



INTERNATIONAL EUROPEAN UNIVERSITY
EDUCATIONAL AND RESEARCH INSTITUTE
"EUROPEAN MEDICAL SCHOOL"

**Department of Fundamental, Medical and Preventive
Disciplines**

APPROVED by
The Scientific and Methodical Council of the
University, protocol dd. August 29, 2023 No. 7
Deputy Chair of SMC *[Signature]* O. LISNICHUK

WORKING PROGRAM OF THE ACADEMIC DISCIPLINE:
MEDICAL BIOLOGY

to train students of the second (Master's) level
(full-time mode of study)

Knowledge area 22 "Health care"

Specialty 222 "Medicine"

Educational program: Medicine

Discipline status: Compulsory

Kyiv – 2023

The working program of the **Medical biology** academic disciplines is based on the Medicine educational and professional program for the second (Master) level of the 222 Medicine specialty approved by the University Academic Council on May 30, 2023, protocol №4.

PROGRAM DEVELOPER:

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REVIEWER:

Professor of the Department of Fundamental and Medical and Preventive Disciplines _____ M. VERGOLYAS, Doctor of biology, Professor

Guarantor of EP _____ A. BONDARENKO

The working program of the academic disciplines is reviewed and approved by the Department of Fundamental, Medical and Preventive Disciplines, protocol No. 1 dd. August 25, 2023.

Head of the Department of Fundamental, Medical and Preventive Disciplines, PhD in biology, Associate Professor _____ Victoria KOVALENKO

The program is reviewed and approved by the Academic Council of the European Medical School, protocol No. 1 dd. August 29, 2023.

Chair of the Academic Council
of the European Medical School

Ph.D in Medicine,
associate professor

_____ Yevhenii SIMONETS

INTRODUCTION

Study program of the academic discipline "Medical Biology" compiled in accordance with Standard of higher education of the second (master's) level of training for higher education holders of the "Master's" educational degree, field of knowledge 22 - "Health care", specialty - 222 "Medicine", educational qualification level "Master of Medicine".

Description of the academic discipline (abstract). According to the curriculum, students study the discipline "*Medical Biology*" in the 1st year, in the 1st semester. The discipline is based on previously studied subjects such as "General Biology", "Human Biology", "Animal Biology", "Plant Biology" in secondary comprehensive school. "Medical Biology" lays the foundation for students' further acquisition of knowledge and skills in specialized theoretical and clinical professional-practical disciplines (biological and bioorganic chemistry, histology, cytology and embryology, physiology, microbiology, medical genetics, clinical immunology, infectious diseases, epidemiology, pediatrics etc).

The discipline program is structured into **three sections** .

Section I. Biological features of human life

Section II. Organismal level of life organization. Basics of human genetics

Chapter III. Population-species, biogeocenotic and biosphere levels of life organization

Informative description of the initial discipline

Name of indicators	Field of knowledge, direction of training, educational and qualification level	Characteristics of the academic discipline
		full-time education
The number of credits is 5.0	Branch of knowledge 22 "Health care"	Normative (optional)
	Training direction "Medicine"	
There are 3 sections	Specialty: 222 "Medicine"	Year of training:
There are 8 content sections		1st
The total number of hours is 150		1st semester
Weekly load: classrooms 1st year of study - 3 hours,	Education level: "Master of Medicine" professional qualifications "doctor"	Lectures
		4 p.m.
		Practical
		64 hours
		Independent work
		64 hours
		Type of control:
exam		

The subject of study of the academic discipline is the biological basis of human life.

Interdisciplinary connections . Academic discipline "Medical Biology" integrates with the following disciplines:

Content sections of the discipline "Medical Biology"	Disciplines with which it is integrated
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<p>Content section 1. Molecular and cellular level of life organization.</p>	<p>1 . Histology, cytology and embryology Content section 1. Cytology. Basics of general embryology. 2 . Biological and bioorganic chemistry Content section 12. Fundamentals of molecular biology Content section 13. Fundamentals of molecular genetics</p>
<p>Content section 2. Patterns of heredity and variability.</p> <p>Content section 3. Methods of studying human heredity. Hereditary diseases</p>	<p>1. Biological and bioorganic chemistry Content section 13. "Fundamentals of molecular genetics" 2 . Pathological physiology . Content section 1. General nosology - general teaching about disease, etiology and pathogenesis. Typical pathological processes. Topic 7. The role of heredity, constitution, age-related changes in pathology. 3. Microbiology. Content section 1. General microbiology. Topic: Molecular genetic research methods 4. Medical genetics . Content sections: 1) Heredity and pathology. The role of heredity in human pathology. 2) Propaedeutics of hereditary pathology. Phenotype description methodology. Syndrome analysis. 3) Clinical genealogical method. 4) Chromosomal diseases. 5) Monogenic diseases. Diseases with hereditary predisposition. 6) Prevention of hereditary pathology. Medical genetic counseling and prenatal diagnosis. 5. Obstetrics and gynecology Isoantigenic incompatibility of maternal and fetal blood. Anomalies of the development of the fertile egg. Pregnancy and childbirth with polyhydramnios and multiple fertility.</p>
<p>Content section 4. Biology of individual development.</p>	<p>1. Histology, cytology and embryology Content section 1. Cytology. Basics of general embryology. 2 . Obstetrics and gynecology Content section 1. Physiological course of pregnancy, childbirth and the postpartum period Topic: Fertilization and development of the fertile egg. Anomalies of the development of the fertile egg 3. Physiology Content section 6. Humoral regulation and the role of endocrine glands in the regulation of visceral functions.</p>
<p>Content section 5. Medico-biological bases of parasitism. Medical protozoology</p> <p>Content section 6. Medical helminthology</p> <p>Content section 7. Medical arachnoentomology</p>	<p>1. Infectious diseases Chapter 1. Infectious diseases and parasitic infestations. 2. Tropical medicine. Content section 1. Tropical medicine 3. Epidemiology. Content section 2. Special epidemiology Topic: Anti-epidemic measures in foci of infections with a transmissible transmission mechanism. 4. Microbiology Content section 3. Pathogenic prokaryotes and eukaryotes Topic: Spirochetes; Topic: Rickettsia; Topic: Basics of medical protozoology; Topic: Rhabdoviruses. Arboviruses.</p>
<p>Content section 8. Relationship between individual and historical</p>	<p>1. Pathomorphology. Content section 8. Diseases of pregnancy and the postpartum period. Diseases of the pre- and perinatal period. Pathomorphology of hypo-</p>

development. Biosphere and man	<p>and vitamin deficiency. Diseases caused by human activity and the influence of the external environment .</p> <p>2. Medical genetics . Content section. Propedeutics of hereditary pathology. Phenotype description methodology. Syndrome analysis.</p> <p>3. Pediatrics . Content section 2. Respiratory diseases in children. Topic: Congenital defects and chronic diseases of the bronchopulmonary system in children. Content section 4. Cardiorheumatology of childhood. Topic: The most common congenital heart defects in children. Content section 5. Diseases of the digestive system in children</p>
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1. The purpose and tasks of the educational discipline

1.1. The purpose of the educational discipline "Medical Biology" stems from the goals of the educational and professional training program for graduates of a higher education institution and is determined by the content of those systemic knowledge and skills that a doctor must master. The knowledge that students receive from the academic discipline is basic for the block of disciplines that provide natural-scientific (PN block) and professional-practical (PP block) training.

