

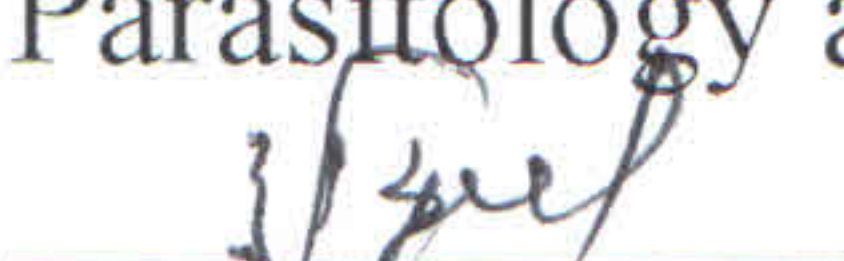
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WORKING PROGRAM OF THE DISCIPLINE

«MEDICAL BIOLOGY, PARASITOLOGY AND GENETICS»

OK 5

for the training of specialists of the 2nd (master's degree) level of higher education
education sector 22 Public Healthcare
Specialty 221 «Dentistry»

Discussed and approved
at the methodical meeting of the
department of Medical Biology,
Parasitology and Genetics
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«Approved»
the profile methodical commission on
medical biological disciplines
Protocol No3
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INTRODUCTION

Working Program of the discipline «Medical biology, parasitology and genetics»
according to the higher education academic standard of *the second (Master's) level*
education sector 22 "Public Healthcare"
specialty 221 "Dentistry"
education program *Master of Dentistry*

The Description of the discipline

«Medical biology, parasitology and genetics» (Annotation)

Working Program of the discipline «Medical biology, parasitology and genetics» is a part of the educational-professional program «Dentistry» of the second (master's) level. It is studied by the I year students, specialty 221 «Dentistry».

Medical Biology as an academic discipline:

- a) is based on previously studied by students subjects in secondary school such as «General Biology», «Human Biology», «Biology of Animals», «Biology of Plants»;
- b) ensures a high level of general biological training;
- c) provides for students a foundation for the further assimilation of knowledge of relevant theoretical and practical clinical professional disciplines (medical chemistry, medical genetics, clinical immunology, infectious disease epidemiology, internal medicine, surgery, pediatrics, etc.

The program of the discipline «Medical biology, parasitology and genetics" is structured as follows:

Chapter 1. «Biological features of human vital functions. Molecular-genetic level of life organization. Organismic level of life organization. Basics of human genetics».

Chapter 2. «Population-species, biogeocenotic and biospheric levels of life organization».

In the Chapter 1 the molecular-genetic, cellular and ontogenetic levels of life organization are being considered, taking into account specificity of the human organism, cell biology, reproduction and basics of human genetics. The material is organized in the manner, so that obtained knowledges were closely related to the further study of hereditary diseases in theoretical and clinical departments and could be used by a physician in his practice.

In the Chapter 2 medical and biological aspects of human ecology are being revealed, which should ensure the formation of ecological thinking, necessary for the doctor nowadays. This section shows the animal world as part of the ecological human environment. Considerable attention is given to the study of parasites life cycles, various forms of relationships between them and the human organism, the origin and evolution of parasitism, modes of infection, methods of diagnosis, parasites prophylaxis. The study of various aspects of parasitology is important because a large number of parasitic diseases very common in the human population. From the perspective of modern synthetic theory of evolution questions of speciation, population patterns of species and microevolution process (for elementary evolutionary factors, elementary evolutionary phenomena) are being taught. Attention is drawn to the specific action of elementary evolutionary factors in human populations, genetic and phenotypic polymorphism of humanity. Androgenesis is considered in connection with

animal world phylogeny and phylogenesis of organs and their systems in the chordates - ontophylogenetic preconditions of human congenital malformations.

Additionally, the issues of structure and function of the biosphere, the doctrine of the noosphere and the impact of human activity on the biosphere as a whole and its constituent parts are being considered, the attention is drawn to environmental protection in national and international research programs.

The types of lessons according to the working program are:

a) lectures; b) practical classes, c) individual student's work, d) consultations.

