



SYLLABUS OF THE ACADEMIC DISCIPLINE

"MEDICAL BIOLOGY, PARASITOLOGY AND GENETICS"

1. General Information	
Faculty	Faculty of Dentistry
Programme	22 Healthcare, 221 Dentistry, 2 nd (master's) degree of Higher Education, full-time
Academic year	2023-2024
Subject	Medical Biology, Parasitology, Genetics code OK 5 e-mail: kaf_medicalbiology@meduniv.lviv.ua
Department	Department of Medical Biology, Parasitology and Genetics Address: 69 Pekarska str. (Shimzeriv, 3a), Lviv, 79010 Telephone: +380(32)275-49-66 e-mail: kaf_medicalbiology@meduniv.lviv.ua e-mail: kaf_med_biol@ukr.net
Head of the Department	Vorobets Zinovij Dmytrovych, Doctor of Biological Sciences, Professor e-mail: kaf_medicalbiology@meduniv.lviv.ua
Year	1 st year
Semester	I, II
Type of the Subject	obligatory
Professors	Solomiya Paryzhak – Ph.D., Associate Professor sola.paryzhak@gmail.com Olena Onufrovych – Ph.D., Associate Professor onufrovychok@gmail.com Liliya Odnorih – Ph.D., Associate Professor liliyaodnorih@gmail.com
Erasmus	No
Responsible for Syllabus	Liliya Odnorih – Ph.D., Associate Professor liliyaodnorih@gmail.com Oksana Pershyn – Ph.D., Associate Professor oksana.pershyn@gmail.com
Credits ECTS	5
Hours	Total – 150 h; Lectures – 16 h; Practical classes – 58 h; Individual work – 76 h
Language of instruction	English
Consultations	According to the schedule
2. Course overview	
<p>The programme of discipline "Medical biology, parasitology and genetics" is structured as follows:</p> <p>Chapter 1. "Biological features of human vital functions. Molecular-genetic level of life organization. Organismic level of life organization. Basics of human genetics".</p> <p>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,</p>	

reproduction and basics of human genetics. The material is organized in the manner, so that obtained knowledges are closely related to the further study of hereditary diseases in theoretical and clinical departments and could be used by a physician in his practice.

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

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 phenomenons) 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 the 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.

Auditory classes – 49.3 %, extracurricular – 50.6%

3. The purpose and objectives of the course

The overall aim of "Medical Biology, Parasitology and Genetics" teaching process is determined by the goals of programme, 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" discipline is basic for a range of subjects providing both natural-science and professional-practical preparation.

The ultimate goals of the course "Medical Biology, Parasitology and Genetics" are:

1. To determine the biological nature and mechanisms of diseases development 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 phenotypic manifestation.
5. To make a preliminary conclusion about the presence of parasitic invasions in human organism and define measures of disease prevention.

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

Integral competency allows to apply acquired general and professional skills to solve complex problems of professional activity of a physician and practical problems in the field of health care in the relevant position, the scope of which is defined by defined lists of syndromes and symptoms of diseases, physiological conditions and and diseases that require special tactics of patient management; laboratory research, implementation of research, implementation of innovations.

-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.

- *special (professional ΦK):*

ΦK 2. The ability to interpret the results of laboratory and instrumental research.

ΦK 13. The ability to evaluate the impact of the environmental, socio-economic and biological determinants on the individual, family and population health.

4. Prerequisites of the Course

"Medical Biology, Parasitology and Genetics" as an academic discipline:

- based on the knowledge of students obtained on the basis of the State standard of basic and complete general secondary education in such subjects as "General Biology", "Human Biology", "Biology of Animals", "Biology of Plants";
- ensure a high level of general biological training;
- 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 with Epidemiology, Internal Medicine, Surgery, Pediatrics, etc.).

5. Programme learning outcomes of the Course

List of learning outcomes

Code of the learning outcomes	The content of the learning outcomes	Matrix of competencies
3H – knowledge УМ – skills AB – independence and responsibility K – competencies		ИПН – program learning outcomes
3H-1	Levels of the living matter organization, forms of life and its fundamental properties	ИПН 7, 15, 17, 18
3H-2	Structural and functional organization, life cycle of eukaryotic cell; the forms of organisms reproduction	
3H-3	Molecular basis of heredity, basic regularities of heredity and variation	

<i>3H-4</i>	Methods of human heredity investigation, classification of hereditary diseases	
<i>3H-5</i>	Ontogenesis and its periods; the main stages of embryonic development	
<i>3H-6</i>	Molecular and cellular mechanisms of differentiation; classification of congenital malformations; teratogenic factors	
<i>3H-7</i>	Types of regeneration, types of transplantation and causes of tissue incompatibility	
<i>3H-8</i>	Concept of population as the elementary unit of evolution, the human population structure	
<i>3H-9</i>	Regularities of phylogenesis of organ systems; ontophylogenetic preconditions of congenital malformations, examples of atavistic malformations of human organs and systems	
<i>3H-10</i>	The forms of symbiosis, parasitism as a biological phenomenon; principles of classification of parasites and hosts; transmission of parasitic diseases; basics of parasitic diseases prevention	
<i>3H-11</i>	The most common agents of protozoan infections, trematodoses, cestoidoses, nematodoses	
<i>3H-12</i>	Arthropoda as the vectors and pathogens of human infections; poisonous representatives of Arthropoda	
<i>3H-13</i>	The subject of ecology; types of environment; environmental factors, the role of man as environmental factor	
<i>3H-14</i>	Main directions and results of anthropogenic changes in the environment	
<i>3H-15</i>	The main principles of academician Vladimir Vernadsky theory on the biosphere and the noosphere	
<i>3H-16</i>	Adaptive ecotypes of people; functional types of people according to their respond to environmental factors ("sprinter", "stayer", "mixt"); concept of biological rhythms, their medical significance	
<i>3H-17</i>	Examples of toxic to humans plants and animals	
<i>YM-1</i>	To examine microscopic specimens at different magnification; to prepare temporary specimens	
<i>YM-2</i>	To differentiate components of animal cells on electron micrographs and figures	
<i>YM-3</i>	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	
<i>YM-4</i>	To predict phenotypes and genotypes for	