The study of medical biology forms in students a holistic idea of the general laws of the development of living nature; about the essence of life, its forms, individual and historical development of the organic world and the place of man in it; about forms of biotic relationships in nature, life cycles of parasites and parasitic human diseases; about the place of man in the biosphere; provides fundamental biological training and acquisition of practical skills for the next professional activity of a general practitioner.

1.2. The main tasks of studying the discipline are

- 1. To explain the patterns of manifestations of vital activity of the human organism at the molecular, biological and cellular levels.
- 2. To determine the manifestations of the action of general biological laws in the course of human ontogenesis.
- 3. To determine the biological essence and mechanisms of the development of diseases arising as a result of anthropogenic changes in the environment.
- 4. To explain the essence and mechanisms of manifestation in the phenotype of hereditary human diseases.
- 5. Make a preliminary conclusion about the presence of parasitic infestations in humans and determine preventive measures

1.3 Competencies and learning outcomes, the formation of which contributes discipline (relationship with normative content preparation acquirers higher education, formulated in terms results teaching in Standards higher education).

According to the requirements of the Standard of Higher Education of Ukraine (second (master's) level of higher education, field of knowledge 22 "Health care", specialty 222 "Medicine"), the discipline ensures that students acquire the following **competencies** :

- **integral**: the ability to integrate knowledge and solve complex specialized tasks in the broad and multidisciplinary contexts of a doctor's professional activity, to solve practical problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account the aspects of social and ethical responsibility in the field of health care .

- **general and professional** :

general competence (ZK)

ZK 1.	Ability to abstract thinking, analysis and synthesis
ZK 2.	Ability to learn and master modern knowledge
ZK 3.	Ability to apply knowledge in practical situations
ZK 4.	Knowledge and understanding of the subject area and understanding of professional activity
ZK 5.	Ability to adapt and act in a new situation
ZK 6.	Ability to make informed decisions
ZK 7.	Ability to work in a team
ZK 8.	Ability to interpersonal interaction
ZK 10.	Ability to use information and communication technologies
ZK 11.	Ability to search, process and analyze information from various sources
ZK 12.	Determination and persistence in relation to assigned tasks and assumed responsibilities
Professionals competence (FC)	
FC 1.	Ability to collect medical information about the patient and analyze clinical data
FC 11.	Ability to solve medical problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility
FC 17.	The ability to assess the impact of the environment, socio-economic and biological determinants on the state of health of an individual, family, population
FC 21.	It is clear and unambiguous to convey one's own knowledge, conclusions and arguments on health care problems and related issues to specialists and non-specialists, in particular to people who are studying
FC 23.	The ability to develop and implement scientific and applied projects in the field of health care.
FC 24.	Adherence to ethical principles when working with patients and laboratory animals.
FC 25.	Adherence to professional and academic integrity, to be responsible for the reliability of the obtained scientific results
Software the results teaching (PRN)	
PRN 1.	Have thorough knowledge of the structure of professional activity. To be able to carry out professional activities that require updating and integration of knowledge. To be responsible for professional development, the ability for further professional training with a high level of autonomy.
PRN 2.	Understanding and knowledge of fundamental and clinical biomedical sciences, at a level sufficient for solving professional tasks in the field of health care.
PRN 3.	Specialized conceptual knowledge that _ include scientific achievements in the field protection health is the basis for conducting research , critical understanding of problems in the field medicine and those related to it interdisciplinary problem m
PRN 21.	Search for the necessary information in professional literature and databases data from other sources, analyze, evaluate and apply this information.
PRN 23.	Assess the impact of the environment on human health in order to assess the morbidity of the population.

Integrative learning outcomes , the formation of which is facilitated by education discipline: "Medical Biology" lays the foundation for the further formation of the following program learning outcomes in accordance with the Standard of Higher Education of Ukraine for postgraduate training of specialists of the second (master's) level of the "Medicine" specialty.

Upon completion of the "Medical Biology" discipline, students should know:

- levels of living organization;
- forms of life and its fundamental properties;
- structural and functional organization of the eukaryotic cell;

- molecular basis of heredity; cell cycle and methods of cell division;
- the main patterns of heredity in mono- and dihybrid crossing and linked inheritance;
- inheritance of human blood groups according to the ABO system and the Rhesus factor;
- inheritance of a person's gender and sex-linked 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, the structure of germ cells; definition of ontogenesis and its periodization;
- the main stages of embryonic development, molecular and cellular mechanisms of differentiation;
- 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;
- ways of transmission of parasitic diseases; obligatorily transmissible and facultatively transmissible diseases;
- natural focal diseases; the structure of the natural cell;
- classification of congenital malformations;
- teratogenic factors; basics of prevention of parasitic diseases;
- the causative agents of the most common protozoa, trematoda, cestoda, and nematoda;
- principles of laboratory diagnosis of helminthiasis;
- arthropods - carriers and pathogens of human diseases, the concept of mechanical and specific carriers;
- poisonous representatives of the Arthropod type;
- the concept of population as an elementary unit of evolution, the population structure of humanity, demes, isolates;
- functional types of people's response to environmental factors ("sprinter", "stayer", "mixed");
- concept of biological rhythms, their medical significance;
- the subject of ecology; types of environment, environmental factors; adaptive ecotypes of people;
- the role of man as an environmental factor;
- the main directions and results of anthropogenic changes in the surrounding environment;
- examples of plants and animals poisonous to humans;
- the basic tenets of academician V.I. Vernadsky about the biosphere and noosphere;
- the position of the species Homo sapiens in the system of the animal world, the main stages of anthropogenesis;
- regularities of the phylogeny of organ systems, ontogenetic prerequisites of congenital malformations, examples of atavistic malformations of human organs and organ systems.