Structure of the discipline	Quantity of credits, hours, from them				Year of study, semester	Forms of the control
	Total	Auditory		ISW		
		Lectures (hours)	Practical classes (hours)			
Name of the discipline: Medical biology, parasitology, genetics <i>Chapters 2</i>	5 credits / 150 hours	16	58	76	I course (I, II semesters)	exam
by semesters						
<i>Chapter 1</i>	2.5 credits / 75 hours	8	28	39	I semester	
<i>Chapter 2</i>	2.5 credits / 75 hours	8	30	37	II semester	exam

The subjects of academic discipline study are the basics of human vital functions, the study of the laws of heredity, variability, individual development and human morpho-physiological adaptation to the environment due to its biosocial nature and impact of molecular genetic, cellular, ontogenetic, population and ecological factors on human health.

Interdisciplinary links: the integration with related departments, in which biomedical disciplines are being studied (Histology, Cytology, Embryology, Human anatomy, Microbiology, Virology, Immunology, Epidemiology, Infectious diseases).

1. Aim and Objectives of the Academic discipline.

1.1. The overall aim of «Medical biology, parasitology and genetics» teaching process is determined by the goals of program, outlining educational and professional training of higher medical institutions, as well as by the content of systemic competence and practical skills required for a doctor. The knowledge that students gain during the study of «Medical biology, parasitology and genetics» is a basic for a range of subjects providing both natural-science (NS unit) and professional-practical (PP unit) preparation.

1.2. The ultimate goals of the course «Medical biology, parasitology and genetics» are:

1. To determine the biological nature and mechanisms of diseases that arise from anthropogenic changes in the environment.
2. To identify the manifestations of general biological laws during human ontogenesis.
3. To explain the patterns of human organism vital functions manifestation at the molecular-biological and cellular levels.
4. To explain the nature and mechanisms of inherited human diseases manifestation in a phenotype.
5. To make a preliminary conclusion about the presence of parasitic infestations in human organism and define measures of disease prevention.

1.3 Competencies and training results, developed by the subject «Medical biology, parasitology and genetics» (the correlation with the normative content of training acquired by those who are obtaining higher education, formulated in terms of study results of Higher Education Standards).

According to the requirements of Higher Education Standard, subject «Medical biology, parasitology and genetics» provides the development of the following competencies:

-general (3K):

- 3K 1. The ability for abstract thinking, analysis and synthesis.
- 3K 2. Knowledge and understanding of the subject area and understanding of the professional activities.
- 3K 3. The ability to apply knowledge in practical situations.
- 3K 4. The ability to communicate in the official language both orally and in writing.
- 3K 5. The ability to communicate in English.
- 3K 6. Skills of information and communication technologies application.
- 3K 7. The ability to search, work out and analyze information from various sources.
- 3K 8. The ability to adapt and act in a new situation.
- 3K 9. The ability to determine and solve problems.
- 3K 10. The ability to be critical and self-critical.
- 3K 11. The ability to work as a team member.
- 3K 12. The desire to protect the environment.
- 3K 13. The ability to act on the basis of ethical considerations (motives).
- 3K 14. The ability to realize the own rights and responsibilities as a member of society, to recognize the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human and civil rights and freedoms in Ukraine.
- 3K 15. The ability to preserve and multiply the moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about

nature and society and in the development of society, techniques and technologies, to use different types and forms of motor skills for recreation and a healthy lifestyle.

Details of the competencies are set out below in the matrix table of competencies according to the NPK descriptors.

The matrix of competencies

№	Competence	Knowledge	Skills	Communication	Autonomy and responsibility
1	2	3	4	5	6
General competencies					
Ability to interpret general biological regularities that are the basis of human life processes					
Special competencies					
1.	The ability to use in dentist doctor practice the knowledge of molecular and cytological basis of heredity, mechanisms of development of hereditary and acquired human diseases.	Levels of the living things organization, forms of life and its fundamental properties; structural and functional organization and life cycle of eukaryotic cell; the forms of organisms reproduction, molecular basis of heredity, basic regularities of heredity and variation, methods for study of human heredity, classification of hereditary diseases.	To examine microscopic specimens at different magnification; to prepare temporary specimens; to differentiate components of animal cells on electron micrographs and drawings; to define the primary structure of the protein, number of amino acids, molecular weight of polypeptide according to the sequence of nucleotides of the gene encoding it; to predict phenotypes and genotypes for offspring according to genotypes of parents; to define the probability of birth a sick child with monogenic diseases when genotypes of the	To be able to explain to the patient and his family the basic regularities of monogenic traits inheritance; possible causes of mutations and their connection with hereditary diseases; the essence of the methods used in human genetics.	Be responsible for the acquirement of relevant knowledge and skills.

