SYLLABUS

«BIOLOGY WITH BASIS OF GENETICS»

1. General information	
Faculty	**Faculty of Foreign Students**
Education Programme (Education sector, speciality, level of high education, form of study)	22 Healthcare, 226 «Pharmacy, industrial pharmacy», 2nd (master's degree) level of higher education, day time study
Academic year	2023-2024
Discipline, code (e-mail on the website of the Danylo Halytsky Lviv National Medical University)	Biology with basis of Genetics, code ОК8
Department (name, adress, phone number, e-mail)	Department of Medical Biology, Parasitology and Genetics 79010, Lviv, Pekarska str., 69 (Shimzeriv, 3 a) ph +380(32)275-49-66 e-mail Kaf_medicalbiology@meduniv.lviv.ua e-mail kaf_med_biol@ukr.net
Head of the Department (e-mail)	Vorobets Zinovij Dmytrovych, Doctor of Biological Sciences, Professor e-mail Kaf_medicalbiology@meduniv.lviv.ua
Academic year (year, when the study of the discipline is realized)	I course
Semester (semester, when the study of the discipline is realized)	First| semester
Type of discipline (obligatory / selective)	Obligatory
Educators (names, surnames, Scientific Degree and Academic Titles, e-mail)	1. Paryzhak S.Ya. – Ph.D., Associate Professor sola.paryzhak@gmail.com 2. Odnorih L.O. – Ph.D., Associate Professor liliyaodnorig@gmail.com 3. Onufrovych O.K. – Ph.D., Associate Professor onufrovychok@gmail.com e-mail Kaf_medicalbiology@meduniv.lviv.ua
Erasmus yes/no (availability of the discipline for students in framework of Erasmus+ program)	No
Person, responsible for syllabus (person, who is to be given comments concerning syllabus, contact e-	Assoc. Prof. Onufrovych O.K., *Ph.D* Onufrovychok@gmail.com

mail)	
Credits ECTS	3
Quantity of hours (lectures/ practical classes/ individual work)	Total — 90 h; Lectures – 14 h;Practical classes – 30 h; Individual work – 46 h
Language of Instruction	English
Consultations	According to the schedule

2. Brief review of the subject

Educational subject of «Biology with the basics of genetics» has been set up on the basis of standard program, studied by students of the first year of speciality 226 Pharmacy. Educational programme has been set up on the basis of standard program «Medical Biology».

Educational programme «Biology with the basics of genetics» consists of the chapter «Biological features of human vital activities. Molecular-genetic level of life organization. Organism level of life organization. Basis of human genetics. Population, species, biogeocenotic and biospheric levels of living matter organization» where 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. Medical and biological aspects of human ecology are being revealed, which should ensure the formation of ecological thinking, necessary for the pharmacist 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 processes.

The subject «Biology with the basics of genetics» lays the foundation for pharmacist students for their further acquisition of knowledge in the relevant theoretical and clinical professional and practical disciplines (medical chemistry, hygiene, immunology, etc.)

3. The aim and goals of the course

1. The overall aim of «Biology with the basics of 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 pharmacist.

The study of biology with basis of genetics forms in students-pharmacists a complete picture of the general laws of nature; the essence of life, its forms, individual and historical development of the organic world and human place in it; forms of biotic relationships in nature, the life cycles of parasites and parasitic diseases of humans; human place in the biosphere; provides fundamental biological training and practical skills for further professional practice of pharmacist.

2. The ultimate goals of the course «Biology with the basics of genetics» are:

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

3. Competencies and training results, the formation of which provides the study of the discipline (general and special):

1) general:

ЗК 01. The ability for abstract thinking, analysis and synthesis.

ЗК 02. Knowledge and understanding of the subject area and understanding of professional activity.

ЗК 03. The ability to communicate in the official language both orally and in writing.
ЗК 04. The ability to communicate in the foreign language t a level that ensures effective professional activity.
ЗК 05. The ability to evaluate and ensure the quality of work being performed.
ЗК 06. The ability to work as a team member.
ЗК 07. 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.
ЗК 08. 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.
ЗК 09. The ability to apply information and communication technologies.

***2)*special (professional*):**

ФК 01. The ability to integrate knowledge and solve complex problems of pharmacy/industrial pharmacy in broad or multidisciplinary contexts.
ФК 03. The ability to solve pharmacy problems in new or unfamiliar environments in the presence of incomplete or limited information, taking into account aspects of social and ethical responsibility.
ФК 07. The ability to conduct sanitary-educational work among the population to prevent common diseases of internal organs, prevention of infectious and parasitic diseases, and to promote early detection and maintaining adherence to treatment of these diseases according to their medical-biological and microbiological peculiarities.