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Upon completion of the "Medical Biology" discipline, students should be able to:

- study micropreparations under a light microscope at low and high magnification;
- to produce temporary micropreparations;
- differentiate the components of an 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 according to the nucleotide sequence of the gene encoding it;
- to predict the genotypes and phenotypes of the offspring based on the genotypes of the parents;

- calculate the probability of a sick child with monogenic diseases given the known genotypes of the parents:
- exclude paternity when determining the blood groups of the parents and the child:
- calculate the probability of the manifestation of hereditary diseases in the offspring depending on the penetrance of the gene;
- analyze the human karyotype and determine the diagnosis of the most common chromosomal diseases;
- build a pedigree and conduct its genealogical analysis;
- calculate the role of heredity and environmental conditions in the development of traits (according to the results of twin analysis);
- calculate the frequencies of genes and genotypes according to the Hardy-Weinberg law;
- to distinguish the concepts of teratogenic and hereditary congenital malformations;
- determine the place of the biological object (causing agents of parasitic diseases) in the living nature system;
- to justify the belonging of human parasitic diseases to the group of transmissible and naturally focal diseases;
- diagnose on macro- and micro-preparations the causative agents and vectors of causative agents of the parasitic diseases being studied;
- justify the methods of laboratory diagnosis of human parasitic diseases;
- justify the methods of prevention of parasitic diseases, based on the methods of infection with them.

2. Information volume of the academic discipline

150 hours (16 hours of lectures, 64 practical classes, 70 hours of SRS), 5 ECTS credits are allocated to the study of the academic discipline.

SECTION 1.

MOLECULAR AND CYTOLOGICAL BASIS OF VITAL ACTIVITY PEOPLE

Content section 1. Molecular and cellular level of life organization

Topic 1. Introduction to the course of medical biology. Optical systems in biological research. Levels of living organization

Medical biology as a science of the foundations of human life, which studies the laws of heredity, variability, individual and evolutionary development and morpho-physiological and social adaptations of a person to environmental conditions in connection with his biosocial essence. Modern stage of development of general and medical biology. The place of biology in the system of medical education. The essence of life. Forms of life, its fundamental properties and attributes. Evolutionary structural levels of life organization; elementary structures of levels and the main biological phenomena characterizing them. The importance of ideas about the levels of organization of living things for medicine. The special place of man in the system of the organic world. Correlation of physico-chemical, biological and social phenomena in human life. Optical systems in biological research. Structure of a light microscope and rules for working with it. The technique of manufacturing temporary micropreparations and their study. Methods of studying the structure and functioning of cells.

Topic 2. Cell morphology. Structural components of the cytoplasm and nucleus. Structural and functional organization of the eukaryotic cell

Chemical composition of the cell: macro- and microelements. Water, the importance of hydrogen bonds in the life processes of cells. Organic compounds are 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. Concept of lysosomal storage diseases, mitochondrial and peroxisomal diseases. The nucleus is the central information apparatus of the cell. The structure of the

interphase core. Chromosomal and genomic levels of the organization of hereditary material. Chromatin: euchromatin, heterochromatin.

Topic 3. Cell membranes. Transport of substances through the plasmalemma The cell as an open system

The cell as an open system. Assimilation is dissimilation. Cell membranes, their structure and functions. The principle of compartmentation. Cell receptors. Transport of substances through the plasma membrane. Organization of flows of matter and energy into cells. Stages of energy exchange. Energy supply of the cell, ATP. Distribution of energy.

Topic 4. Core. Morphology of chromosomes. Human karyotype

Core structure. Karyotype. Morphofunctional characteristics and classification of human chromosomes. Rules of chromosomes. Chromosome analysis. Nucleus as a derivative of chromosomes, role in the formation of ribosomes. Idiogram.

Topic 5. Molecular basis of heredity. Characteristics of nucleic acids.

Molecular basis of heredity. Characteristics of nucleic acids: DNA, RNA; spatial organization, species specificity, role in storage and transmission of hereditary information. Replication of the DNA molecule. Maintenance of genetic stability of cells; self-correction and repair of the DNA molecule.

Topic 6. Proto- and eukaryotic gene structure

A gene as a unit of genetic function. Gene structure of pro- and eukaryotes. Genes are structural, regulatory, tRNA, rRNA. mRNA. Genetic code, its main properties. Post-translational modification of proteins.

Topic 7. Organization of information flow in the cell Regulation of gene expression. Molecular mechanisms of human variability

Organization of information flow in the cell. Processing, splicing. Broadcast (initiation, elongation, termination). Post-translational modification of proteins. Regulation of gene expression in prokaryotes. Exon-intron organization of the genome of eukaryotes. Molecular mechanisms of variability in humans.

Topic 8. Life cycle and cell division. Mitosis. Meiosis.

Cell organization in time. Cell cycle. Concept of apoptosis and necrosis. Ways of cell division: mitosis, meiosis. Endomitosis, polythemia. 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. Violations of mitosis, somatic mutations. Meiosis, its biological significance. Life of cells outside the body. Cell cloning. Use of cell clones in medicine.

SECTION 2.

ORGANISM LEVEL OF LIFE ORGANIZATION. FUNDAMENTALS OF HUMAN GENETICS

Content section 2. Patterns of heredity and variability

Topic 9 . Peculiarities of human genetics. Mono-, di- and polyhybrid crossing.

Mendelian features of a person

Genetics: subject and tasks, stages of development; basic terms and concepts of genetics. Principles of hybridological analysis. Monohybrid crossing: the law of uniformity of hybrids of the first generation, the law of splitting. The law of "purity of gametes". Cytological bases of laws. Analytical crossing, its practical application. Lethal genes. Deviation from the expected cleavage. Di- and polyhybrid crossing: the law of independent combination of traits, its cytological basis. Dominant and recessive types of inheritance of normal and pathological human traits. Intermediate nature of inheritance in humans. Deviation from Mendelian inheritance. Genomic imprinting. Epigenetics.

Topic 10. Interaction of allelic and non-allelic genes. Pleiotropy. Genetics of blood groups

Interaction of allelic genes (complete dominance, incomplete dominance, superdominance or superdominance, codominance) and non-allelic genes (complementary interaction, epistasis,

polymyria). Polygenic inheritance of traits in humans. Primary and secondary pleiotropy. Series of multiple alleles. Inheritance of human blood groups according to ABO and MN antigenic systems. Rhesus factor. Rhesus conflict. Immunogenetics: subject, task. Tissue and species specificity of proteins, their antigenic properties.

Topic 11 . Chromosomal theory of heredity. Linked inheritance. Gender genetics .

Linked inheritance. Peculiarities of inheritance of linkage groups. Chromosomal theory of heredity. Crossover mechanism, cytological evidence, biological significance. Genetic maps of chromosomes. Methods of human chromosome mapping. Current status of human genome research. Non-chromosomal inheritance. Inheritance of human sex. Mechanisms of genetic sex determination in humans and their disorders. Bisexual human nature. The problem of gender redefinition, psychosocial aspects. Sex-linked signs, patterns of their inheritance. Hemizygoty Inheritance of sex-linked human diseases. Sex-limited and sex-dependent signs.

