcus, alveococcus. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnostics and prevention of teniosis, cysticercosis, teniarinhosis, hymenolepidosis, diphyllobotriasis, echinococcosis, alveococcosis. The role of the oral cavity in the formation of transmission routes and mechanisms of infection with cestodes. Morphophysiological changes in the oral cavity as a result of infection of the body with cestodes.	**2**
25	**Phylum Round worms (Nemathelminthes). Class Nematoda – human roundworm, human whipworm, Old World hookworm, human hookworm and pinworm – agents of human diseases.** Phylum Round worms (*Nemathelminthes*). Class *Nematoda*. Human roundworm, pinworm, human whipworm, Old World hookworm, human hookworm. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of ascariasis, enterobiasis, trichocephalosis, ankylostomiasis, necatorosis. The role of the oral cavity in the formation of transmission routes and mechanisms of infection with ascariasis, enterobiasis, trichocephalosis, ankylostomiasis, necatorosis.	**2**

26	**Phylum Round worms (Nemathelminthes). Class Nematoda – trichina, threadworm, ryshta, filaria – agents of human diseases. Laboratory diagnosis of helminthiasis.** Trichina, threadworm, ryshta, filaria. Medical geography, morphofunctional features, development cycle, ways of infection, pathogenic influence, laboratory diagnostics and prevention of trichinosis, strongyloidiasis, dracunculosis. The role of the oral cavity in the formation of transmission routes and mechanisms of infection with trichinosis, strongyloidiasis, dracunculiasis. Morphophysiological changes in the human dentofacial apparatus as a result of infection with nematodes. Methods of laboratory diagnosis of helminthiasis: parasitological, immunological. Principles and content of the main macro- and microhelminthoscopic methods of research of feces, water, soil, etc. Features of the eggs' structure of flukes, tapeworms and roundworms – human parasites. K.I. Scriabin's doctrine of deworming, devastation and disinfection of the environment from eggs and larvae of helminths.	**2**
27	**Medical arachnoentomology. Phylum Arthropoda. Class Arachnoidea. Ticks (Acarina) – agents of human diseases and carriers of human pathogens.** Phylum *Arthropoda*. Class *Arachnoidea*. Features of morphology, nutrition and reproduction of arachnids. Poisonous arachnids (scorpions, spiders). Itch mite, hair follicle mite as human pathogens. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnostics and prevention of scabies and demodicosis. Ixodes, Argasids, Gamazids mites as vectors of human pathogens. Ticks – inhabitants of human homes, their medical significance.	**2**
28	**Class Insecta: lice (Anoplura), fleas (Aphaniptera), bugs (Hemiptera), cockroaches (Blattoidea), flies and mosquitoes (Diptera) – agents and vectors of human diseases.** Class *Insecta*. Progressive and regressive changes in the organization of the class *Insecta* depending on the habitat. Features of morphology, nutrition and reproduction of insects. The *Blattoidea* order. Cockroaches as mechanical vectors of human diseases. The *Diptera* order. Flies, mosquitoes, gnats and their components: characteristics, medical significance as pathogens of myiasis and vectors of human pathogens. The *Anoplura, Aphaniptera*, *Hemiptera* orders. Medical significance of lice, fleas, bedbugs as pathogens of invasions and vectors of infectious diseases.	**2**
29	**Evolution of the dento-maxillary system. Ontophylogenetically determined congenital malformations of human development. Synthetic theory of evolution.** Evolution of the dento-maxillary system. Formation of the dento-maxillary apparatus. Classification and localization of the most common anomalies of the development of the maxillofacial region. Biogenetic law. Ontophylogenetically determined congenital malformations of human development. Synthetic theory of evolution. Features of the action of evolutionary factors in human populations. The doctrine of macro- and microevolution. Ideal and real populations. The Hardy-Weinberg law. Population structure of humanity.	**2**
30	**Control of mastering of the content module 3 «***Medical and biological bases of parasitism. Manifestations of parasitism in the*	**2**

	*organs of the dentofacial system. The relationship between individual and historical development. Biosphere and man».**	
	Total:	**60**

Note: mark as * the topics, for which a positive grade must be obligatorily given.