			<p>parents are known;</p> <p>to exclude paternity by determining blood groups of parents and children;</p> <p>to analyze karyotypes of patients with the most common chromosomal disease and determine the diagnosis;</p> <p>to build a family tree and spend its genealogical analysis;</p> <p>to define the role of heredity and environment in terms of characteristics (based on analysis of twins);</p> <p>to calculate the frequencies of genes and genotypes based on the law of Hardy-Weinberg.</p>		
2.	<p>The ability to apply the knowledge of peculiarities of human ontogenesis and its connection with phylogenesis in diagnostic and treatment of human dental diseases.</p>	<p>Ontogenesis and its periods; the main stages of embryonic development; molecular and cellular mechanisms of differentiation; classification of congenital malformations; teratogenic factors; types of regeneration; types of transplantation, causes of tissue incompatibility; placement of <i>Homo sapiens</i> in the system of the animal world,</p>	<p>To recognize atavistic malformation</p>	<p>To explain the importance of genetic and teratogenic factors in the formation of congenital malformations, importance of critical periods of human embryogenesis in formation of teratogenic congenital malformations</p>	<p>Be responsible for the acquirement of relevant knowledge and skills</p>

		the main stages of anthropogenesis; concept of population as the elementary unit of evolution, the human population structure, small populations of people; regularities of phylogenesis of organ systems; ontophylogenetic preconditions of congenital malformations, examples of atavistic malformation of human organs and systems.			
3.	The ability to apply knowledge of biological basis of parasitism, life cycles of the human parasites for diagnostics, prevention and treatment of human parasitic diseases, development of preventive measures	The forms of symbiosis, parasitism as a biological phenomenon; principles of classification of parasites and hosts; transmission of parasitic diseases; obligate-borne and facultative vector-borne diseases; natural focal disease, the structure of the natural foci; basis of parasitic diseases prevention; the most common pathogens of protozoan infection, trematodiasis, cestodiasis, nematodiasis; <i>Arthropoda</i> as the vectors and pathogens of human infections; poisonous representatives of <i>Arthropoda</i>	To define the placement of biological object (causative agents of parasitic diseases) in the system of nature; to prove the relation of human parasitic diseases to the group of transmissible and natural foci; using macro- and microspecimen to diagnose pathogens and pathogens carriers of parasitic diseases which are studied; to prove the methods of laboratory diagnosis of parasitic diseases in humans; to prove prevention methods of	To explain ways of transmission of parasitic diseases; to explain methods of personal prevention of parasitic diseases	Be responsible for the acquirement of relevant knowledge and skills

			parasitic diseases based on their modes of infection		
4.	The ability to estimate the impact of environmental factors on human health, use their professional activities for the environment protection	The subject of ecology; types of environment; environmental factors, the role of man as environmental factor; main directions and results of anthropogenic changes in the environment; the main ideas of academician V.I. Vernadsky theory on the biosphere and the noosphere; adaptive ecotypes of people; functional types of people respond to environmental factors ("sprinter", "stayer", "mixed"); concept of biological rhythms, their medical significance; examples toxic to humans plants and animals.	To form the requirements themselves and others to protect the environment	To explain the impact of environmental factors on human health and the role of man as an environmental factor; to promote conservation and environmental protection	Be responsible for the acquirement of relevant knowledge and skills; be responsible for the measures that preserve the environment within its competence

Learning outcomes:

Integrative learning outcomes of the academic discipline «Medical biology, parasitology and genetics» provide an opportunity to apply the acquired general and professional competencies to solve complex problems of professional activity of doctors and practical problems in health care in the relevant position, the scope of which is defined by certain lists, physiological conditions and diseases that require special tactics of patient treatment; laboratory research, innovation.