Topic 12. Human variability as a property of life and a genetic phenomenon: phenotypic and genotypic variability

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. Combinatorial variability, its sources. Mutational variability in humans, its phenotypic manifestations. Classification of mutations: genomic, chromosomal aberrations, genetic. Epigenetic mutations. Natural mutagenesis, induced mutagenesis. Mutagens: physical, chemical, biological. Genetic monitoring. Genetic danger of environmental pollution. The concept of antimutagens and commutagens. The law of homologous series of hereditary variability, its practical significance.

Content section 3. Methods of studying human heredity. Hereditary diseases

Topic 13 . Basics of medical genetics. Methods of studying human heredity.

Basics of medical genetics. Man as a specific object of genetic analysis. Methods of studying human heredity. Genealogical method. Rules for building pedigrees. Genetic analysis of pedigrees. Twin method. Determination of the influence of genotype and environment in the manifestation of pathological signs of a person. Dermatoglyphic, immunological methods and the method of hybridization of somatic cells.

Topic 14. Cytogenetic method. Chromosomal diseases

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 hereditary diseases. Determination of X- and Y-sex chromatin as an express method of diagnosing human hereditary diseases. Molecular and cytogenetic methods.

Topic 15 . Biochemical method and DNA diagnostics.

Monogenic (molecular) human diseases caused by a change in the molecular structure of a gene. Examples of monogenic diseases of carbohydrate, amino acid, lipid, and mineral metabolism. Mechanism of their occurrence and principles of laboratory diagnostics. Biochemical methods of diagnosis. Concept of selective and mass screening. Molecular and genetic methods of diagnosis. Polymerase chain reaction. Genetic engineering. Biotechnology. Concept of gene therapy.

Topic 16. Population-statistical method. Medical genetic counseling.

Population-statistical method. Types of human populations. The law of constancy of the genetic structure of ideal populations. Using the formula of the Hardy-Weinberg law in medicine to determine the genetic structure of human populations. Medical and genetic aspects of the family. Medical genetic counseling. Prevention of hereditary and congenital pathology. Prenatal diagnosis of hereditary diseases.

Content section 4. Biology of individual development

Topic 17 . Biological features of human reproduction. Gametogenesis. Fertilization.

Reproduction as a mechanism for ensuring genetic continuity in a number of generations.

Peculiarities of human reproduction in connection with its biosocial essence. Gametogenesis. Fertilization in humans is the restoration of the diploid set of chromosomes, increasing the diversity of gene combinations in the offspring.

Topic 18 . Peculiarities of the prenatal period of human development. Violation ontogenesis and their place in human pathology. Molecular genetic mechanisms of ontogenesis. Ontogeny: types, periods, stages. Stages of human embryonic development. Differentiation at the molecular genetic, cellular and tissue levels. Regulation of gene function in ontogenesis. Experimental study of embryonic development. The problem of determination and interaction of blastomeres. Embryonic induction. Regulation in the process of crushing and its violations (polyembryony, formation of monozygotic twins, malformations). Stem cells. Prospects for use in medicine. Critical periods of development. Teratogenesis. Congenital malformations. Classification of congenital malformations: hereditary, exogenous (teratogenic), multifactorial, gametopathies, blastopathies, embryopathies, fetopathy. Teratogenic environmental factors.

Topic 19. Postnatal period of human ontogenesis. Peculiarities of the postnatal period of human ontogenesis in connection with its biosocial essence. Periods of human postembryonic development. Processes of growth and differentiation in the postnatal period of individual human development.

Topic 20. Biological mechanisms of maintaining body homeostasis. Final lesson from chapters 1, 2. "Molecular and cytological bases of human life", "Organic level of life organization. Basics of human genetics". Concept of homeostasis, biological mechanisms of maintaining homeostasis. The concept of biofields, biological rhythms and their medical significance. Types and ways of regeneration. Types of tissue transplantation in humans. Old age as the final stage of human ontogenesis. Basic theories of aging.

SECTION 3.

POPULATION-SPECIES, BIOGEOCENOTIC AND BIOSPHERE LEVELS OF LIFE ORGANIZATION

Content section 5. Medico-biological bases of parasitism. Medical protozoology

Topic 21. Medical and biological bases of parasitism. Medical protozoology. Subkingdom Protozoa (Protozoa). Type Sarcomastigophora (Sarcomastigophora). Class True amoebae (Lobosea). Type Ciliophora (Ciliophora). Representatives of the Rimostomatea class are human parasites.

Introduction to medical parasitology. The origin and evolution of parasitism. Principles of classification of parasites. Principles of parasite-host interaction. Morphophysiological adaptation of parasites. Concept of intensity and extensiveness of invasion. Outstanding scientists-parasitologists . Characteristic features and classification of the subkingdom Protozoa (Protozoa). Type. Sarcomastigophora Class True amoebae (Lobosea). Dysenteric, intestinal, oral and other types of amoeba. Medical geography, morphofunctional features, development cycles, ways of infection, laboratory diagnostics, prevention of amebiasis. Type Ciliophora (Ciliophora). Rimostomatea class - human parasites. Balantidium. Medical geography, morphofunctional features, development cycles, ways of infection, laboratory diagnostics, prevention of balantidiasis.

Topic 22. Representatives of the class Animal flagellates (Zoomastigophorea) are human parasites. Type Apicomplexa (Apicomplexa). Representatives of the Sporozoa class are human parasites . Class Animal flagellates (Zoomastigophorea). Giardia, trichomonads (vaginal, intestinal, oral). Leishmania, trypanosomes. Medical geography, morphofunctional features, development cycles, ways of infection, laboratory diagnostics and prevention of giardiasis, genitourinary trichomoniasis, leishmaniasis and trypanosomiasis. The concept of natural focal and transmissible diseases. Type Apicomplexa (Apicomplexa). Class Sporozoa (Sporozoa). Malarial plasmodia, toxoplasma. Medical geography, morphofunctional features, development cycles of malaria plasmodia and

toxoplasma. Ways of infection, laboratory diagnosis and prevention of diseases caused by them. Methods of laboratory diagnosis of diseases caused by parasitic protozoa.

Content section 6. Medical helminthology

Topic 23. Medical helminthology. Type Flatworms (Plathelminthes). The class of mammals (Trematoda) is the causative agent of human diseases. Type Flatworms (Plathelminthes). Class Trematoda. Hepatic, feline, lanceolate and pulmonary. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of fasciolosis, opisthorchosis, dicrocelosis, paragonimosis. Blood mammals are the causative agents of human parasitic diseases. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of schistosomiasis.