4. Preliminary requirements

1. The discipline «Biology with the basis of genetics» is 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», «Animal Biology», «Plant Biology»;
2. Provides a high level of general biological training;
3. Lays the foundation for students to further master their knowledge of relevant theoretical and clinical professional and practical disciplines (medical chemistry, medical genetics, clinical immunology, infectious diseases with epidemiology, etc.).

5. Program learning results

List of the learning results

ПРН 01. To possess specialized conceptual knowledge in the field of pharmacy and related fields, taking into account modern scientific achievements, and to be able to apply them in professional activities.
ПРН 03. To possess specialized knowledge and abilities/skills for solving professional problems and tasks, including for the purpose of improving knowledge and procedures in the field of pharmacy.
ПРН 04. To communicate freely in the national and English languages orally and in writing to discuss professional problems and results of activities, presentation of scientific research and innovative projects.
ПРН 06. To develop and make effective decisions to solve complex/complex problems of pharmacy personally and based on the results of joint discussion; formulate the goals of one's own activity and the activity of the collective, taking into account public and industrial interests, the general strategy and existing limitations, determine the optimal ways to achieve goals.
ПРН 10. To provide the sanitary and educational work among the population for the purpose of prevention and in case of outbreaks of dangerous infectious, viral and parasitic diseases.

Code of	Essence of education results	Matrix of

education results		competencies
Зн-1	To know and understand the levels of living matter organization, forms and fundamental properties of living	*ПРН-1,3,4,6.*
Зн-2	To know the structural and functional organization of eukaryotic cells; types of reproduction of organisms	*ПРН-1,3,4,6.*
Зн-3	To know and understand basic patterns of heredity and variability.	*ПРН-1,3,4,6.*
Зн-4	To know and understand methods of human inheritance investigation, classification of hereditary diseases. The concept of population as an elementary unit of evolution, the population structure of humanity.	*ПРН-1,3,4,6.*
Зн-5	To know ontogenesis and its periodization; main stages of embryonic development.	*ПРН-1,3,4,6.*
Зн-6	To know molecular and cellular mechanisms of differentiation; classification of congenital anomalies; teratogenic factors	*ПРН-1,3,4,6.*
Зн-7	To know forms of symbiosis, parasitism as a biological phenomenon; principles of classification of parasites and hosts; ways of transmission of parasitic diseases; basics of prevention of parasitic diseases	*ПРН-1,3,4,6,10.*
Зн-8	To know pathogens of the most common protozoa, trematodoses, cestodoses, nematodoses.	*ПРН-1,3,4,6,10.*
Зн-9	To know Arthropods as vectors and causative agents of human diseases; poisonous representatives of phylum Arthropods.	*ПРН-1,3,4,6,10.*
Зн-10	To know the subject of ecology; types of environments; environmental factors, the role of human as an environmental factor.	*ПРН-1,3,4,6……..*
Зн-11	To know the main principles of academician V.I. Vernadsky theory on the biosphere and noosphere	*ПРН-1,3,4,6.*
Зн-12	To know adaptive ecotypes of people; functional types of people's response to environmental factors («sprinter», «stayer», «mixt»); the concept of biological rhythms, their medical significance	*ПРН-1,3,4,6.*
Ум-1	Be able to make temporary microslides and to examine them under a light microscope .	*ПРН-1,3,4,6.*
Ум-2	Be able to differentiate the components of the animal cell on electronic microphotographs and figures.	*ПРН-1,3,4,6.*
Ум-3	Be able to determine the primary structure of the protein, the number of amino acids, the molecular weight of the polypeptide by the nucleotide sequence of the gene encoding it.	*ПРН-1,3,4,6.*
Ум-4	Be able to predict the genotypes and phenotypes of offspring by parental genotypes.	*ПРН-1,3,4,6.*
Ум-5	Be able exclude paternity when determining the blood groups of parents and children.	*ПРН-1,3,4,6.*
Ум-6	Be able to analyze the human karyotype and to determine the diagnosis of the most common chromosomal diseases.	*ПРН-1,3,4,6.*
Ум-7	Be able to make family tree s and to conduct genealogical analysis.	*ПРН-1,3,4,6.*