«Medical biology, parasitology and genetics» as a studying discipline provides the foundations for a future in the following program learning outcomes in accordance with the standards of higher education in Ukraine predegree training of second (master's) level specialists of speciality «Dentistry»:

IIPH 1. To recognise and identify the main clinical symptoms and syndromes (according to list 1 OIII 221 Dentistry); in accordance with the standard methods, on the base of patient's anamnesis, examination, and basic knowledge of human biology,

organs and systems, to establish a probable nosological or syndromic preliminary clinical diagnosis of a dental disease (according to list 2 ОПП 221 Dentistry).

ППН 2. To collect information about the general condition of the patient, to evaluate the psychomotor and physical development of the patient, the condition of the maxillofacial area, to assess the information about the diagnosis based on the results of laboratory and instrumental studies (according to list 5 ОПП 221 Dentistry).

ППН 3. To prescribe and analyze additional (mandatory and optional) examination methods (laboratory, radiological, functional and/or instrumental) according to list 5, patients with diseases of organs and tissues of the oral cavity and maxillofacial region for differential diagnosis of diseases (according to list 2 ОПП 221 Dentistry).

The learning goals of the course: After studying the discipline «Medical biology, parasitology and genetics» students should **know**:

- levels of living matter organization;
- forms of life and its fundamental properties;
- structural and functional organization of eukaryotic cells;
- molecular basis of heredity;
- cell cycle and types of cell division;
- basic patterns of heredity during mono-, dihybrid crosses and linked inheritance;
- inheritance of human blood groups according to the AB0 system and a Rhesus-factor;
- sex determination in humans and the inheritance of sex linked traits;
- variability, its forms and manifestations;
- methods of human heredity investigation: genealogy, study of twins, dermatoglyphics, cytogenetic, molecular genetic, biochemical and population-statistical;
- classification of hereditary diseases, principles of prenatal diagnosis of hereditary diseases;
- types of reproduction of organisms;
- characteristic of gametogenesis, structure of gametes;
- definition of ontogenesis and its periodization;
- the main stages of embryonic development, molecular and cellular mechanisms of differentiation;
- types of regeneration;
- types of transplantation, reasons of tissue incompatibility;
- types of symbiosis, parasitism as a biological phenomenon;
- the principles of classification of parasites and hosts;
- modes of parasitic diseases transmission; obligate and facultative transmission diseases optional;

- natural-focal diseases; the structure of the natural foci;
- classification of congenital abnormalities; teratogenic factors;
- basics of parasitic diseases prophylaxis;
- causative agents of the most spreaded protozoonosis, trematodosis, cestodosis and nematodosis;
- principles of laboratory diagnosis of helminthoses;
- arthropods - vectors and causative agents of human diseases, the concept of mechanical and specific carriers;
- poisonous representatives of Phylum Arthropoda;
- concept of population as the smallest unit of evolution, population structure of mankind, demos, isolates;
- functional types of people respond to environmental factors ("sprinter", "stayers", "mixed");
- concept of biological rhythms, their medical significance;
- subject of ecology; types of environment, environmental factors;
- adaptive ecotypes of people;
- the role of human as environmental factor. Basic directions and results of anthropogenic environmental changes;
- examples of poisonous to humans animals and plants;
- the doctrine of academician B. I. Vernadsky about biosphere and a noosphere;
- position of *Homo sapiens* species in a system of the animal world, the main stages of anthropogenesis;
- regularities of phylogenesis of organ systems, ontophylogenic basis of the congenital defects in humans, examples of ancestral (atavistic) defects of the development.

be able:

- to examine microslides under the light microscope at low and high magnification;
- to make temporary microslides;
- to differentiate the components of animal cell in electron micrographs and figures;
- to identify (schematically) the primary structure of the protein, quantity of amino acids, molecular weight of polypeptide, according to sequence of nucleotides of the gene, encoding it;
- to predict genotypes and phenotypes of offspring according to parental genotypes;
- to calculate the probability of a sick child with monogenic diseases birth in the family with certain genotypes of parents;
- to exclude paternity due to determination of blood groups for parents and child;

- to calculate the probability of hereditary diseases manifestation in the offsprings depending on penetrance of the gene;
- to analyze the human karyotype and to determine the diagnosis of the most common chromosomal diseases
- to draw a family tree and to conduct genealogical analysis;
- to calculate the role of heredity and conditions of environment in development of traits (based on analysis of twins);
- to calculate the frequencies of genes and genotypes according with Hardy-Wineberg's law;
- to distinguish the concepts of teratogenic and hereditary congenital malformations;
- to determine the place of a biological object (causative agents of parasitic diseases) in the system of nature;
- to substantiate affiliation of human parasitic diseases to the group of transmissible and natural focal;
- to diagnose on macro- and microspecimens causative agents and vectors of parasitic diseases that are studied;
- to substantiate methods of laboratory diagnosis of parasitic diseases of humans;
- to substantiate methods of parasitic diseases prophylaxis, based on their modes of infection.