Topics 24-25. Type Flatworms (Plathelminthes). Class Styozhkovi (Cestoidea) - causative agents of human diseases. Class Styozhkovi (Cestoidea). Armed, unarmed, dwarf sticklebacks. Medical geography, morphofunctional features, developmental cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of taeniosis, cysticercosis, taeniarhynchosis, hymenolepidosis. Styozhak is wide, echinococcus, alveococcus. Medical geography, morpho-functional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of diphyllobotrio, echinococcosis, alveococcosis.

Topics 26-27. Type Roundworms (Nemathelminthes). Class Nematoda, the causative agents of human diseases. Methods of laboratory diagnosis of helminthiasis. Type Roundworms (Nemathelminthes). Class Properly round worms (Nematoda). Ascaris, pinworm, hairyhead, hookworm, nekator, intestinal acne. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of ascariasis, enterobiosis, trichocephalosis, hookworm, nekatorosis, strongyloidiasis. Trichinella Medical geography, morphofunctional features, development cycle, ways of infection, pathogenic influence, laboratory diagnosis and prevention of trichinellosis. Rishta Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnosis and prevention of dracunculosis. Methods of laboratory diagnosis of helminthiasis: parasitological, immunological. Principles and content of the main macro- and microhelminthoscopy methods of examination of feces, water, soil, etc. Peculiarities of the structure of the eggs of suckers, tapeworms and roundworms - human parasites. K. I. Scriabin's teaching on deworming, devastation and decontamination of the environment from helminth eggs and larvae.

Content section 7. Medical arachnoentomology

Topic 28. Medical arachnoentomology. Type Arthropoda (Arthropoda). Class Arachnoidea (Arachnoidea). Ticks (Acarina) are pathogens and carriers of pathogens of human diseases. Poisonous arachnids. Type Arthropoda (Arthropoda). Class Arachnoidea (Arachnoidea). Peculiarities of morphology, feeding and reproduction of arachnids. Poisonous arachnids (scorpions, spiders). Scabies mite, demodex as causative agents of human diseases. Medical geography, morphofunctional features, development cycles, ways of infection, pathogenic influence, laboratory diagnostics and prevention of scabies and demodicosis. Ixodes, argas, gamaza ticks as carriers of pathogens of human diseases. Ticks are inhabitants of people's homes and their medical significance.

Topic 29. Class Insecta (Insecta). Cockroaches (Blattoidea). Diptera (Diptera) are pathogens and carriers of pathogens of human diseases. Class Insecta (Insecta). Progressive and regressive changes in the organization of the class Insecta depending on the habitat. Peculiarities of morphology, nutrition and reproduction of insects. A row of cockroaches (Blattoidea). Cockroaches as mechanical carriers of human diseases. Order Diptera (Diptera). Flies, mosquitoes, mosquitoes, their medical importance. Gnus, its

components: characteristics, significance as intermediate hosts of helminths and carriers of human pathogens

Topic 30. Class of Insects (Insecta): lice (Anoplura), fleas (Aphaniptera), bedbugs (Hemiptera) are pathogens and carriers of human pathogens. Rows of Lice (Anoplura), Fleas (Aphaniptera), Bedbugs (Hemiptera). The medical significance of lice, fleas, bedbugs as agents of invasions and carriers of infectious disease agents.

Content section 8.

Relationship between individual and historical development. Biosphere and man

Topic 31. Synthetic theory of evolution. The population structure of mankind. The origin of man. Phylogeny of vertebrate organ systems . Synthetic theory of evolution. Peculiarities of the action of evolutionary factors in human populations. The doctrine of macro- and microevolution. Biogenetic law. The population structure of mankind. The origin of man. Human races as a reflection of adaptive patterns of human development. Evolution of the main organ systems of vertebrates. Ontophylogenetically determined congenital malformations of human development.

Topic 32. The biosphere as a system for ensuring human existence. Final lesson from chapter 3 "Population-species, biogeocenotic and biospheric levels of life organization" . Structure and functions of the biosphere. The main provisions of V. I. Vernadskyi's teaching on the organization of the biosphere. Modern concepts of the biosphere. Noosphere. Humanity as an active geological force. Protection of the biosphere in national and international scientific programs. Human ecology. Environment as an ecological concept. Types of environments. Environmental factors. Unity of organism and environment. Types of ecosystems. Human penetration into biogeocenoses, formation of anthropocenoses. Anthropogenic migration of elements. Medicinal substances in food chains. Environmental forecasting. Healthy (comfortable), unhealthy (uncomfortable), extreme environment. Adequate and inadequate environmental conditions. Adaptation of people to extreme conditions. Stress. Adaptive ecological types of people (arctic, tropical, temperate zone, desert, high mountain, etc.). The influence of anthropogenic factors of environmental pollution on the health of the population. Characteristics of plants, mushrooms and animals poisonous to humans.

3. The structure of the academic discipline

The name of meaningful sections and topics	Number of hours			
	Tha t's all	Including		
		l	p	s.r
CHAPTER I. Molecular and cytological bases of human vital activity <i>Content section 1 . Molecular and cellular level of life organization</i>				
Topic 1. Introduction to the course of medical biology. Optical systems in biological research. Levels of living organization	5	1	2	1
Topic 2. Cell morphology. Structural components of the nucleus and cytoplasm	5	1	2	2
Topic 3. Cell membranes. Transport of substances through the plasmolemma	3	-	2	1
Topic 4. Core. Morphology of chromosomes. Human karyotype	4	-	2	2
Topic 5. Molecular basis of heredity. Characteristics of nucleic acids.	4	-	2	2
Topic 6 . Gene structure of pro- and eukaryotes	5	-	2	3