Ум-8	Be able to calculate the frequencies of genes and genotypes according to Hardy-Weinberg law.	*ПРН-1,3,4,6.*
Ум-9	Be able to determine the place of a biological object (causative agent) of parasitic diseases in the system of living nature	*ПРН-1,3,4,6,10.*
Ум-10	Be able to substantiate the affiliation of parasitic human diseases to the group of transmissive and natural-focal	*ПРН-1,3,4,6,10.*
Ум-11	Be able to diagnose from macro- and micropreparations of causative agents and vectors of parasitic diseases that are studied	*ПРН-1,3,4,6,10.*
Ум-12	Be able to substantiate methods of laboratory diagnostics of human parasitic diseases.	*ПРН-1,3,4,6,10.*
Ум-13	Be able to substantiate methods of prophylaxis of parasitic diseases, based on ways of their infection.	*ПРН-1,3,4,6,10.*
Ум-14	Be able to form requirements for one-self and others of environment protection .	*ПРН-1,3,4,6.*
К-1	To apply in pharmacist's practice knowledge of molecular and cytological basis of heredity, mechanisms of development of hereditary and acquired human diseases.	*ПРН-1,3,4,6.*
К-2	To apply knowledge of peculiarities of human ontogenesis and the impact of pharmaceuticals on its various stages.	*ПРН-1,3,4,6.*
К-3	To apply in pharmacist's practice knowledge of the biological basis of parasitism for the diagnostics and prevention of human parasitic diseases, development of preventive measures.	*ПРН-1,3,4,6,10.*
К-4	To estimate the impact of environmental factors on human health, use their professional activities for the environment protection, carrying out health education	*ПРН-1,3,4,6.*
АВ-1	To be responsible for mastering the relevant knowledge and skills	*ПРН-1,3,4,6.*
АВ-2	To manifest responsible attitude and care for the environment.	*ПРН-1,3,4,6.*

6. Course content

Discipline format *(day-time, or extramural)*	Day-time	
Classes	**Hours**	**Quantity of groups**
lectures	**14**	**1**
practical classes	**30**	**1**
seminars	**-**	**-**
individual works	**46**	**1**

7. Topic content of the course

Code of class	Topic	Content	Code of education results	Educator
Л-1 *(lecture-1)*	Introduction to Medical Biology Course. Structural and functional organization of a cell.	Introduction. Levels of living matter organization. Optical systems in biological investigations. Structure and functions of the cell membrane. Active and passive	*Зн-1,2,3 Ум-2,3 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

		transport across the cell surface membrane. Peculiarities of prokaryotic cell structure. Structure and functions of eucariotic cell organells. Structural components of nuclei.		
Л-2	Organismic level of the genetic information organization. Genetic interactions. Chromosomal theory of heredity. Genetics of sex.	The subject and tasks of genetics and medical genetics. Key terms. Stages of genetics development. Classification of genes and their properties. Patterns of inheritance of traits. Mendelian traits in humans and types of inheritance of traits. Forms of gene interactions. The genetic of sex. Inheritance of linkage genes. Patterns of linkage genes inheritance. Crossing-over. Chromosomal theory of heredity.	*Зн-5,6 Ум-4-8 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
Л-3	The basic principles of human genetics. Methods of the human inheritance investigation.	Human as a specific object of genetic analysis. Medical genetics: subject and tasks. Genealogy method. Study of twins. Cytogenetic method. Dermatoglyphics. Population statistic method. Biochemical method. Prenatal diagnosis. Medical and genetic aspects of the family. The concept of deontology.	*Зн-4,5 Ум-4-8 К-1,2,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
Л-4	Introduction to Medical Parasitology. Medical and biological basis of parasitism. Protozoa are human parasites.	Relationship forms between organisms. Medical parasitology, subject and task. The contribution of prominent scientists in the development of parasitology. Key terms of parasitology. Classification of hosts of parasites, diseases. Parasitocenosis, ways of invasion, pathogenicity. The concept of natural-focal diseases. General characteristics of Subregnum Protozoa. Phylum Sarcomastigophora. Phylum Ciliophora Phylum Apicomplexa. Peculiarities of the morphology and epidemiological significance.	*Зн-7-10 Ум-9 К-2,3 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