Self-directed work

№	Topic	Number of hours
1.	Preparation for practical classes – theoretical preparation and development of practical skills (27×1.5 hours)	**40.5**
2.	Elaboration of topics that are not included in the plan of classes	**17.5**
2.1	**Organization of substance and energy flows in the cell.** 1. The exchange of substances and energy is the main property of living things. 2. Features of plastic and energy exchange. 3. The flow of substances in the cell. 4. Energy flow. 5. Information flow. 6. Unity of the processes of assimilation and dissimilation.	**2.5**
2.2	**Genetic danger of environmental pollution. The concept of antimutagens and commutagens.** 1. Genetic danger of environmental pollution. 2. Mutagenic action of anthropogenic factors. 3. Problems of antimutagenesis. Antimutagens. 4. Commutagens – substances that enhance the effect of mutagens. 5. Genetic monitoring.	**2.5**
2.3	**Phylogeny of the main organs of vertebrates.** 1. Phylogeny, determination of historical family relationships between organisms. 2. Comparative anatomical examination of the outer covering of the body. 3. Comparative anatomical examination of the skeleton. 4. Comparative anatomical examination of respiratory organs. 5. Comparative anatomical examination of the digestive system. 6. Comparative anatomical examination of the nervous system. 7. Comparative anatomical examination of the immune system. 8. Comparative anatomical examination of the endocrine system. 9. Comparative anatomical examination of the urinary system. 10. Comparative anatomical examination of the reproductive system.	**3.5**
2.4	**The origin of man. Human races as a reflection of adaptive patterns of human development.**	**3**

	1. Origin of man. 2. The main stages of anthropogenesis. 3. The position of the species Homo sapiens in the system of the animal world. 4. Relationship between ontology and phylogeny. Biogenetic law (F. Muller, E. Haeckel), its interpretation by O. M. Severtsov. Atavistic defects of human development.	
2.5	**Basics of general ecology and human ecology. Plants and animals poisonous to humans.** 1. Ecology. Environment as an ecological concept. Types of environment. 2. Environmental factors. Unity of organism and environment. 3. Concept of homeostasis. Stress. Functional types of people's response to environmental factors ("sprinter", "stayer", "mixed"). 4. Biological variability of people in connection with biogeographic features of the environment. Formation of adaptive ecotypes of people. 5. Man as an environmental factor. Main directions and results of anthropogenic environmental changes. Environmental protection. 6. Plants, mushrooms and animals poisonous to humans.	**3**
2.6	**The biosphere as a system that ensures human existence.** 1. Academician V. I. Vernadskyi's teachings on the biosphere and noosphere. Living matter, its characteristics. 2. The problem and medico-biological consequences of genetic burden and the influence of mutagenic factors (radiation and chemical) on the human population. 3. Medical and biological aspects of the impact of the biosphere on human health. Concepts of biofields and biological rhythms, their medical significance.	
3.	Preparation for control of content modules (3×2 hours)	**6**
4.	Preparation for exam.	**6**
	Total:	**70**

Individual tasks

- Creation of multimedia presentations with reports at meetings of the scientific student group of the department,
- Participation in the manufacture of macro- and micro-drugs, participation in research work of the department,
- Participation in writing abstracts and articles, reports at student scientific conferences,
- Participation in subject Olympiads.
- Writing abstracts.

The list of theoretical questions for preparation of students for semester final certification (exam)

Substantial module 1. Molecular, cellular and ontogenetic bases of development of human dentofacial apparatus