	offsprings according to genotypes of parents
<i>Y_{M-5}</i>	To define the probability of birth of a sick child with monogenic diseases when genotypes of the parents are known
<i>Y_{M-6}</i>	To exclude paternity by determining blood groups of parents and children
<i>Y_{M-7}</i>	To analyze karyotypes of patients with the most common chromosomal diseases and determine the diagnosis
<i>Y_{M-8}</i>	To build a pedigree and conduct its genealogical analysis
<i>Y_{M-9}</i>	To calculate the frequencies of genes and genotypes based on the Hardy-Weinberg law
<i>Y_{M-10}</i>	To recognize atavistic malformation in dental diseases
<i>Y_{M-11}</i>	To define the placement of causative agents of parasitic diseases in the system of nature
<i>Y_{M-12}</i>	To substantiate the relation of human parasitic diseases to the group of transmissible and natural foci
<i>Y_{M-13}</i>	Using macro- and microspecimens to distinguish pathogens and pathogens carriers of parasitic diseases which are studied
<i>Y_{M-14}</i>	To substantiate the methods of laboratory diagnosis of parasitic diseases in humans
<i>Y_{M-15}</i>	To substantiate prevention methods of parasitic diseases based on their modes of infection
<i>Y_{M-16}</i>	To form the requirements to themselves and others to protect the environment
<i>AB-1</i>	Be responsible for the acquirement of relevant knowledge and skills
<i>AB-2</i>	Be responsible for the measures that preserve the environment within its own competence
<i>K-1</i>	The ability to use in dentist's practice knowledge of molecular and cytological basis of heredity, mechanisms of development of hereditary and acquired human diseases
<i>K-2</i>	The ability to apply the knowledge of peculiarities of human ontogenesis and its connection with phylogenesis in diagnostic and treatment of human dental diseases
<i>K-3</i>	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 in dentist's practice
<i>K-4</i>	The ability to estimate the impact of environmental factors on human health, use of the own professional activities for the environment protection

Programme learning outcomes				
IPPH 7	To analyze the epidemiological situation and provide mass and individual, general and local drug and non-drug prevention measures for dental diseases.			
IPPH 15	To evaluate the environmental impact on human health in order to assess the morbidity of the population.			
IPPH 17	To adhere a healthy lifestyle, to apply self-regulation and self-control techniques.			
IPPH 18	To be aware of and be guided in one's activities by civil rights, freedoms and duties, to raise the general educational cultural level.			
6. Course format and timetable				
Course format		Full-time Course		
Classes		Hours		Groups
lectures		16		-
practical		58		-
seminars		-		-
individual		76		
7. Topics and content of the Course				
Code of the classes type	Topic	Content	Code of the learning outcome	Professor
Л – lecture П – practical class CPC – individual student's work				
Л-1	Introduction to Medical Biology Course. Structural and functional organization of a cell	To acquaint students with the essence of the evolutionary process at all levels of life organization; consider the chemical composition, molecular organization and functions of biological membranes; structure and structural-functional relation of organelles of prokaryotic and eukaryotic cells. To draw students' attention to the structural and functional features of the cell as an elementary unit of the	ЗН-1, ЗН-2	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih

		structure of living organisms. To point on the differences in the structure of prokaryotic and eukaryotic cells		
Л-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.	To consider the structure and functions of nucleic acids as the units of the genetic code that ensures the organization of the flow of biological information in the cell; molecular mechanisms of realization of genetic information; structure and functioning of the E. coli Lac-operon and exon-intron organization of the eukaryotic genome. To draw students' attention to the realization of genetic information, which is carried out by transmitting information encoded in DNA to molecules of messenger RNA (transcription) and subsequent decoding of this information in the synthesis of proteins (translation). To acquaint students with the structure, methods of diagnostics and prophylaxis of novel coronavirus (SARS-CoV-2). To describe the process of reproduction as a universal property of living organisms, which provides morpho-genetic continuity in several generations, conservation and evolution of species. To acquaint students with the evolution of forms of asexual and sexual reproduction, to	ЗН-1, ЗН-2, ЗН-3	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		characterize mitosis, meiosis, to find out cell ploidy.		
Л-3	Organismic level of the genetic information organization. Gene interactions	To acquaint students with the basic notions of genetics; the method of hybridological analysis; consider the forms of interaction of allelic and non-allelic genes, the phenomenon of multiple allelism and pleiotropy. To draw students' attention to the interaction of genes as a basis for the development of human morphological, physiological, biochemical, immunological, as well as pathological signs and symptoms of diseases	ЗН-4, УМ-4, УМ-5, УМ-6	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
Л-4	Chromosomal theory of heredity. Genetics of sex. Variation in human as life property and genetic phenomenon	To consider the mechanisms of genetic sex determination in animals and humans; patterns of inheritance of sex-linked traits; problems related to sex inheritance; to acquaint students with the forms of variability, their characteristics; reaction rate; types of chromosomal aberrations; classification of mutations and mutagenic environmental factors. Explain the importance of mutations and mutagens of different nature in the occurrence of molecular and chromosomal human diseases. To draw students' attention to the connection of the phenomenon of	ЗН-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		<p>heredity with cellular structures – chromosomes.</p> <p>Emphasize the importance of variability in the formation of morphological, physiological and biochemical characteristics of the organism, the development of hereditary human diseases and the birth of offsprings with burdened heredity</p>		
Л-5	<p>The basic principles of human genetics. Methods of the human inheritance investigation. Human hereditary diseases</p>	<p>To acquaint students with methods of human heredity studying; find out the essence, possibilities and advantages of each of the methods. To consider the classification of hereditary human diseases, mechanisms of occurrence and principles of diagnosis of molecular and chromosomal diseases. Emphasize the features of man as a specific object of genetic analysis, the need to use knowledge of human genetics in the practice of the doctor in order to identify hereditary diseases. To find out the role of genetic burden in the development of hereditary human diseases, the importance of medical and genetic counseling in preventing the birth of children with hereditary pathology, the achievements and prospects of gene therapy</p>	ЗН-4, УМ-7, УМ-8, УМ-9	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