2. Informational content of the discipline

For the discipline studying is given 5.0 credits ECTS / 150 hours.

Structure of the discipline «Medical biology, parasitology and genetics»:

Chapter I.

Biological features of human vital activities. Molecular-genetic level of life organization. Organism level of life organization. Fundamentals of human genetics.

Chapter II.

Population-species, biogeocenotic and biospheric levels of living matter organization.

3. Structure of the discipline

Topic	Lectures	Practical (seminar) classes	ISW	Personal tasks
Chapter I. "Biological features of human vital activities. Molecular-genetic level of life organization. Organism level of life organization. Fundamentals of human genetics".				

Topic 1. Levels of living matter organization. Non-cellular and cellular forms of life. Structural and functional organization of a cell.	2	7	8	-
Topic 2. Characteristic of nucleic acids. The organization of the information flow in a cell.	2	4.5	4	-
Topic 3. Reproduction – the basic property of living matter. Cell cycle.		4.5	10	-
Topic 4. Peculiarities of human ontogenesis. Infringements of ontogenesis and their place in human pathology.			10	-
Topic 5. Peculiarities of human genetics. Basic patterns of the main types of inheritance. Gene interactions. Linkage inheritance. Genetics of sex. Chromosomal theory of heredity.	4	9	4	-
Topic 6. Variability of organisms, its forms. The basic principles of medical genetics. Methods of human inheritance investigation. Hereditary human diseases.	2	9	4	-
Total for Chapter 1	10	34	40	-
Chapter II. Population-species, biogeocenotic and biospheric levels of living matter organization				
Topic 7. Medical Protozoology. Phylum Sarcomastigophora, Class Lobosea. Class Zoomastigophorea Phylum Ciliophora. Class Rimostomatea. Phylum Apicomplexa. Class Sporozoa – the causative agents of human diseases.	2	7	6	-
Topic 8. Medical Helminthology. Phylum Flat worms (Platyhelminthes). Class Trematoda, Class Cestoidea; Phylum Round worms (Nemathelminthes). Class Nematoda – the causative agents of human diseases.	2	13	6	-
Topic 9. Medical Arachnoentomology, Phylum Arthropoda. Class Arachnoidea. Class Insecta – vectors and causative agents of human diseases.	2	4	8	-
Topic 10. Phylogenesis of Vertebrate organ systems. Onto-phylogenetic reasons for developmental defects.			6	-
Topic 11. Biosphere as a system, supporting existence of human being. Human ecology..			6	-
Topic 12. Synthetic theory of evolution. Population structure of mankind.			4	-
Total for Chapter 2	6	24	36	
Total hours 150/5.0 credits ECTS	16	58	76	
Final control	Exam			

4. Thematic plan of lectures

No	Topic	Hours
1	Introduction to Medical Biology Course. Structural and functional organization of a cell.	2
2	Molecular basis of heredity. Realization of hereditary information. Reproduction at the cellular level. Novel coronavirus SARS-CoV-2: structure, methods of diagnosis and prevention of coronavirus disease.	2
3	Organism level of the genetic information organization. Gene interactions.	2
4	Genetics of sex. Chromosomal theory of heredity. Variation in human as life property and genetic phenomenon.	2
5	The basic principles of human genetics. Methods of the human inheritance investigation. Hereditary human diseases.	2
6	The medical and biological basis of parasitism. Protozoa are human parasites.	
7	Medical Helminthology. Flat and Round worms are human parasites.	2
8	Medical Arachnoentomology. Arthropods as the causative agents and vectors of human infections and invasions.	2
	Total	16