Topic 7. Organization of the flow of information in the cell. Regulation of gene expression. Molecular mechanisms of variability	4	-	2	2
Topic 8. Life cycle and cell division. Mitosis. Meiosis	5	-	2	3
SECTION II.				
Organismal level of life organization. Basics of human genetics				
<i>Substantive chapter 2. Patterns of heredity and variability</i>				
Topic 9. Peculiarities of human genetics. Mono-, di- and polyhybrid crossing. Mendelian features of a person	4	-	2	2
Topic 10. Interaction of allelic and non-allelic genes. Pleiotropy. Multiple allelism. Genetics of blood groups	5	1	2	2
Topic 11. Chromosomal theory of heredity. Linked inheritance. Genetics of the article.	4	-	2	2
Theme 12. Variability in humans as a property of life and a genetic phenomenon	5	1	2	2
<i>Content section 3. Methods of studying human heredity. Hereditary diseases</i>				
Topic 13. Basics of medical genetics. Methods of studying human heredity. Hereditary human diseases	5	1	2	2
Topic 14. Cytogenetic method. Human chromosomal diseases	5	1	2	2
Topic 15. Biochemical method and DNA diagnostics.	4	-	2	2
Topic 16. Population-statistical method. Medical genetic counseling.	4	-	2	2
<i>Content section 4. Biology of individual development</i>				
Topic 17. Biological features of human reproduction. Gametogenesis. Fertilization	4	-	2	2
Topic 18. Molecular genetic mechanisms of ontogenesis. Peculiarities of the prenatal period of human development. Disorders of ontogenesis and their place in human pathology	5	1	2	2
Topic 19. Postnatal period of human ontogenesis.	5	-	2	3
Topic 20. Biological mechanisms of maintaining body homeostasis. Final lesson from sections 1,2	6	1	2	3
Total according to chapters 1-2	90	8	40	42
CHAPTER III. Population-species, biogeocenotic and biosphere levels of life organization				
<i>Content section 5. Medico-biological bases of parasitism. Medical protozoology</i>				
Topic 21. Medical and biological bases of parasitism. Medical protozoology. Under the kingdom of Protozoa. Sarcophagellate type. Class True amoebae. Ciliated type. Representatives of the cleft-mouth class are human parasites	5	1	2	2
Topic 22. Representatives of the class Animal flagellates - human parasites. Type Apicomplexa. Representatives of the class Spores are human parasites	5	1	2	2
<i>Substantive chapter 6. Medical helminthology</i>				
Topic 23. Medical helminthology. Medical helminthology. Flat and round worms are human parasites Type Flatworms. Class Mammals - causative agents of human diseases	6	2	2	2
Topic 24. Type Flatworms. Class Styozhkovi - causative agents of human diseases (part 1)	4	-	2	2

Topic 25. Type Flatworms. Class Styozhkovi - causative agents of human diseases (part 2)	4	-	2	2
Topic 26. Type Round Worms. Class Actually round Worms - causative agents of human diseases (1 part)	4	-	2	2
Topic 27. Type Round Worms. Class Actually round Worms - causative agents of human diseases (part 2). Methods of laboratory diagnosis of helminthiasis	4	-	2	2
<i>Substantive chapter 7. Medical arachnoentomology</i>				
Topic 28. Medical arachnoentomology. Arthropods are pathogens and carriers of infections and invasions. Type Arthropoda. Class Arachnida. Ticks are pathogens and carriers of human diseases. Poisonous arachnids	6	2	2	2
Topic 29. Class of Insects. Cockroaches. Diptera are pathogens and carriers of pathogens of human diseases	5	-	2	3
Topic 30. Class of Insects: lice, fleas, bugs - pathogens and carriers of human diseases	5	-	2	3
<i>Content module 8. Relationship between individual and historical development. Bosphorus and man</i>				
Topic 31. Synthetic theory of evolution. Peculiarities of the action of evolutionary factors in human populations. The population structure of mankind. The origin of man.	6	1	2	3
Topic 32. The biosphere as a system for ensuring human existence. Human ecology. Final lesson from chapter 3 "Population-species, biogeocenotic and biospheric levels of life organization"	6	1	2	3
Total according to chapter 3	60	8	24	28
<i>EVERYTHING FROM THE DISCIPLINE</i>	150	16	64	70

4. Lecture topics

No. z/p	Topic name	Number of hours
1	Introduction to the course of medical biology. Structural and functional organization of the cell. Cell morphology. Structural components of the nucleus and cytoplasm.	2
2	Organismal level of organization of genetic information. Interaction of genes. Chromosomal theory of heredity. Variability in humans as a property of life and a genetic phenomenon	2
3	Basics of human genetics. Methods of studying heredity Human chromosome diseases	2
4	Molecular genetic mechanisms of ontogenesis. Disorders of ontogenesis and their place in human pathology. Biological mechanisms of maintaining homeostasis	2
5	Medical and biological bases of parasitism. The protozoa are human parasites. Under the kingdom of Protozoa. Sarcoflagellate type. Class True amoebae	2
6	Medical helminthology. Flat and round worms are human parasites	2
7	Medical arachnoentomology. Arthropods are pathogens and carriers of infections and invasions	2

8	Synthetic theory of evolution. Peculiarities of the action of evolutionary factors in human populations. The biosphere as a system that ensures human existence. Human ecology	2
	TOGETHER	16

5. Topics of seminar classes are not provided for in the program

6. Topics of practical classes

No	Topic name	K - st hours
Chapter 1. Molecular and cytological bases of human vital activity Content section 1. Molecular and cellular level of life organization		
1	levels organization of living. Optical systems in biological research	2
2	Morphology cells _ Structural components cytoplasm and nucleus	2
3	Cellular membranes . Transport of substances through plasmalemma	2
4	Core. Morphology of chromosomes. Karyotype a person	2
5	Molecular mechanisms of heredity . Characteristics of nucleic acids .	2
6	Gene structure of pro- and eukaryotes	2
7	Organization of information flow in the cell Regulation of gene expression. Molecular mechanisms of human variability	2
8	Life cycle of a cell. Cell division. Mitosis . Meiosis.	2
Section 2. Organisms are the level of organization of life. Basics of human genetics Substantive chapter 2. Patterns of heredity and variability		
9	Features of human genetics . Mono- , di- and polyhybrid crossing _ Mendelucci signs a person	2
10	Interaction allelic and non-allelic genes _ Pleiotropy . Plural allelism _ Genetics of groups blood _	2
11	Chromosomal theory heredity _ Clutched inheritance _ Gender genetics . .	2
12	Variability in a person as a property life and genetic phenomenon	2
Content section 3. Methods of studying human heredity. Hereditary diseases		
13	Foundations medical genetics. Methods of studying human heredity	2
14	Cytogenetic method. Chromosomal diseases	2
15	Biochemical method and DNA diagnostics .	2
16	Population-statistical method. Medical genetic counseling	2
Content section 4. Biology of individual development		
17	Biological features of human reproduction . Gametogenesis. Fertilization	2
18	Peculiarities of the prenatal period development a person Disorders of ontogenesis and their place in human pathology. Molecular genetic mechanisms of ontogenesis	2
19	Postnatal period of human ontogenesis.	2
20	Biological mechanisms of maintaining homeostasis. Final lesson from chapters 1, 2. "Molecular and cytological bases of human life.", " Organic level of life organization. Basics of human genetics "	2
Section 3. Population-species, biogeocenotic and biosphere levels of life organization Content section 5. Medico-biological bases of parasitism. Medical protozoology		