Л-6	The medical and biological basis of parasitism. Protozoa are human parasites	To acquaint students with the basics of parasitism, to uncover the main forms of biotic relationships in the interaction of the parasite and the host. Provide key representatives of the Protozoa which lead a parasitic lifestyle. Describe their peculiarities of structure, epidemiological significance, cycles of development and prevention of the diseases they cause. Emphasize the importance of Medical Parasitology at the current stage in the context of increasing migration of people. Indicate the value of parasitologists	ЗН-10, ЗН-11, УМ-11	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
Л-7	Medical Helminthology. Flat- and roundworms are human parasites	To acquaint students with the morphology features and characteristics of flat- and roundworms that have a pathogenic effect on the human body. To consider the life cycles of helminths and to understand the concepts of geohelminths and biohelminths	ЗН-10, ЗН-11	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
Л-8	Medical Arachnoentomology. Arthropods as the carriers of human infections and invasions	To acquaint students with the main representatives of the Phylum Arthropoda, the characteristic morphoanatomical features of the organization as well as their medical significance. On the examples of the the Phylum Arthropoda representatives explore the main features of the	ЗН-10, ЗН-12	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		structure, life cycles, habitats distribution of arthropods, which cause invasions and carry pathogens of serious infectious diseases		
II-1	Levels of living matter organization. Optical systems in biological investigations. Cell membranes. Transport across the plasmalemma	Levels of living matter organization. Cell as an elementary unit or living organisms. Structure of the light microscope, rules for using. The techniques or making temporary preparations. Peculiarities of the plant cell structure. Functions of cell membranes. The main intracellular compartments. Chemical components of biological membranes and their functions. Molecular organization of biomembranes based on fluid-mosaic model of Singer and Nicolson. Types of transport of substances across plasma membrane	3H-1, 3H-2, YM-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih, Assis.Prof. Kovalska S.P.
II-2	Cell morphology. Structural components of cytoplasm	Structural components of eukaryotic cell: plasma membrane, cytoplasm and nucleus. Structure and functions of eukaryotic cell organelles. Cytoplasm. Cyclosis. Differences between prokaryotic and eukaryotic cells	3H-1 3H-2, YM-1 YM - 2	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih,
II-3	Chromosomes morphology. Human karyotype	Structural components of the nucleus. Heterochromatin and euchromatin. Barr body, its functional purpose. Morphological characteristics of	3H-1 3H-2, YM-1 YM - 2	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych,

		<p>chromosomes. Definition of karyotype and ideogram. Denver classification of human chromosomes. The concept of karyotype and idiogram. Barr body, its functional purpose.</p>		<p>Assoc. Professor Liliya Odnorih,</p>
II-4	<p>Organization of the information flow in cell. Regulation of gene expression</p>	<p>Nucleic acids, their structure and functions. Genetic code, its properties. Mechanisms of biological information flow in the cell</p>	<p>ЗН-3, УМ-3</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih</p>
II-5	<p>The gene structure in pro- and eukaryotes. Structural, regulatory, tRNA, and rRNA genes. The genome structure of the human immunodeficiency virus. Genome organization of coronavirus (SARS-CoV-2)</p>	<p>Mechanisms of regulation of gene expression in non-cellular and cellular living organisms. Mechanisms of transcription regulation in pro- and eukaryotes.</p>	<p>ЗН-3, УМ-3</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih</p>
II-6	<p>Cell cycle. Forms of reproduction.</p>	<p>Classification of forms and types of organisms' reproduction. Types of asexual reproduction in uni- and multicellular organisms. Sexual reproduction, its forms. Peculiarities of cell cycle. Interphase, its periods. Mitosis: phases, their characteristic. Mitosis infrigements and their consequences.</p>	<p>ЗН-2 УМ-1 УМ-2</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih</p>
II-7	<p>Biological features of human reproduction.</p>	<p>Meiosis, cytogenetic characteristic. Gametogenesis – the</p>	<p>ЗН-2 УМ-1 УМ-2</p>	<p>Assoc. Professor Solomiya</p>

	Gametogenesis. Meiosis. Fertilization	process of gametes (sex cells) formation. Peculiarities of human spermatogenesis and oogenesis. Structure of human germ cells. Fertilization.		Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-8	Practical skills for Part "Cell biology. Reproduction"	Levels of living matter organization and their importance for medicine. Cell theory. Peculiarities of the prokaryotic cell structure. Plant cell: structure and functions of structural components and organells Animal cell: main structural components. Cell membranes: chemical composition, functions. Types of substances transport across a plasma membrane. Structure and functions of nucleus. Hereditary apparatus of the cell. Human karyotype and ideogram, importance for medicine. Barr body its formation and significance. Nucleic acids: structure and functions. Gene structure. Structural, regulatory, tRNA and rRNA synthesis genes. Mechanisms of DNA replication. Genetic code, its properties. The main stages of protein biosynthesis in the cell. Peculiarities of gene regulation prokaryotes.	3H-1, 3H-2, 3H-3 YM-1 YM-2 AB-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		<p>Peculiarities of gene work regulation in prokaryotes. Realization of genetic information in eukaryotes. Cell cycle, its periodization. Interphase, its periods. Mitosis: phases. Differences between mitosis and meiosis. Meiosis, cytogenetic characteristic. Types of asexual reproduction. Types of sexual reproduction Oogenesis. Cytogenetic characteristic and biological importance of spermatogenesis. Characteristic of gametes (sex cells). Peculiarities of human reproduction.</p>		
II-9	<p>Peculiarities of human genetics. Basic patterns of human mendelian traits inheritance (mono-, di- and polyhybrid crosses)</p>	<p>Subject and tasks of medical genetics. Main terms of genetics: gene, genotype, phenotype, allelic genes, dominant character, recessive character, heterozygotes, homozygotes. Mendelian laws. Patterns of inheritance. Mendelian traits in humans and their inheritance. Patterns of inheritance in di- and polyhybrid crossing. Lethal genotypes, their influence on inheritance pattern. Penetrance and expressivity of gene. Pleiotropy: types, mechanisms of development,</p>	<p>3H-3 YM-4 YM-5 K-1</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

		examples.		
II-10	Allelic genes interactions. Multiple alleles. Genetics of blood groups. Pleiotropy	Forms of interaction between allelic genes. Dominance, incomplete dominance, over dominance. Essence of processes, mechanisms of genes action. Multiple allelism: essence of the process, reasons for origin. Inheritance of human ABO-blood groups. Inheritance of Rhesus blood types in human. Pleiotropy: types, mechanisms of development, examples	3H-3 Y _M -4 Y _M -5 Y _M -6 K-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-11	Non-allelic genes interactions	Forms of interaction between non-allelic genes. Complementary interaction of non-allelic genes. The genetic scheme. Examples. Dominant epistasis. The genetic scheme. Inheritance of enzymopathies in human. Recessive epistasis. The genetic scheme. Bombay phenomenon. Polymeric genes interaction. The genetic scheme. Examples. Polymeric traits (diseases) or human. Genetic scheme. Examples. Multifactorial diseases. Concept about immunogenetics.	3H-3 Y _M -4 Y _M -5 K-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-12	Linked inheritance. Genetics of sex	Genetic mechanism of sex determination in human and animals. Concept about homo-, heterogametic sex and hemizyosity. Inheritance of sex-	3H-3 Y _M -4 Y _M -5 K-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena

		<p>linked traits. X-linked traits. Genetic scheme. Y-linked traits. Genetic scheme. Holandric traits. Problems of sex determination</p>		<p>Onufrovych, Assoc. Professor Liliya Odnorih</p>
II-13	Variation of organisms, its forms and manifestation	<p>Variability, its forms. Modification variation: norm of reaction, variation series, variation curve. Combinatorial variation as a result of different combinations of parental genes. Mutational variation: gene and genomic mutations, chromosomal aberrations. Types of chromosomal aberrations: deletion; duplication; inversion; translocation. Classification of mutations: somatic and generative; spontaneous and induced. Mutagens of environment and their classification. Antimutagenes and comutagenes. Natural and induced mutagenesis.</p>	<p>3H-6 Y_M-7 Y_M-10 K-1 K-4</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
II-14	The basic principles of human genetics. Cytogenetic and biochemical analysis of the human being and its value for gene and chromosomal diseases diagnostics.	<p>Human organism as a specific object of the genetic studies: disadvantages and advantages. Cytogenetic method of human inheritance investigation, its scopes. Karyotyping, its application in clinical practice. Method of X- and Y-sex chromatin detection, application for sex determination.</p>	<p>3H-4 3H-6, Y_M-7 Y_M-10 K-1</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

		<p>Gene and chromosomal diseases of human being.</p> <p>Mosaicism.</p> <p>Biochemical method of human inheritance investigation.</p> <p>The principles of molecular diseases laboratory diagnostics.</p> <p>General principles of hereditary enzymopathies treatment.</p> <p>Methods of the hereditary diseases prenatal diagnostics and the importance of medico-genetic counseling</p>		
II-15	<p>Genealogy of human as the method of human inheritance investigation. Study of twins.</p>	<p>The essence of genealogy method (pedigree analysis), its possibilities.</p> <p>Genetic symbols for pedigree construction.</p> <p>Stages of pedigree analysis. Genetic analysis of family pedigree. The basic types of character inheritance: autosomal dominant, autosomal recessive, sex-linked.</p> <p>The twin method, its value for medicine.</p> <p>Concordant and discordant characters of twins.</p> <p>Determination of the heredity coefficient (H) by Holtzinger's formula and calculation of environmental influence (C).</p>	3H-4, УМ-8 K1	<p>Assoc. Professor Solomiya Paryzhak,</p> <p>Assoc. Professor Olena Onufrovych,</p> <p>Assoc. Professor Liliya Odnorih</p>
II-16	<p>Population-statistic method. The genetic counseling.</p> <p>Dermatoglyphics as the method of human inheritance investigation.</p>	<p>Dermatoglyphics as a method of human inheritance investigation, the possibility of use in medicine.</p> <p>Sections of</p>	3H-8, УМ-9 K-1	<p>Assoc. Professor Solomiya Paryzhak,</p> <p>Assoc. Professor Olena</p>

		<p>dermatoglyphics: dactyloscopy, palmoscopy, plantoscopy.</p> <p>Population statistics method of human inheritance investigation, use for study of the genetic structure of the population, the frequency distribution of genes and genotypes in the population.</p> <p>Hardy-Weinberg law, its value for medicine</p>		<p>Onufrovych, Assoc. Professor Liliya Odnorih</p>
II-17	<p>Practical skills for the Part "Basic principles of heredity and variation. Methods of the human inheritance investigation"</p>	<p>Subject and tasks of medical genetics. Main terms of genetics: gene, genotype, phenotype, allelic genes, dominant character, recessive character, heterozygotes, homozygotes. Mendelian laws. Penetrance and expressivity of the gene. Mendelian traits in humans and their inheritance. Lethal genotypes, their influence on inheritance pattern. Pleiotropy: types, mechanisms of development, examples. Forms of allelic genes interactions. Complete dominance, incomplete dominance. Essence of the processes, mechanism of gene action. Multiple allelism: essence of the process, reasons for origin. Inheritance of human ABO-blood groups. Phenomenon of codominance.</p>	<p>3H-3, 3H-4, YM-4, YM-5, YM-6, YM-7, YM-8, YM-9, YM-10 K-1 K-4 AB-1</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

		<p>Inheritance of rhesus factor system.</p> <p>Forms of nonallelic genes interactions.</p> <p>Complementary interaction of non-allelic genes.</p> <p>Dominant epistasis.</p> <p>Inheritance of enzymopathies in human. Recessive epistasis. Bombay phenomenon.</p> <p>Polymeric genes interaction. Concept about homo-, heterogametic sex and hemizyosity.</p> <p>Inheritance of sex-linked traits. X-linked traits. Genetic scheme. Y-linked traits. Genetic scheme.</p> <p>Holandric traits.</p> <p>Linkage inheritance of genes: complete and incomplete linkage of genes. Crossing-over and its biological essence. Chromosome theory of heredity. The main postulates of Chromosomal theory of heredity. Genetic maps of chromosomes.</p> <p>Chromosome mapping.</p> <p>Variability, its forms.</p> <p>Modification variation: norm of reaction, variation series, variation curve.</p> <p>Combinatorial variation, its role in evolutionary process.</p> <p>Mutational variation: gene and genomic mutations, chromosomal aberrations.</p> <p>Types of chromosomal aberrations: deletion; duplication; inversion;</p>		
--	--	---	--	--