1. Definition of biology as a science. The place and tasks of biology in the training of a dentist.
2. Definition of the concept of life at the current level of development of biological science.
3. Classification of living organisms. The concept of non-cellular and cellular life forms, pro- and eukaryotes.
4. Morphophysiology of the cell. Cytoplasm and organelles.
5. Human diseases caused by organelle dysfunction.
6. Cell membranes. Chemical composition. Spatial organization and significance.
7. Active and passive types of transport of substances through the plasmalemma.
8. The cell as an open system. Assimilation and dissimilation. Stages of energy metabolism, the role of the oral cavity in this process.
9. Structure and functions of the nucleus. Chromatin: levels of organization (packaging) of hereditary material (euchromatin, heterochromatin).
10. Chemical composition of chromosomes. Structure of metaphase chromosome. Chromosome shapes.
11. Human karyotype. Morphofunctional characteristics and classification of human chromosomes. The role of the oral cavity in the study of individual features of the human karyotype.
12. Nucleic acids. DNA, structure and functions.
13. RNA, structure and functions. Types of RNA.
14. Structure of the eukaryotic gene. Classification of genes.
15. DNA replication, its significance. DNA repair.
16. Genetic code, its properties.
17. Main stages of protein biosynthesis in the cell.
18. Features of the implementation of genetic information in eukaryotes. Exon-intron organization of genes in eukaryotes, processing, splicing.
19. Features of gene regulation in proto- and eukaryotes. Operon.
20. Cell cycle, its periodization. Regulation of the cell cycle.
21. Mitosis. Mitotic disorders. Cell cloning. Use of cell clones in medicine and dentistry.
22. Meiosis. Mechanisms that determine the genetic diversity of gametes.
23. Human sex cells.
24. Reproduction is a universal property of living things. Forms of reproduction. Possibility of cloning organisms. Features of human reproduction.
25. Gametogenesis: spermatogenesis, oogenesis.
26. Fertilization: stages and mechanisms.
27. Ontogenesis, its periodization. Embryonic development, its stages. Provisional organs.

28. Molecular and cellular mechanisms of differentiation. Embryonic induction. Cloning of organisms and tissues.
29. Critical periods of human embryonic development. Teratogenic factors.
30. Congenital malformations, their modern classification: hereditary, exogenous, multi-factorial; embryopathies and fetopathies; phylogenetically determined and non-phylogenetic.
31. Postembryonic human development and its periodization. Neurohumoral regulation of growth and development. Tumor growth.
32. Aging as a stage of ontogenesis. Theories of aging. The concept of gerontology and geriatrics. Clinical and biological death.
33. Regeneration of organs and tissues. Types of regeneration. The significance of the problem of regeneration in biology and medicine.
34. The problem of organ and tissue transplantation. Types of transplantations. Tissue incompatibility and ways to overcome it.

Substantial module 2. *Organismic level of life organization. Bases of human genetics. Regularities of heredity and variability in the functioning of the dento-maxillary apparatus*

1. Subject and tasks of human genetics and medical genetics. Heredity and variability. Allelic genes. Homozygotes, heterozygotes. Genotype, phenotype.
2. Patterns of inheritance in monohybrid crossing. Mendel's first and second laws. Mendelian traits. Monogenic diseases.
3. Patterns of inheritance in dihybrid and polyhybrid crossing on the example of human dentofacial features. Mendel's third law.
4. Multiple alleles. Inheritance of human blood groups according to the AB0 antigen system and the Rh factor. Significance for medicine. Rh conflict.
5. Interaction of allelic and non-allelic genes. Pleiotropy, its influence on the inheritance of oral cavity and dentofacial features.
6. Linked inheritance of genes (Morgan's law). Crossing over. Chromosomal theory of heredity.
7. Sex genetics. Inheritance of sex-linked traits, using the example of the organs of the oral cavity and the dentofacial apparatus.
8. Variability, its forms, significance in ontogenesis and evolution.
9. Modification variability, its characteristics. Reaction norm. Phenocopies, their manifestations at the level of the dentofacial apparatus.
10. Genotypic variability, its forms. Combinatorial variability. Mechanisms of occurrence and significance.
11. Mutational variability and its phenotypic manifestations. Classification of mutations by genotype.
12. Gene mutations, mechanisms of occurrence. The concept of monogenic diseases, manifestations at the level of the dentofacial apparatus.
13. Chromosomal aberrations. Mechanisms of occurrence and examples of diseases that are their consequence.