21	Medical and biological basics of parasitism. Medical protozoology . Sarcoflagellate type . Real class amoeba _ Ciliary type . Representatives of the cleft-mouthed class .	2
22	Representatives of the Animal flagellate class are human parasites. Type Apicomplexan . Representatives of the class Spores are human parasites.	2
Substantive chapter 6. Medical helminthology		
23	Medical helminthology . Type Flatworms . Sysun class . Hepatic , feline, pulmonary , lanceolate suck	2
24	Type Flatworms . Class Tapeworms . Bovine , porcine and dwarf sticks (1 part)	2
25	Type Flatworms . Class Tapeworms . Echinococcus , alveococcus , broad-leaved flatworm (part 2)	2
26	Type Round worms. Class Actually round worms Ascaris, pinworm , Head of hair (1 part)	2
27	Type Round worms. Class Actually round worms Hookworm , nekator, trichinella , blackworm (part 2) . Methods laboratory diagnostics helminth infections	2
Substantive chapter 7. Medical arachnoentomology		
28	Medical arachnoentomology . Type Arthropoda . Class Arachnida . Ticks are causative agents and carriers of diseases . Poisonous arachnids.	2
29	Class of Insects . Ovi cockroach . Diptera insects : flies, mosquitoes , mosquitoes	2
30	Class of Insects . Lice , fleas, bedbugs are pathogens and carriers of human diseases .	2
Substantive chapter 8. Relationship between individual and historical development. Bosphorus and man		
31	Synthetic theory evolution . The population structure of mankind . Origin a person Phylogeny of vertebrate systems	2
32	Biosphere as a system that provides existence a person Ecology a person Final lessons from chapter 3. " Population-species , biogeocenotic and biosphere levels of life organization.	2
TOGETHER		64

7. Topics of laboratory classes are not provided for in the program

8 . Topics for self - study

No	That 's it	K - st hours
CHAPTER I.		
Molecular and cytological bases of human vital activity		
Content section 1. Molecular and cellular level of life organization		
1 .	Preparation for practical classes – theoretical preparation and development of practical skills	5
2 .	Working on topics that are not part of the classroom lesson plan:	
2.1.	Organization of substance and energy flows in the cell	3
2.2.	Life of cells outside the body. Cell cloning	3
3.	Preparation for the final control of learning module 1.	2
SECTION II.		
Organisms are the level of organization of life. Basics of human genetics		
Substantive chapter 2. Patterns of heredity and variability		
4.	Preparation for practical classes – theoretical preparation and development of practical skills	5
5.	Working on topics that are not part of the classroom lesson plan:	
5.1.	Genetic maps. Methods of human chromosome mapping. Current status of human genome research	2
5.2.	Genetic danger of environmental pollution. The concept of mutagens and antimutagens	3
Content section 3. Methods of studying human heredity. Hereditary diseases		
6.	Preparation for practical classes - theoretical preparation and study practical skills	3
7.	Elaboration of topics that are not included to the plan classroom classes:	
7.1.	Genetic engineering. Biotechnology. Concept of gene therapy	3
7.2.	Methods of human genetics: dermatoglyphic , immunological, hybridization of somatic cells	3
8.	Solving problems in medical genetics	3
Content section 4. Biology of individual development		
9.	Preparation for practical classes - theoretical preparation and study practical skills	3
10.	Elaboration of topics that are not included to the plan classroom classes:	
10.1.	Old age as the final stage of human ontogenesis. Theories of aging	1
10.2.	The concept of biofields, biological rhythms and their medical significance	1
CHAPTER III.		
Population-species, biogeocenotic and biosphere levels of life organization		
Content section 5. Medico-biological bases of parasitism. Medical protozoology		
11.	Preparation for practical classes – theoretical preparation and study practical skills –	6
12.	Elaboration of topics that are not included to the plan classroom classes:	
1 2.1.	Methods of laboratory diagnosis of diseases caused by parasitic protozoa	2

Substantive chapter 6. Medical helminthology		
13.	Preparation for practical classes - theoretical preparation and study practical skills	2
14.	Elaboration of topics that are not included to the plan classroom classes:	
14.1.	Mammals are human parasites. The causative agents of metagonimosis and nanophytosis .	2
15.2.	Roundworms and filaria are the causative agents of human diseases	2
Substantive chapter 7. Medical arachnoentomology		
16.	Preparation for practical classes - theoretical preparation and study practical skills	2
17.	Elaboration of topics that are not included to the plan classroom classes:	
17.1.	Ticks are inhabitants of people's homes and their medical importance	2
17.2.	Gnus and its components: characteristics, importance of intermediate hosts of helminths and vectors of pathogens	2
Content module 8. Relationship between individual and historical development. Bosphorus and man		
18.	Preparation for practical classes – theoretical preparation and study practical skills	5
19.	Elaboration of topics that are not included to the plan classroom classes:	
19.1.	Phylogeny of the main systems of vertebrates	2
19.2.	The origin of man, human races as a reflection of adaptive patterns of human development.	2
19.3.	Plants and animals poisonous to humans	2
19.4.	Basics of general ecology and human ecology	2
20.	Preparation for the exam	2
Total for all sections:		70

9. Individual tasks are not provided

10. Teaching methods

According to the sources of knowledge, teaching methods are used: verbal - story, explanation, lecture, instruction; visual - demonstration, illustration; practical - practical work, problem solving. According to the nature of the logic of knowledge, methods are used: analytical, synthetic, analytical-synthetic, inductive, deductive. According to the level of independent mental activity, the following methods are used: problem-based, searching, research.

1. Verbal methods: lecture, conversation;
2. Visual methods: illustration, demonstration
3. Practical methods: performing practical work and solving situational tasks to develop skills and abilities;
4. Students' independent work on understanding and assimilation of new material
5. Use of control and educational computer programs
6. Innovative teaching methods: business game, case method.

The types of training according to the curriculum are: lectures; practical training; independent work of students.

1 1. Control methods

Current control is carried out on the basis of control theoretical knowledge, practical skills and abilities.

Forms of current control are: *in* the dream survey (frontal, individual, combined), interview; practical verification of professional skills (conducted based on the results of practical work at the end of the class); test control ("open" and "closed" test tasks).

Current control is mandatory . During the assessment assimilation of every topic of all discipline curriculum for the current one educational activities are presented to the student assessment on a 4-point (traditional scale) taking into account approved criteria evaluation of the discipline . Are taken into account all species works provided for educational program . The student has get assessment for each topic. The teacher conducts a survey of each student in the group at each lesson and exhibits assessment in the journal accounting visits and success students according to the traditional scale ("5", "4", "3", "2").

When evaluating the student's current educational activity, 20% of the grade is the student's independent work, which takes into account the knowledge of the topic of independent study and the performance of work in the notebook.

The final (summary) control of the sections is carried out at the end of the section in the form of a written test, which includes test tasks from the "Step-1" bank, theoretical questions and control of practical skills (solving situational problems, defining and describing macro- and micropreparations, etc.) .