		<p>translocation.</p> <p>Classification of mutations: somatic and generative; spontaneous and induced.</p> <p>Mutagens of environment and their classification.</p> <p>Antimutagenes and comutagenes. Natural and induced mutagenesis. The role of mutations in the occurrence of human diseases.</p> <p>Cytogenetic method of human inheritance investigation, its scopes.</p> <p>Karyotyping, its application in clinical practice. Method of X- and Y- sex chromatin detection, application for sex determination.</p> <p>Genocopies and phenocopies in human pathology.</p> <p>The principles of molecular diseases laboratory diagnostics.</p> <p>General principles of hereditary enzymopathies treatment. Methods of the hereditary diseases prenatal diagnostics and the importance of medico-genetic counseling.</p>		
II-18	<p>Phylum Sarcomastigophora, Class Lobosea.</p> <p>Phylum Ciliophora. Class Rimostomatea – human parasites.</p>	<p>General characteristic of Subregnum Protozoa.</p> <p>Characteristic of Class Lobosea. The forms of existence of pathogenic and non-pathogenic representatives of the Class. Morphological differences between dysentery and intestinal amoeba. Life</p>	<p>3H-10, 3H-11, YM-11, YM-12, YM-13, YM-14, YM-15, YM-16, K-3 K-4</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

		<p>cycle of dysenteric amoeba. The geographical distribution of infection, pathogenic action, diagnosis and prevention of amebiasis.</p> <p>Characteristics of mouth amoeba.</p> <p>Characteristics of Class Rimostomatea.</p> <p>Morphological features, life cycle, pathogenic significance of intestinal balantidium.</p>		
II-19	<p>Representatives of the Class <i>Zoomastigophorea</i> – human parasites</p>	<p>Characteristics of Class Zoomastigophora and its evolutionary significance. Morpho-anatomical peculiarities of <i>Giardia lamblia</i> and its life cycle. Morpho-anatomical differences between intestinal and urogenital trichomonads, their pathogenic effect on the human organism. Morphological features of <i>Leishmania</i>, their life cycles and pathogenic effect on the human organism.</p> <p>Geographical distribution, pathogenic action, diagnosis and prophylaxis of leishmaniasis. The concept of obligate-transmissible and natural-foci diseases.</p>	<p>3H-10, 3H-11, YM-11, YM-12</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
II-20	<p>Phylum <i>Apicomplexa</i>. Representatives of the Class <i>Sporozoea</i> – human parasites</p>	<p>Life cycle of malaria parasites.</p> <p>Peculiarities of the structure of <i>Toxoplasma</i>.</p> <p>Life cycle of <i>Toxoplasma gondii</i></p>	<p>3H-10, 3H-11, YM-11, YM-12 YM-13 YM-14 YM-15</p>	

			YM-16 K-3 K-4	
II-21	Medical Helminthology. Phylum Flat worms (<i>Platyhelminthes</i>). Class <i>Trematoda</i> : liver, lancet, cat, and lung flukes.	General characteristics of Phylum <i>Platyhelminthes</i> . General characteristics of Class <i>Trematoda</i> . Morpho-anatomical peculiarities of liver, lancet, cat's, and lung flukes. Geographical distribution, pathogenic action, diagnosis and prevention of fascioliasis, dicrocoeliasis, opisthorchiasis, and paragonimiasis	3H-10, 3H-11, YM-11, YM-12 YM-13 YM-14 YM-15 YM-16 K-3 K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-22	Class <i>Trematoda</i> : blood flukes, metagonimus and nanophyetus.	General characteristics of Phylum <i>Plathelminthes</i> . General characteristics of Class <i>Trematoda</i> . Morpho-anatomical differences between blood flukes, Metagonimus and Nanophyetus. Geographical distribution, pathogenic significance, diagnosis and prevention of schistosomiasis, metagonimiasis, and nanophyetiasis.	3H-10, 3H-11, YM-11, YM-12 YM-13 YM-14 YM-15 YM-16 K-3 K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-23	Class <i>Cestoidea</i> : beef, pork and dwarf tapeworms	General characteristics of Class <i>Cestoidea</i> representatives. Adaptations to parasitism. Morpho-anatomical peculiarities of the structure and life cycles of <i>Taenia solium</i> , <i>Taeniarhynchus saginatus</i> and <i>Hymenolepis nana</i> . Geographical distribution, pathogenicity and prophylaxis of	3H-10, 3H-11, YM-11, YM-12 YM-13 YM-14 YM-15 YM-16 K-3 K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		taeniasis, taeniarhinchiasis, cysticercosis and hymenolepiasis. Medical importance of cestodes.		
II-24	Class <i>Cestoidea</i> : echinococcus, alveococcus, broad tapeworm	Peculiarities of the structure of Cestoidea, their adaptations to parasitism. Morpho-anatomical peculiarities of <i>Echinococcus granulosus</i> , <i>Alveococcus multilocularis</i> , <i>Diphyllobothrium latum</i> and their life cycles. Geographical distribution, pathogenic action, diagnosis and prophylaxis of echinococcosis, alveococcosis and diphyllobothriasis. Life cycles of these helminthes. Medical importance of <i>E. granulosus</i> , <i>A. multilocularis</i> and <i>D. latum</i> .	3H-10, 3H-11, YM-11, YM-12, YM-13, YM-14, YM-15, YM-16, K-3, K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-25	Phylum Round worms (<i>Nemathelminthes</i>). Class <i>Nematoda</i> : large intestinal roundworm, pinworm (seatworm) and whipworm – activators of human diseases	General characteristics of Phylum Nemathelminthes. Morpho-anatomical peculiarities of <i>Ascaris lumbricoides</i> , <i>Enterobius vermicularis</i> and <i>Trichocephalus trichiurus</i> . Life cycles of these helminthes. Geographical distribution, pathogenic action and prophylaxis of ascariasis, enterobiasis and trichocephaliasis.	3H-10, 3H-11, YM-11, YM-12, YM-13, YM-14, YM-15, YM-16, K-3, K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
II-26	Phylum Round worms (<i>Nemathelminthes</i>). Class <i>Nematoda</i> :	General characteristics of Phylum Nemathelminthes. Morpho-anatomical	3H-10, 3H-11, YM-11, YM-12	Assoc. Professor Solomiya Paryzhak,