1. Thematic plan of practical classes

No	Topic	Hours
1	Levels of living matter organization. Optical systems in biological investigations. Cell membranes. Transport of substances across the plasmalemma.	2
2	Cell morphology. Structural components of cytoplasm.	
3	Chromosomes morphology. Human karyotype.	2
4	Organization of the information flow in a cell. Regulation of gene expression.	2
5	Gene structures in pro- and eukaryotes. Structural and regulatory genes. The genome structure of the human immunodeficiency virus. Genome organization of coronavirus (SARS-CoV-2).	2
6	Cell cycle. Types of reproduction.	2
7	Biological features of human reproduction. Gametogenesis. Meiosis. Fertilization.	2
8	Practical skills for Part «Cell biology. Reproduction».	2
9	Peculiarities of human genetics. Basic patterns of human Mendelian traits inheritance (mono-, di- and polyhybrid crosses).	2
10	Allelic gene interactions. Multiple alleles. Genetic of blood groups. Pleiotropy.	2
11	Non-allelic gene interactions.	2
12	Linkage inheritance. Genetics of sex.	2
13	Variability of organisms, its forms and manifestation.	2
14	The basic principles of human genetics. Cytogenetic and biochemical analysis of the human being and its value for gene's and chromosomal diseases diagnostics.	2

15	Genealogy of human as the method of human inheritance investigation. Study of twins.	2
16	Population-statistic method. The genetic counseling. Dermatoglyphics as the method of human inheritance investigation.	2
17	Practical skills for the Part "Basic principles of heredity and variation. Methods of the human inheritance investigation".	2
18	Phylum Sarcomastigophora, Class Lobosea. Phylum Ciliophora. Class Rimostomatea – human parasites.	2
19	Representatives of the Class Zoomastigophora – human parasites.	2
20	Phylum Apicomplexa. Representatives of the Class Sporozoea – human parasites.	2
21	Medical Helminthology. Phylum Flat worms (Platyhelminthes). Class Trematoda: liver, lancet, cat and lung flukes.	2
22	Class Trematoda: blood flukes, metagonimus and nanophyetus.	2
23	Class Cestoidea: beef, pork and dwarf tapeworms.	2
24	Class Cestoidea: echinococcus, alveococcus, broad tapeworm.	
25	Phylum Round worms (Nemathelminthes). Class Nematoda: large intestinal roundworm, pinworm (seatworm) and whipworm – the causative agents of human diseases.	2
26	Phylum Round worms (Nemathelminthes). Class Nematoda: threadworm, hookworm and Guinea worm.	2
27	Practical skills for the Parts "Medical Protozoology" and "Medical Helminthology".	
28	Phylum Arthropoda. Class Arachnoidea. Ticks and mites are activators and vectors of human diseases.	2
29	Class Insecta: lice (Anoplura), fleas (Aphaniptera), Diptera are activators and vectors of human diseases.	2
	Total	58

6. Thematic plan of Individual student's work

No	TOPIC	Hours	Type of control
1	Organization for matter and energy flow in a cell.	4	Current control during practical classes
2.	Structure of human immunodeficiency virus and coronavirus SARS-CoV-2 genomes.	4	
3.	Molecular-genetic methods for the diagnosis of coronavirus disease. Prevention measures against coronavirus disease.	4	
4.	The life of cells outside the organism. Cell cloning.	4	
5.	Regeneration and its types: physiological and reparative. Levels of regeneration: intracellular and extracellular. Modes of regeneration. The importance of regeneration for the homeostasis system.	6	
6.	Genetic maps. Methods of the human chromosomes mapping. The modern state of human genome investigation.	4	
7.	Genetic engineering. Biotechnology. Concept about gene therapy.	4	
8.	Peculiarities of prenatal period of human development. The possibility of prenatal transmission of the virus in HIV-infected pregnant women..	5	
9.	Peculiarities of postnatal period of ontogenesis. Ageing as the final stage of human ontogenesis. Theories of ageing.	5	
10.	Methods of laboratory diagnosis of protozoan diseases.	6	

11.	Methods of laboratory diagnosis of helminthiasis.	6	
12.	Midges and its components: characteristic, importance as the intermediate hosts of helminthes and vectors of human diseases. Cockroaches and bedbugs.	4	
13.	Poisonous plants and animals for human.	4	
14.	Phylogenesis of urogenital systems of Vertebrates. Onto-phylogenetic causes of congenital defects.	6	
15.	Synthetic theory of evolution. Peculiarities of the evolutionary factors action in human populations.	4	
16.	Biosphere as a system, supporting the existence of human beings. Human ecology.	6	
	Total	76	

7. Individual tasks. Preparing scientific reports for a scientific students' association meetings and for the Annual Student Scientific Conference.