14. Mechanisms of genomic mutations (polyploidy, haploidy, polysomy, monosomy). Chromosomal diseases resulting from a violation of the number of autosomes and sex chromosomes, manifestations at the level of the dentofacial apparatus.
15. Mutations in germ and somatic cells, their significance. Mosaicism.
16. Spontaneous and induced mutations. Mutagenic factors, their types. Mutagenesis. Genetic monitoring.
17. Diseases with hereditary predisposition. The concept of multifactorial diseases.
18. Man as a specific object of genetic analysis. Methods of studying human heredity: genealogical, twin, dermatoglyphic methods.
19. Biochemical method of studying hereditary diseases. Screening programs. Molecular genetic methods.
20. Cytogenetic method of studying human heredity. Definition of sex chromatin and the diagnostic role of the oral cavity organs.
21. Population structure of humanity. Features of the action of evolutionary factors in human populations. Population-statistical method of studying human heredity.
22. Medical-genetic aspects of the family. Medical-genetic counseling. Prenatal diagnosis of hereditary diseases.

Substantial module 3. Medical and biological bases of parasitism. Manifestations of parasitism in the organs of the dentofacial system. The relationship between individual and historical development. Biosphere and man

1. Principles of parasite classification: obligate, facultative, temporary, permanent, endo- and ectoparasites.
2. Natural focal diseases. The structure of the natural focus. The teachings of Academician E.N. Pavlovsky on the natural focus of parasitic diseases. The concept of anthroponoses and zoonoses.
3. Transmissible diseases. Facultative-transmissible and obligate-transmissible diseases. Specific and mechanical vectors of pathogens.
4. Giardia. Morphology, ways of infection, methods of laboratory diagnostics, prophylaxis. The role of the oral cavity in shaping the transmission routes and mechanisms of giardiasis infection.
5. Vaginal trichomonas. Systematic position, morphology, development cycle, ways of infection, substantiation of methods of laboratory diagnostics.
6. Biology of pathogens of cutaneous and visceral leishmaniasis. Systematic position, morphology, substantiation of methods of laboratory diagnostics and prevention.
7. Pathogens of trypanosomiasis. Systematic position, morphology, substantiation of methods of laboratory diagnostics and prevention.
8. Dysenteric amoeba. Systematic position, morphology, development cycle, substantiation of laboratory diagnostic methods, prevention.
9. Balantidium. Systematic position, morphology, development cycle, ways of infection, substantiation of methods of laboratory diagnostics.
10. Malarial plasmodium. Systematic position, development cycle, malaria control, tasks of antimalarial service at the present level. Species of malarial plasmodia.
11. Toxoplasma. Systematic position, morphology, development cycle, ways of infection, substantiation of laboratory diagnostic methods. The role of the oral

cavity in shaping the transmission routes and mechanisms of toxoplasmosis infection.

12. The concept of helminths. Bio- and geohelminths. Ways and mechanisms of transmission of helminthiasis, the role of the oral cavity in these processes.
13. Phylum Flatworms. Classification, characteristics of the organization, medical significance of representatives.
14. Class Flukes (Trematoda) – pathogens of human diseases. Morphology, development cycles, ways of infection, substantiation of laboratory diagnostic methods, prevention. The role of the oral cavity in forming the transmission routes and mechanisms of infection with trematodes.
15. Class Tapeworms – causative agents of human diseases. Morphology, development cycles, ways of infection, substantiation of laboratory diagnostic methods, prevention. The role of the oral cavity In forming the transmission routes and mechanisms of infection with cestodes. Morphophysiological changes in the oral cavity due to infection with cestodes.
16. Phylum Roundworms. Characteristic features of the organization, medical significance of the representatives.
17. Class Nematoda – the pathogens of human diseases. Morphology, development cycles, ways of infection, substantiation of laboratory diagnostic methods, prevention. The role of the oral cavity in forming the transmission routes and mechanisms of infection with nematodes.
18. Transmissible helminthiasis. Filariasis, heartworms – pathogens of human diseases.
19. Laboratory diagnosis of helminthiasis. Ovo-, larvo- and helminthoscopy. Immunological diagnosis of helminthiasis.
20. Phylum Arthropoda. Classification, characteristics of the structure, medical significance. Poisonous representatives of the Arthropoda phylum.
21. Ticks – pathogens and vectors of human diseases.
22. Flies and cockroaches. Features of structure and development, medical value.
23. Mosquitoes. Species, features of structure and development, medical value. Midges and its components.
24. Lice. Species, features of structure and development, medical value.
25. Fleas, bedbugs. Features of structure and development. Medical significance.
26. Synthetic theory as a modern stage of development of the theory of evolution.
27. Influence of mutation process, migration, isolation and gene drift on the genetic structure of human populations. The specifics of the action of natural selection in human populations.
28. The problem and medical and biological consequences of genetic burden and the impact of mutagenic factors (radiation and chemicals) on human populations. The teachings of Academician V.I. Vernadsky on the biosphere and noosphere. Living matter, its characteristics.
29. Medical and biological aspects of the impact of the biosphere on human health. The concept of biofields and biological rhythms, their medical significance.
30. Connection of ontogenesis and phylogeny. Biogenetic law (F. Müller, E. Haeckel), its interpretation by O.M. Severtsov. Atavistic defects of human development.