	threadworm, hookworm and Guinea worm.	<p>peculiarities of <i>Ancylostoma duodenale</i>, <i>Strongyloides stercoralis</i> and <i>Trichinella spiralis</i>. Life cycles of these helminthes.</p> <p>Geographical distribution and pathogenic action of <i>A. duodenale</i>, <i>S. Stercoralis</i> and <i>T. spiralis</i>. Diagnosis and prophylaxis of nematodosises, caused by <i>A. duodenale</i>, <i>S. stercoralis</i> and <i>T. spiralis</i>.</p> <p>Geographical distribution of ancylostomiasis, strongyloidiasis, trichinellosis. Measures to prevent nematodosis.</p>	<p>Y_M-13 Y_M-14 Y_M-15 Y_M-16 K-3 K-4</p>	<p>Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
II-27	Practical skills for the Parts "Medical Protozoology" and "Medical Helminthology"	<p>Modes of human infection with protozoan diseases. Life cycle of dysenteric amoeba. The geographical distribution of infection, pathogenic action, diagnosis and prevention of amebiasis.</p> <p>Characteristics of mouth amoeba. Morphological features, life cycle, pathogenic influence of intestinal balantidium. Morpho-anatomical peculiarities of <i>Giardia lamblia</i> and its patogenesis. Morpho-anatomical peculiarities of urogenital trichomonad, its pathogenic effect on</p>	<p>3H-10, 3H-11, Y_M-11, Y_M-12 Y_M-13 Y_M-14 Y_M-15 Y_M-16 K-3 K-4 AB-2</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>

		<p>the human organism. Morpho-anatomical peculiarities of intestinal trichomonad, its pathogenic effect on the human organism. Asexual and sexual malaria parasite reproduction. The doctrine of academician E.N. Pavlovsky about natural focality of parasitic diseases. Peculiarities of the Toxoplasma structure. Life cycle of Toxoplasma. Methods of laboratory diagnosis of protozoan diseases.</p> <p>Morpho-anatomical peculiarities of sheep liver and lancet liver flukes. Geographical distribution, pathogenesis and prophylaxis of fasciolosis and dicrocoeliosis.</p> <p>Morpho-anatomical peculiarities of cat's, blood and lung flukes. Geographical distribution, pathogenesis and prophylaxis of opistorchosis, urogenital shistosomiasis and paragonimosis.</p> <p>General characteristics of cestodes. Adaptations to parasitism. Morpho-anatomical differences between pork and beef tapeworms.</p> <p>Cysticercosis: causative agent, diagnosis and prophylaxis.</p> <p>Pathogenesis of armed</p>		
--	--	---	--	--

		<p>and unarmed tapeworms, diagnosis and prophylaxis. Morpho-anatomical peculiarities and life cycle of dwarf tapeworm. Pathogenesis of dwarf tapeworm, diagnosis and prophylaxis of hymenolepidosis. Phynn structure peculiarities in cestodes. Laboratory diagnosis and prophylaxis of echinococcosis. Peculiarities of A. lumbricoides structure according with its parasitic lifestyle. Life cycle of A. lumbricoides. Structural peculiarities and life cycle of pinworm. Structural peculiarities and life cycle of whipworm. Modes of infection with ascariasis, enterobiasis, trichocephalosis and trichinosis. Methods of laboratory diagnosis of nematodoses. Differencies in life cycles between bio-and geohelminths.</p>		
II-28	<p>Phylum Arthropoda. Class Arachnoidea. Ticks and mites are activators and vectors of human diseases.</p>	<p>General characteristics of Arthropoda. Class Arachnoidea. Main features of organization. Structural peculiarities of ticks and mites. Morphology, life cycle, epidemiological importance of dog's tick and taiga tick. Epidemiological importance of steppe tick. Morphology, life cycle, epidemiological importance of</p>	<p>3H-12, Y_M-11, Y_M-12, Y_M-13, Y_M-14, Y_M-15, Y_M-16, K-3, K-4</p>	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyeh, Assoc. Professor Liliya Odnorih</p>

		settlement tick. Morphology, life cycle, epidemiological importance of itch mite. Morphology, life cycle, epidemiological importance of <i>Demodex folliculorum</i> . Methods of laboratory diagnosis of scabies and demodecosis. Ways of getting rid with ticks and mites, measures of prophylaxis.		
П-29	Class Insecta: lice (Anoplura), fleas (Aphaniptera), Diptera are activators and vectors of human diseases	General characteristics of Class <i>Insecta</i> . Morphology, biology and development of lice and fleas. Epidemiological importance of fleas. Epidemiological importance of lice, modes of infection transmission Morphology, biology and reproduction of different species of flies. Peculiarities of structure, biology and development of mosquitoes and their epidemiological importance. Differences of <i>Anopheles maculipennis</i> and <i>Culex pipiens</i> developmental stages. Gonotrophic cycle. Ways to combat blood-sucking insects. Midges and its components.	ЗН-12, УМ-11, УМ-12 УМ-13 УМ-14 УМ-15 УМ-16 К-3 К-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-1	Organization of matter and energy flows in the cell	Principles of synthetic processes in cells and organisms, cell organelles involved in the flow of matter and energy in the cell, the role of chemosynthetic bacteria in the	ЗН-1 ЗН-2	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych,

		<p>biosphere and the cycle of substances, peculiarities of chemosynthesis and photosynthesis; processes of glycolysis, aerobic and anaerobic respiration in pro- and eukaryotic cells, assimilation and dissimilation in cells</p>		<p>Assoc. Professor Liliya Odnorih</p>
CPC-2	<p>Structure of human immunodeficiency virus and coronavirus SARS-CoV-2 genomes.</p>	<p>Peculiarities of human immunodeficiency virus and coronavirus "SARS-CoV-2" genome structure as noncellular life forms.</p>	3H-3	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
CPC-3	<p>Molecular-genetic methods for the diagnosis of coronavirus disease. Prevention measures against coronavirus disease.</p>	<p>Peculiarities of molecular-genetic methods application of coronavirus disease diagnosis. Measures to prevent coronavirus disease (types of vaccines and features of their use).</p>	3H-3 K-4	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
CPC-4	<p>The life of cells outside the organism. Cell cloning</p>	<p>Peculiarities of cell life outside the organism; ideas about cell cloning; historical aspects of the study of cloning; the importance of cell cloning in medicine; useful directions of cloning (in medicine); problems of human cloning; the principle of therapeutic cloning</p>	3H-2	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih</p>
CPC-5	<p>Regeneration and its types: physiological and reparative. Levels of regeneration: intracellular and extracellular. Modes of regeneration. The</p>	<p>Pathways and levels of regeneration; factors that affect the intensity of regeneration processes; the importance of regeneration for the</p>	3H-7 K-2	<p>Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena</p>