Such methods of control as oral, written and test are used, which should contribute to increasing the motivation of students-future specialists for educational and cognitive activities. According to the specifics of professional training, preference is given to test and written control. In the case of final control, preference is given to written or test control.

12. Form of final control of study success .

The final control of the discipline is carried out on the basis of theoretical control knowledge, practical skills and abilities.

An exam is a form of final control of a student's assimilation of theoretical and practical material from an educational discipline.

Scheme of calculation and distribution of points received by students.

The maximum number of points for a discipline is 200 points. The ratio between the results of the evaluation of the current educational activity and the final control of knowledge is 60% and 40% .

The study of the discipline ends with final control in the form of an exam .

Only those students who do not have academic debt (all missed classes have been completed) and whose average score for the current educational activity in the academic discipline is at least "3" are admitted to the exam .

The maximum number of points that a student can score for the current educational activity for admission to the exam is 120 points and is defined as the sum of the arithmetic average of all grades received in the semester.

The minimum number of points that a student must score for the current educational activity for admission to the exam is 72 points. Recalculation of the average grade for the current academic performance (on a 120-point scale) in the table. 1.

Table 1.

Recalculation of the average grade for the current academic performance in a multi-point scale for disciplines ending with an exam

4-point scale	200-point scale	4-point scale	200-point scale	4-point scale	200-point scale
5	120	4.29	103	3.58	86

4.96	119	4.25	102	3.54	85
4.92	118	4.21	101	3.50	84
4.87	117	4.17	100	3.46	83
4.83	116	4.12	99	3.42	82
4.79	115	4.08	98	3.37	81
4.75	114	4.04	97	3.33	80
4.71	113	4.00	96	3.29	79
4.67	112	3.96	95	3.25	78
4.62	111	3.92	94	3.21	77
4.58	110	3.87	93	3.17	76
4.54	109	3.83	92	3.12	75
4.50	108	3.79	91	3.08	74
4.46	107	3.75	90	3.04	73
4.42	106	3.71	89	3	72
4.37	105	3.67	88	Less than	Not enough
4.33	104	3.62	87		

Maximum quantity points as much as possible recruit a student when composing exam is 80 (min number - not less than 50).

Discipline assessment _ is defined comprehensively as the sum of points for the current one educational activities and points for the exam .

From the allocated 120 points for the current educational activity, 4 to 12 additional points are allocated for the assessment of individual independent work of higher education applicants, according to the work curriculum. Encouragement points are added to the final grade for the discipline at the end of its study.

Discipline points for students who _ successfully performed program are converted into the national scale and the ECTS system (Table 2).

Table 2

Rating scale : national and ECTS

Total points for all species educational activity	Rating ECTS	Rating by national scale	
		for exam , diploma course	for offset
180-200	AND	Perfectly	counted
160-179	IN	Fine	
150-159	WITH	Satisfactorily	
130-149	D		
120-129	E	unsatisfactory with possibility rearrangement	
50-119	FX		not counted with possibility rearrangement
0-49	F	unsatisfactory with mandatory repeated study disciplines	not counted with mandatory repeated study disciplines

13. Methodological support

1. Working curriculum of the discipline;
2. Plans of lectures, practical classes and independent work of students;
3. Syllabus of the discipline
4. Abstracts of lectures on the discipline;
5. Methodical instructions for practical classes for students;

6. Methodical materials that ensure independent work of students;
7. Test and control tasks for practical classes;
8. List of exam questions

14. Recommended literature

Basic literature

1. Medical biology: a textbook / Ed. V. P. Pishaka, Yu. I. Bazhory. Textbook / 4th edition, revised and supplemented. – Vinnytsia: Nova kniga, 2021. – 608 p.
2. Medical biology: textbook for students. honey. institutions of higher and vocational pre-university education / R.O. Sabydshyn, S.E. Bukhalska – 3rd ed., with changes and additions. – Vynitsia: Nova kniga, 2020. -344 p.: illustrations.

Supporting literature

1. Medical parasitology. Atlas / Ed. Yu. I. Bazhori. – Odesa: OGMU, 2001. – 110 p.
2. Bochkov N.V., Puzyrev V.P., Smyrnikhina S.A. Clinical genetics / Textbook sub. ed. Acad. N.P. Bochkova.-4th Uzd. - M.: GEOTAR-media, 2011. - 592 p.
3. Collection of tasks for preparation for the license test exam in natural sciences "Step-1. General medical training" / Col. author; In general ed. Prof. V. F. Moskalenko, prof. O. P. Volosovets, prof. I. E. Bulak, prof. O. P. Yavorskyi, prof. O. V. Romanenko, Assoc. L. I. Ostapyuk. - K.: Medicine, 2004. - 368 p.; P. 9-41.
4. Kovalchuk L.E., Telyuk P.M., Shutak V.I. Human parasitology: Study guide. – Ivano-Frankivsk: Lileya, 2004.; fig.
5. Medical biology: Manual for practical classes / O.V. Romanenko, M.G. Kravchuk et al. Under the editorship O.V. Romanenko. - K.: Zdorovya, 2005. - 372 p. From fig..
6. Pavlichenko V.I., Pishak V.P., Bulyk R.E. Basics of molecular biology: Study guide. – Chernivtsi: Med University, 2012. – 388 p.; fig.
7. Pishak V.P., Zakharchuk O.I. Medical biology, parasitology and genetics. Practicum Kind. 2nd - Chernivtsi:, 2012. - 632 p.; fig.
8. Salyak N.O. Practicum in medical biology: teaching. manual – 3rd ed., revised. and added - K.: VSV "Medicine", 2017. - 296 p.
9. Slyusarev A.O. Biology / A.O. Slyusarev, S.V. Zhukov. - K.: Vyscha Shk., 1992. - 461p.
10. Taylor D., Green N., Stout U. Biology. In 3 volumes. - M.: Mir, 2002. - 1340 p.
11. Scientific bulletins of the Institute of Molecular Biology and Genetics: <https://www.imbg.org.ua/uk/journals/>
12. Scientific Bulletin of the Ukrainian Society of Geneticists and Breeders: <http://utgis.org.ua/index.php/ua/publ-ua/visnyk-ua>
13. Herald of problems of biology and medicine: <https://vpbm.com.ua/ua/>

16. Information resources:

Ministry of Education and Science of Ukraine <http://www.mon.gov.ua/>
 Ministry of Ecology and Natural Resources of Ukraine <http://www.menr.gov.ua/>
 State Service of Ukraine for Emergency Situations <http://www.dsns.gov.ua/>
 Testing center - database of licensed test tasks "Step" - 1 <http://testcentr.org.ua/>
 Testing Center at the Ministry of Health of Ukraine <https://www.testcentr.org.ua/uk/>
 Genetic Disorders <http://omim.org/>