31. Phylogeny of the integuments of the body, skeleton, digestive, respiratory, circulatory, nervous, urinary and genital systems of the Chordates. Congenital malformations with ontophylogenetic conditionality.
32. The origin of man. The main stages of anthropogenesis. The position of the species *Homo sapiens* in the system of animal world.
33. Ecology. Environment as an ecological concept. Types of environment. Environmental factors. Unity of organism and environment.
34. The concept of homeostasis. Mechanisms of homeostasis regulation at different levels of life organization. Stress. Functional types of human response to environmental factors («sprinter», «stayer», «mixt»).
35. Biological variability of people in connection with biogeographical features of the environment. Formation of adaptive ecotypes of people.
36. Man as an environmental factor. The main directions and results of anthropogenic changes in the environment. Environment protection.
37. Plants, fungi and animals, poisonous to human.

The list of practical skills and abilities to exam

- Have the technique of microscopy;
- Make temporary micropreparations;
- Differentiate cell components;
- Make an ideogram of human chromosomes;
- Identify the primary structure, the number of amino acids, the molecular weight of the polypeptide by the structure of the gene encoding it;
- Analyze the sequence of stages of regulation of gene expression;
- Determine the type of inheritance of mendelian human traits;
- Predict the genotypes and phenotypes of offspring and genotypes of parents;
- Exclude paternity when determining the blood groups of parents and children;
- Analyze the complex mechanisms of inheritance of traits in humans;
- Develop measures to reduce the degree of manifestation of the pathological condition in patients with hereditary pathology;
- Choose appropriate methods of studying human heredity to diagnose the level of hereditary diseases;
- Calculate the probability of hereditary diseases in offspring depending on the penetrance of the gene;
- Differentiate human chromosomal diseases;
- To build and conduct a genealogical analysis of pedigrees with a hereditary disease;
- Calculate the role of heredity and environmental conditions in the development of traits (based on the results of twin analysis);
- Calculate the genetic composition of human populations;
- Apply the biogenetic law to determine ontophylogenetically caused congenital malformations of human development;
- To compare the mechanisms of congenital malformations of human development of different genesis;

- Master the basic principles of regeneration and transplantation.
- To determine the place of a biological object in the system of living nature;
- To substantiate the affiliation of parasitic human diseases to the group of transmissible and naturally occurring;
- Diagnose on micro- and micropreparations of pathogens and vectors of parasitic diseases;
- To determine the species of pathogens of protozoa;
- Identify the different stages of the life cycle of human parasites;
- To substantiate methods of laboratory diagnostics of parasitic diseases;
- To determine the species of helminths and their eggs;
- Differentiate the diagnosis of invasions using laboratory methods;
- To determine the species of vectors of infectious agents;
- Prove the effectiveness of methods of prevention of parasitic diseases, based on ways of infecting them;
- Predict the impact of environmental factors on the human body.