	importance of regeneration for the homeostasis system.	homeostasis system; types of transplantation, the reasons for the development of transplant immunity and mechanisms for overcoming tissue incompatibility		Onufrovych, Assoc. Professor Liliya Odnorih
CPC-6	Genetic maps. Methods of the human chromosomes mapping. The modern state of human genome investigation	Methods of human chromosomes mapping; the concept of genetic and cytological chromosome maps; features of the structure and functioning of the human genome; main stages of human genome research; the importance of the Human Genome Program for studying the nature of hereditary and malignant diseases, as well as the development of gene and cell therapy.	3H-3 3H-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-7	Genetic engineering. Biotechnology. Concept about gene therapy	Principles of work and tasks of genetic engineering; main directions of biotechnology; types of genetic engineering; stages of genetic engineering; the concept of gene therapy.	3H-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-8	Peculiarities of prenatal period of human development. The possibility of prenatal transmission of the virus in HIV-infected pregnant women.	Peculiarities of prenatal period of human development; main stages and methods of gastrulation; critical periods of fetal development; malformations depending on the stage of embryogenesis.	3H-5 K-2 K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-9	Peculiarities of postnatal period of human development.	Peculiarities of postnatal period of human development	3H-5 K-2	Assoc. Professor Solomiya

	Aging as the terminal stage of human ontogeny. Theories of ageing.	critical periods of development; general biological patterns of post-embryonic development; periods of ontogenesis and their features; basic types of human constitution		Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-10	Methods of laboratory diagnosis of protozoan diseases.	Microscopic and non-microscopic methods for protozoan diseases diagnostic. Rules for conducting laboratory tests.	3H-10 3H-11 YM-12 YM-13 YM-14 K-3	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-11	Methods of laboratory diagnosis of helminthiasis.	Microscopic and macroscopic methods for diagnosing helminthiasis. Clinical and immunological methods for the diagnosis of helminthiasis. Rules for conducting laboratory tests	3H-10 3H-11 YM-12 YM-13 YM-14 K-3	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
CPC-12	Midges and its components: characteristic, importance as the intermediate hosts of helminthes and vectors of human diseases. Cockroaches and bedbugs.	Peculiarities of biology of different species of blood-sucking insects as pathogens and vectors of transmissive diseases. Morpho-physiological features of the midges representatives, their development cycles, pathogenic effects and medical significance, measures to control and prevent these parasites. Morpho-physiological characters representative of the orders <i>Blattoidea</i> , <i>Heteroptera</i> . Diversity of orders. Life cycles, pathogenic	3H-12 YM-11 K-3 K-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih

		effect and medical significance. Control and prevention.		
CPC-13	Poisonous plants and animals for human	Formation of ecological thinking in medical students based on the study of toxic to humans plants and animals as integral components of biocenoses; examples of poisonous plants, fungi and animals; the origin of toxicity in the animal world; the concept of phyto- and zootoxins; adaptation of poisonous animals; toxic properties; signs of poisoning; medical use of poisons	ЗН-17 К-4	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih, Assis.Prof. Kovalska S.P.
CPC-14	Phylogenesis of circulatory systems of Vertebrates. Onto-phylogenetic causes of congenital defects.	Evolution of vertebrate circulatory system. Structural peculiarities of fish, amphibians, reptiles, birds and mammals circulatory systems. Phylogenesis of aortic arches. Congenital developmental defects of cardiovascular system in humans.	ЗН-9, УМ-10, К-2, АВ-1	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih
CPC-15	Synthetic theory of evolution. Peculiarities of evolutionary factors action in human populations	Basic principles of the synthetic theory of evolution and mechanisms of microevolution; species criteria; Hardy-Weinberg law; elementary evolutionary factors; forms of natural selection; pathways of speciation, the structure of human populations; sources of genetic and phenotypic polymorphism of human populations	ЗН-8	Assoc. Professor Solomiya Paryzhak, Assoc. Professor Olena Onufrovyh, Assoc. Professor Liliya Odnorih
CPC-16	Biosphere as a system, supporting existence of human being. Human	Biosphere: the structure of the shells of the Earth, the role of	ЗН-13, ЗН-15, ЗН-16,	Assoc. Professor Solomiya

	ecology.	organisms in the shells of the Earth conversion. The current state of the biosphere. Ecological factors. Acclimatization, endemic diseases. Adaptive human types. The major races of mankind.	3H-17, AB-2 K-4	Paryzhak, Assoc. Professor Olena Onufrovych, Assoc. Professor Liliya Odnorih
--	----------	---	-----------------------	---

Classes organization system

- **by sources of knowledge:** methods of verbal transmission and auditory perception of educational information (lecture, conversation, explanation, discussion); methods of visual transmission and visual perception of information (tables, figures, study of literary and other sources of information; the use of visual aids); methods of transferring educational information through practical actions (performing practical work, solving situational problems, mastering practical skills and abilities);
- **by the level of independent mental activity:** problem, partial-search, research (solution of situational problems, preparation of scientific reports);

Use of interactive methods

- problem-oriented method
- method of individual teaching, research and practical tasks
- method of competing groups
- method of "formal game"

8. Verification of results

Current control

Learning outcome code	Code of classes type	The method of learning outcomes verification	Criteria of evaluation
<p>3H-1, 3H-2, 3H-3, 3H-4, 3H-10 3H-11, 3H-12 K-1, K-2, AB-1, AB-2</p>	<p>JI-1, JI-2, JI-3, JI-4, JI-5, JI-6, JI-7, JI-8,</p>	<p>Types of educational activities of students are: a) lectures b) practical classes c) individual work of students (ISW) Thematic plans of lectures, practical classes, ISW ensure the implementation in the educational process of all topics according to the program. The lecture course consists of 12 lectures. The topics of the lecture course reveal the problematic issues of the relevant sections of medical biology, parasitology and genetics. During lectures, students develop theoretical basic knowledge, provides a motivational component and a general-indicative stage of mastering scientific knowledge during independent work. The lecture course makes maximum</p>	<p>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</p>