8. Teaching methods:

- Verbal methods: lecture, conversation;
- Visual methods: illustration, demonstration;
- Practical methods: practical work and solving situational problems to develop skills;
- Individual work of students with material understanding and learning;
- Using an educational computer programs on discipline.

9. Control methods

- Current control is performed based on checking of theoretical knowledge and skills during practical classes. Individual work of students is estimated during current control topics at the proper lesson and is a part of the final grade of student.
- The final control is performed in the form of written exam (II semester).

Criteria for evaluation. The teacher evaluates each student's knowledge at each practice according to four-mark (traditional) system, taking into account the approved evaluation criteria:

Excellent ("5") – the student perfectly mastered the theoretical material of the topic, demonstrates deep and comprehensive knowledge of the topic, the main concepts of scientific sources and recommended literature, thinks logically and answers thoroughly, freely uses the acquired theoretical knowledge in analyzing of practical material, expresses his attitude to certain problems, demonstrates high level of practical skills acquisition.

Good ("4") – the student has well mastered the theoretical material of the lesson, knows the basic aspects of primary sources and recommended literature; possess practical skills, expresses his views on certain issues, but assumes certain inaccuracies and errors in the logic of the presentation of theoretical content or in the implementation of practical skills.

Satisfactory ("3") – the student has mainly mastered the theoretical knowledge of the subject, is guided by primary sources and recommended literature, but answers unconvincingly, confuses concepts, additional questions cause the student uncertainty or lack of stable knowledge; answering questions of a practical nature, reveals inaccuracies in knowledge, is unable to assess facts and phenomena, relate them to future activities, makes mistakes in the implementation of practical skills

Unsatisfactory ("2") – the student has not mastered the study material of the topic, does not know the scientific facts, definitions, almost does not navigate in the original sources and recommended literature, there is no scientific thinking, practical skills are not formed.

Traditional scales are converted into the points.

10. Current control is performed based on a comprehensive assessment of the students activities and acquired competencies (knowledge, practical skills, etc.), which includes control of the input level of knowledge, quality of practical work, level of theoretical training, and the results of the final knowledge control.

Current control is performed during the studying classes and is aimed at checking the mastering by students the learning material.

The forms of current control are:

- a) tests with a choice of one correct answer (multiple choice questions), the definition of the correct sequence of actions, definition of correspondency, the definition of specific areas in a picture or diagram ("recognition");
- b) individual oral examination, interview;
- c) solving of typical situational problems;
- d) identification of causative agents and vectors of parasitic diseases in the photos, macro- and micropreparations;
- e) control of practical skills;
- f) solving of typical problems from genetics and medical genetics.

10.1. Evaluation of student current educational activity is carried out at each practical (laboratory or seminar) class according to four-mark system, taking into account the approved evaluation criteria for the discipline and is represented in the Journal of Academic Performance. All types of work and the list of competencies, provided by the program and methodical recommendations for the topic study, are taken into account.

A student must receive a grade on each topic.

10.2. Individual work of students is estimated during current control on the relevant lesson.

11. A form of final control of learning success (exam)

Exam – a form of final control of mastering of student theoretical and practical material from studying discipline.

The final control is carried out in the form of a written exam according with exam card tasks, which includes:

- a) test tasks (40), composed in accordance with the topics of content modules 1, 2 (40 points – 1 point for each test task);
- b) two situational problems (on genetics, medical genetics and molecular biology) (10 points – 5 points for one problem);
- c) 5 describing questions (30 points – 6 points for each question).

Totally – 80 points.

12. The scheme of calculation and distribution of points that are received by students:

Maximum quantity of points, which student can collect for the current educational activity for admission to the exam (differentiated credit) makes 120 points.

Minimum quantity of points, which student can collect for the current educational activity for admission to the exam (differentiated credit) makes 72 points.