List of micropreparations, which must be able to define during exam

1. Ovary of a cat
2. Golgi apparatus
3. Trophic inclusions
4. Secretory inclusions
5. Pigment inclusions
6. Mitosis
7. Embryo at different stages of gastrulation
8. Leishmania
9. Trypanosoma
10. Giardia
11. Vaginal trichomonas
12. Dysenteric amoeba
13. Malarial plasmodia
14. Toxoplasma
15. Liver fluke
16. Cast fluke
17. Mature progottide of armed tapeworm
18. Mature progottide of unarmed tapeworm
19. Hydatid cyst of echinococcus
20. Mature progottide of the broad-fish tapeworm
21. Ascaris
22. Pinworm
23. Human whipworm
24. Old World Hookworm
25. Encapsulated Trichina larvae
26. Karakurt
27. Tarantula
28. Itch mite
29. Hair follicle mite
30. Dog tick
31. Larvae of ixodidae ticks
32. Cave tick
33. Head louse
34. Body louse
35. Pubic louse
36. Human flea
37. Bed bug
38. Eggs of malarial mosquitoes
39. Eggs of non-malarial mosquitoes
40. Larvae of malarial mosquitoes
41. Larvae of non-malarial mosquitoes
42. Pupae of malarial mosquitoes
43. Pupae of non-malarial mosquitoes
44. Heads of female and male of malarial mosquitoes
45. Heads of female and male of non-malarial mosquitoes.

The form of final control of academic success is exam.

Teaching methods:

- Verbal methods: lecture, conversation;
- Visual methods: illustration, demonstration;
- Practical methods: performing practical work and solving situational tasks to develop skills and abilities;
- Independent work of students on comprehension and assimilation of new material;
- Use of control and educational computer programs on the discipline;
- Innovative teaching methods: business game, case method.

Assessment forms and methods:

- ***Entrance control*** is carried out at the beginning of the academic discipline in order to determine the readiness of higher education applicants for its assimilation. Control is carried out in test mode.
- ***Current control*** is carried out during practical classes, in order to ensure feedback between a scientific and pedagogical worker and a student of higher education in the process of learning and formation of educational motivation of students of higher education.
- ***The final control*** is carried out in order to evaluate the results of training in the discipline.
- ***Oral survey*** allows to control knowledge and verbal abilities, helps to correct speech errors; reproduction of the material contributes to its better memorization, active use of scientific concepts, which is impossible without sufficient application of them in speech.
- ***A written survey*** helps to find out the level of assimilation of the material, but the possibility of writing off should be excluded and the students should be carefully monitored during this survey.
- ***Testing*** as a standardized assessment method meets the new goals and objectives of higher medical education and promotes individualization and control of the educational process and is designed to ensure the quality of training of the future doctor.
- ***Self-control*** is intended for self-assessment by students of higher education of the quality of assimilation of educational material from the discipline (content module, section, topic). For this purpose, questions (situational problems, test problems) for self-control are provided for each topic (section).

The system of continuous and final control

Control measures for assessing the educational activities of higher education students at the Biology Department include incoming, current and final control of knowledge, skills and abilities.

Entrance control is carried out at the beginning of the discipline in order to determine the readiness of higher education students to master it. The control is performed in test mode.

Current control is carried out during practical classes and aims to check the level of readiness of the student to perform a particular job.

Forms of current control during practical classes at the Biology Department:

1. Checking the tasks performed during independent preparation for practical training.
2. Oral examination.
3. Computer test control on the topic of the lesson.
4. Solving tests of I and II levels.
5. Consideration of situational tasks «Step 1» with an explanation of the correct answer.

6. Practical check of the formed professional skills of the student – is carried out at the end of employment by results of performance of practical work and registration of the protocol of practical employment.