<p>3H-1, 3H-2, 3H-3, 3H-4, 3H-7, 3H-8, 3H-9, 3H-10, 3H11, 3H-12, 3H-13, 3H-14 3H-15 3H-16, 3H-17,</p> <p>УМ-1, УМ-2, УМ-3, УМ-4, УМ-5, УМ-6, УМ-7, УМ-8, УМ-9, УМ-10, УМ-11, УМ-12, УМ-13, УМ-14, УМ-15, УМ-16,</p> <p>K-1, K-2, K-3, K-4, AB-1, AB-2</p>	<p>П-1, П-2, П-3, П-4, П-5, П-6, П-7, П-8, П-9, П-10, П-11, П-12, П-13, П-14, П-15, П-16, П-17, П-18, П-19, П-20, П-21, П-22, П-23, П-24, П-25, П-26, П-27, П-28, П-29</p>	<p>use of various didactic tools - multimedia presentations, educational films, slides.</p> <p>Practical classes aim at control of theory, the formation of practical skills and ability to analyze and apply their knowledge to solve practical problems. Each lesson begins with a test to assess the initial level of knowledge and determine degree of readiness of students for classes. The teacher determines the purpose of the lesson and creates a positive cognitive motivation; answers questions from students that arose during the ISW on the topic of the lesson. The main stage of the lesson is to perform practical work. Students consider microslides and macropreparations, solve typical situational problems, problems in molecular biology, genetics and medical genetics, make an album. At the final stage of the lesson in order to assess the student's mastery of the topic he is asked to answer the situational tasks. The teacher summarizes the lesson, gives students tasks for independent work, points out the main issues of the next topic and offers a list of recommended reading. The duration of the practical lesson is 2 academic hours</p>	<p>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</p>
---	--	---	--

			<p>implementation of practical skills</p> <p>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.</p> <p>Minimum quantity of points which the student should collect for current educational activity for admission to the examination equals to 72 points</p>
--	--	--	---

Current educational activity

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 figure or diagram ("recognition"). Control can be performed using the Misa distance learning platform.
- 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 microspecimens;
- e) control of practical skills;
- f) solving of typical problems from genetics and medical genetics.

Evaluation of current educational activity. During the estimation of mastering of each topic for current educational activity student is graded in 4-point (traditional) scale according to the approved assessment criteria for the appropriate discipline. This takes into account all types of work, provided by the program of the discipline.

The student's **individual work** is assessed on practical classes and is a part of the final assessment of the student.

Final control

General evaluation system	Conducted upon completion of the discipline in the form of a written exam.	
Grading scales	traditional 4-point scale, multi-point (200-point) scale, ECTS rating scale	
Conditions of admission to	The student attended all practical classes and received at least 72 points for current performance	

the final control		
Type of final control	Exam	Criteria for crediting

Exam evaluation criteria

Exam		
	<p>Exam – a form of final control of mastering of student theoretical and practical material from academic discipline. The final control is carried out in the form of a written exam, using the Misa training platform, according to the schedule. It lasts for 2 academic hours.</p> <p>Exam card structure and evaluation criteria for each type exam tasks:</p> <ol style="list-style-type: none"> 1) MCQs (50); 2) 4 open questions; 3) 2 situational problems (from molecular biology and medical genetics). 	<p>I stage Maximum quantity of points – 50 (1 point for each test);</p> <p>II stage – answers to 4 open questions. Maximum quantity of points – 20 (5 points for each question);</p> <p>III stage – solution of situational problems. Maximum quantity of points – 10 (5 points for each problem);</p> <p>Total quantity – 80 points.</p>

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 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:

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

Individual work of students is estimated during current control on the relevant lesson. Learning of topics present only in individual work is controlled by final control.

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. The ECTS scale points are not converted to the 4-point scale and vice versa.

Amount of points which is charged to students, from the discipline is converted in scale ECTS, thus:

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

Points of discipline 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

Objective evaluation of educational activities of students is tested by statistical methods (the correlation coefficient between ECTS score and score in a national scale).

9. Course policy

The policy of the course is determined by the system of requirements for the student in the study of the discipline "Medical Biology, Parasitology and Genetics" and is based on the principles of academic integrity. Students are explained the value of acquiring new knowledge, the need for independent performance of all types of work and tasks provided by the work program of this discipline. Lack of references to used sources, fabrication of sources, writing off, interference in the work of other students are examples of possible academic dishonesty. Detection of signs of academic dishonesty in the student's work is the basis for its non-enrollment by the teacher, regardless of the extent of plagiarism or deception. Literature resources may be provided by the teacher exclusively for educational purposes without the right to transfer to third parties. Students are encouraged to use other literature resources which are not provided by the recommended list.

10. Literature

Required course literature:

1. Medical Biology: textbook / S.Ya. Paryzhak, Z.D. Vorobets. – Lviv: Qvart, 2020. – 436 p.
2. Medical Biology: textbook / Bazhora Yu. I., Bulyk R.Ye., Chesnokova M.M. [et al]. – 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 Haltsky Lviv National Medical University, 2021. – 306 p.

Additional literature:

1. Bihunyak T.V. Medical biology. – Ternopil: Ukrmedknyha, 2016. – 214 p.
2. Bogitsh B.J., Carter C.E., Oeltmann T.N. Human parasitology.– 5th ed. Textbook. – AcademicPress, 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. – JaypeeBrothersMedicalPub, 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 TypotexKiadó. – 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.

Informational on-line 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/>

11. Equipment, hardware and software resources of the discipline/ course**Methodological support of the lecture course:**

1. Lecture theses.
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.

12. Additional Information

Responsible for the educational process at the department – Assoc. Prof. Oksana PERSHYN.
There is a scientific students' association at the department. Meetings take place in the auditorium №1.

Practical classes are held in the classrooms of the department at the address: 3a Shimzeriv street, Theoretical building, 2nd floor.

[e-mail: kaf_medicalbiology@meduniv.lviv.ua](mailto:kaf_medicalbiology@meduniv.lviv.ua)

Compilers of Syllabus,
Ph.D., Associate Professor

Liliya ODNORIH

Ph.D., Associate Professor

Oksana PERSHYN

Head of the Department,
Doctor of Biological Sciences, Professor

Zinoviyy VOROBETS