The calculation of the number of points is made on the basis of the collected student's marks on the traditional scale during the discipline study, by calculating the arithmetic mean (AM or average), rounded to two decimal places. The obtained value is converted into points according to the scoring scale as follows:

$$x = \frac{AM \times 120}{5}$$

Maximum quantity of points, which the student can collect on the exam makes 80 points.

Minimum quantity of points on the exam – not less than 50.

Mark of the discipline, which is completed with an exam is defined as the sum of points for current educational activity (at least 72) and points for the exam (at least 50).

The scores from discipline are converted to the ECTS scale and to the 4-point scale independently.

„A”, „B”, „C”, „D”, „E” ranking is made for students studying at one of the specialty and who have successfully completed study course.

Discipline points for students who have successfully completed the program are converted into traditional 4-point scale by absolute criteria, which are listed in the following table:

Points from discipline	Estimation on 4-point scale
From 170 to 200 points	5
From 140 to 169 points	4
From 139 points to minimal quantity of points, which student must collect	3

Less than minimal quantity of points, which student must collect	2
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Objective evaluation of educational activities of students is tested by statistical methods (the correlation coefficient between ECTS score and score in a national scale).

13. Methodological support of the lecture course:

1. Lecture theses from the discipline.
2. Methodical recommendations for lectures.
3. Presentations of lectures.
4. Video content of lectures, placed on the platform for distance learning MISA.

Methodological support of practical classes:

1. Methodical recommendations for practical classes for lecturers.
2. Methodical recommendations for practical classes for students.
3. Variants of test questions and tasks to check the initial level of knowledge on each topic.
4. Variants of situational tasks to check the mastering by students the learning topics.
5. Questions and tasks for final control (exam).
6. Methodical materials, placed on the platform for distance learning MISA.

Logistical support

1. Multimedia projector.

14. Recommended literature

1. Basic:

1. Paryzhak S.Ya., Vorobets Z.D. Medical Biology. Textbook – Lviv: Qvart, 2020. – 426 p.
2. Bazhora Y.I., Bulyk R.Ye., Chesnokova M.M., Shevelenkova A.V., Smetyuk O.O., Lomakina Yu.V. Medical Biology: textbook. – Vinnytsia: Nova Knyha, 2018. – 448 p.: il.
3. Paryzhak S.Ya., Odnorih L.O. Medical biology and parasitology. Manual for the first-year students of the English department, the faculties of medicine and dentistry. – Lviv: Danylo Halytsky Lviv National Medical University, 2021. – 306 p.
4. Step 1. Lecture notes 2018 Biochemistry and Medical genetics. New York. Kaplan, Inc. – 2018 – 403 c.

2. Additional:

1. Bihunyak T.V. Medical biology / T.V. Bihunyak. – Ternopil: TSMU Ukrmedknyha, 2020. – 214 p.

2. Bogitsh B.J., Carter C.E., Oeltmann T.N. Human parasitology. – 5th ed. Textbook. – Academic Press, 2019. – 407 p.
3. Elsheikha H.M., Jarroll E.L. Illustrated Dictionary of Parasitology in the Postgenomic Era. –Caister Academic Press, 2017. – 332 p.
4. Ghosh S., Chander J. Paniker's Textbook of Medical Parasitology. 8th Edition. – Jaypee Brothers Medical Pub, 2018. – 276 p.
5. Kaplan Medical's USMLE STEP 1. Biochemistry and Medical Genetics. Lecture notes. – 2018. – 432 p.
6. Pap E., Falus A., László V., Oberfrank F., Szalai C., Tóth S. Medical Genetics and Genomics. Edited by Typotex Kiadó. – Budapest University of Technology and Economics, 2016. – 206 p.
7. Ryabokon E.V., Onishchenko T.E., Ushenina L.O., Furyk E.A., Mashko O.P. Manual of helminthiasis: for the students of medical faculty. – Zaporozhye: [ZSMU], 2013. – 66 p.

15. Informational resources:

1. Testing center – database of license tests Krok – 1 <http://testcentr.org.ua/>
2. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders <http://omim.org/>
3. NCBI databases <http://www.ncbi.nlm.nih.gov>
4. Encyclopedia of DNA elements <http://genome.ucse.edu/ENCODE/>