Table 1

Standardized generalized criteria for students' knowledge assessment in PDMU

By the 4-point scale	**Point EKTS**	**Evaluation criteria**
5 (excellent)	A	The student is fluent in the studied amount of material, applies it in practice, freely solves exercises and problems in standardized situations, independently corrects errors, the number of which is insignificant, has at least 85% knowledge of the topic as during the survey, and all types of control
4 (good)	B	The student is fluent in the studied amount of material, applies it in practice, freely solves exercises and problems in standardized situations, independently corrects errors, the number of which is insignificant, has at least 85% knowledge of the topic as during the survey, and all types of control .
	C	The student is able to compare, summarize, systematize information under the guidance of a scientific and pedagogical worker, in general, independently apply it in practice, control their own activities; to correct mistakes, among which there are significant ones, to choose arguments to confirm opinions, has at least 75% of knowledge on the topic both during the survey and all types of control.
3 (satisfactorily)	D	The student reproduces a significant part of the theoretical material, shows knowledge and understanding of the basic provisions with the help of research and teaching staff can analyze educational material, correct errors, among which there is a significant number of significant, has at least 65% knowledge of the topic both during the survey and all types of control.
	E	The learner has educational material at a level higher than the initial, a significant part of it reproduces at the reproductive level. has at least 60% knowledge of the topic both during the survey and all types of control.
2 (unsatisfactorily)	FX	The student has the material at the level of individual fragments that make up a small part of the material, has less than 60% knowledge of the topic both during the survey and all types of control.
	F	The student has the material at the level of elementary recognition and reproduction of individual facts, elements, has less than 60% knowledge of the topic as

		during the survey, and all types of control.

Exam

At the end of the study of the discipline, a semester final certification (SFC) is carried out. Students are admitted to the exam, who have not missed classes, scored a minimum of at least 72 (which corresponds to an average score of 3.0 for current performance), passed all content modules and have in the individual curriculum a mark of admission to the exams.

Semester exams in PDMU are accepted on a commission basis, exams are taken openly and publicly. Grades obtained during the examination by the attested persons are set out in the «Statement of final semester control» and in the individual plans of students.

The exam is conducted in one day in two stages: computer testing and theoretical component. At the first stage, on the day of the exam in the cathedral computer class, higher education students are tested on 20 questions (time to complete – 20 minutes) from the base of KROK-1. Each correct answer for the test task when compiling the computer control is counted as 1 point (maximum in the amount for the first stage, respectively 20 points). The result of the computer control by the applicant with higher education is not a reason for not admitting him to the theoretical part of the exam. The examination ticket for each discipline contains three specific basic theoretical (practice-oriented) questions, formulated in such a way that the reference answer of the higher education applicant to each lasts approximately 3–5 minutes.

Exam regulations:

1. Solve 20 tasks from the base of the licensing exam «KROK 1» in computer format. Each task is evaluated by 1 point (maximum number of points scored – 20).

2. Answer on 2 theoretical questions (maximum 20 × 2 = 40 points):

- completeness of presentation – 10 points;
- sequence of presentation – 4 points;
- availability of illustrations and graphological schemes – 2 points;
- use of modern research data – 2 points;
- clinical significance – 2 points.

3. Control of practical skills: solving a situational task in genetics or medical parasitology (maximum – 20 points):

- correct definition of the initial data (short record of the task condition) – 5 points;
- reasoning and algorithmization of the process of solving the problem – 5 points;
- operating with professional terminology (including names of diseases, Latin names of parasites, etc.), providing oral explanations – 5 points;
- reasonableness of the final answer – 5 points.

The maximum number of points scored at exam – 80.

Applicants for higher education who during the study of the discipline «Medical Biology» had an average grade point average of 4.50 to 5.0 are exempt from the exam and automatically (by agreement) receive a final grade in accordance with table 2, with the presence of the applicant at exams are required.

Table 2

Unified table of correspondence of scores for current performance, scores for FMC, exam, and traditional four-point score

Average score for current performance (A)	Points for current success in the module (A * 24)	Points for FMC from the module (A*16)	Points for the module and / or exam (A*24 + A*16)	Category ECTS	By 4-point scale
2	48	32	80	**F FX**	**2 unsatisfactorily**
2,1	50	34	84		
2,15	52	34	86		
2,2	53	35	88		
2,25	54	36	90		
2,3	55	37	92		
2,35	56	38	94		
2,4	58	38	96		
2,45	59	39	98		
2,5	60	40	100		
2,55	61	41	102		
2,6	62	42	104		
2,65	64	42	106		
2,7	65	43	108		
2,75	66	44	110		
2,8	67	45	112		
2,85	68	46	114		
2,9	70	46	116		
2,95	71	47	118		
3	72	50	122	**E**	**3 satisfactorily**
3,05	73	50	123		
3,1	74	50	124		
3,15	76	50	126		
3,2	77	51	128		
3,25	78	52	130	**D**	
3,3	79	53	132		
3,35	80	54	134		
3,4	82	54	136		
3,45	83	55	138		
3,5	84	56	140	**C**	**4 good**
3,55	85	57	142		
3,6	86	58	144		
3,65	88	58	146		
3,7	89	59	148		
3,75	90	60	150		
3,8	91	61	152		
3,85	92	62	154		

3,9	94	62	156		
3,95	95	63	158		
4	96	64	160	**B**	
4,05	97	65	162		
4,1	98	66	164		
4,15	100	66	166		
4,2	101	67	168		
4,25	102	68	170		
4,3	103	69	172		
4,35	104	70	174		
4,4	106	70	176		
4,45	107	71	178		
4,5	108	72	180	**A**	**5 excellent**
4,55	109	73	182		
4,6	110	74	184		
4,65	112	74	186		
4,7	113	75	188		
4,75	114	76	190		
4,8	115	77	192		
4,85	116	78	194		
4,9	118	78	196		
4,95	119	79	198		
5	120	80	200		

In case of disagreement with the assessment, the specified category of applicants for higher education takes the exam according to the general rules.

The exam is taken by examiners who are approved by order of the rector.

The applicant of higher education has the right to retake the exam no more than 2 times and only during the examination session, permission to retake the exam is issued by the dean.

Methodological support:

- Working curriculum of the discipline;
- Plans of lectures, practical classes and independent work of students;
- Abstracts of lectures on the discipline;
- Methodical recommendations and developments for the teacher;
- Methodical instructions for practical classes for students;
- Methodical materials that provide independent work of students;
- Test and control tasks for practical classes;
- Questions and tasks to control the assimilation of the section;
- List of questions for the exam, tasks to test practical skills during the exam.

Recommended reading:

1. Biological features of the human vital activity / G.A. Yeroshenko, O.V. Klepets, N.O. Perederii, A.V. Vatsenko, N.A. Ulanovska-Tsyba, O.B. Riabushko, K.V. Shevchenko. Poltava : ТОВ НВП «Укрпромторгсервіс», 2021. 262 p.
2. Medical Biology. Parasitology. Genetics: textbook / S.Ya. Paryzhak. Lviv: "Novyj Svit-2000", 2024. 432 p.
3. Organismic level of life organisation. Bases of human genetics / Yeroshenko G.A., Klepets O.V., Kinash O.V., Perederii N.O., Vatsenko A.V., Ulanovska-Tsyba N.A., Riabushko O.B., Shevchenko K.V. Poltava: ТОВ НВП «Укрпромторгсервіс», 2021. 288 p.
4. Population-species, biogeocenotic and biosphere levels of life organization. Training text-book on Medical biology (module II) for students of medical and dental specialties / Yeroshenko G.A., Klepets O.V., Kinash O.V., Perederii N.O., Vatsenko A.V., Ulanovska-Tsyba N.A., Riabushko O.B., Shevchenko K.V. Poltava: ТОВ НВП «Укрпромторгсервіс», 2022. 266 p.

Information resources:

1. Base of KROK-1 questions: http://testcentr.org.ua
2. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders http://omim.org/
3. Medicine Encyclopedia Articles on the site of Britannica: https://www.britannica.com/browse/Medicine
4. Human biology: http://jbpub.com/humanbiology
5. Human biology on Website of Open Textbook Library: https://open.umn.edu/opentextbooks/textbooks/human-biology

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