Л-5	Medical Helminthology. Flat worms are human parasites.	General characteristics of Phylum Flat worms. Classis Flukes. Characteristics of representatives and their medical significance. Classis Tapeworms. Characteristics of representatives and their medical significance.	*Зн-7,9 Ум-9-14 К-2,3 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Odnorih L.O., Assoc. Prof. Onufrovych O.K.
Л-6	Phylum *Nemathelmintes*. Classis *Nematoda* – causative agents of human diseases.	General characteristics of Phylum Nemathelminthes Characteristics of the representatives of Phylum Nemathelminthes and their medical significance.	*Зн-7,8,10 Ум-9-14 К-2,3 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
Л-7	Medical Arachnoentomology. Arthopods as the carriers of human infections and invasions.	General characteristics of Phylum Arthropoda. Classis Arachnoidea. Main features of organization. Structural peculiarities of ticks and mites. General characteristics of Classis lnsecta. Methods of control of blood-sucking ectoparasites.	*Зн-7,9 Ум-9-14 К-2,3 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-1 *(practical class 1)*	Levels of living matter organization. Plant and animal cells. Structural components of the cytoplasm.	Levels of living matter organization. Cell as an elementary unit of living matter. Structure of the light microscope, rules of using. The techniques of making temporary preparations. Peculiarities of animal cell structure. Peculiarities of plant cell structure. Structure and functions of one-membranous organelles of eukaryotic cell. Structure and functions of two-membranous organelles of eukaryotic cell. Structure and functions of non-membranous organelles of eukaryotic cell. Ways of entry of substances into the cell.	*Зн-1,2,3 Ум-1,2 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc. Prof. Onufrovych O.K.
П-2	Hereditary apparatus of the cell. Morpho-functional characteristic of chromosomes. Human karyotype and ideogram.	Structural components of nucleus. Morphological characteristic of chromosomes. Barr body, its functional purpose. Denver's classification of chromosomes. Rules of chromosomes. Definition of karyotype and ideogram.	*Зн-1,2,3 Ум-1,2 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc. Prof. Onufrovych O.K.

П-3	Life cycle of a cell. Reproduction and its forms.	Reproduction – the basic property of living matter. Asexual reproduction of organisms, its cytological bases. Sexual reproduction of unicellular and multicellular organisms, its cytological bases Temporal organization of the cell cycle. Cell cycle. Peculiaritieses of the cell life cycle. Changes in cells and their structures during the cell cycle. Interphase, its periods. Mitosis: phases, their characteristics. Violations of mitosis. Somatic mutations. Peculiarities of studying the human karyotype according to the stage of the cell cycle. Influence of harmful substances on the processes of cell self-renewal.	*Зн-1,2,3 Ум-1,2 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc. Prof. Onufrovych O.K.
П-4	Peculiarities of human genetics. Basic patterns of human mendelian traits inheritance (mono-, di- and polyhybrid crosses). Multiple alleles. Genetic of blood groups.	The subject and tasks of medical genetics. Main terms of genetics: gene, allelic genes, dominance, recessiveness, homozygosity, heterozygosity, genotype, phenotype. Mendel's laws. Genetic schemes. Expressivity and penetrance of the gene. Mendelian traits in human, character of their inheritance. Patterns of inheritance in mono-, di- and polyhybrid crossing. Multiple alleles: the essence of the phenomenon, causes of occurrence. Inheritance of human blood groups by the AB0 antigenic system. The phenomenon of co dominance. Inheritance of rhesus factor system.	*Зн-3,4,5 Ум-4,5 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Asst. Prof. Onufrovych O.K.
П-5	Linkage inheritance. Genetics of sex. Sex-linked inheritance.	Genetic mechanism of sex determination in human and animals. Concept about homo-, heterogametic sex and hemizygosity. Inheritance of sex-linked traits. X-linked traits. Genetic scheme. Y-linked traits. Genetic scheme. Holandric traits. Problems of sex determination.	*Зн-3,4,5 Ум-4 К-1 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Asst. Prof. Onufrovych O.K.

П-6	Methods of the human inheritance investigation: cytogenetic and biochemical analysis. Chromosomal and gene's diseases, their diagnostics.	Cytogenetic method of human inheritance investigation, its scopes. Karyotyping, its application in clinical practice. Method of X- and У-sex chromatin detection, application for sex determination. Classification of hereditary diseases. Numerical aberrations of autosomes. Sex chromosome aberrations. Biochemical method of hereditary diseases studying. Genocopies and Phenocopies. Prenatal diagnostics of hereditary diseases and medical genetic counseling.	*Зн-4,5,6 Ум-2,4,6 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc. Prof. Onufrovych O.K.
П-7	Study of twins. Genealogy of human as the method of human inheritance investigation	Genealogy method of human inheritance investigation, its capabilities. Pedigree analysis, using in clinical practice. Characteristics of types of trait inheritance: autosomal dominant, autosomal recessive, sex-linked. Study of twins, using in human inheritance investigation.	*Зн-3,4,6 Ум-4,6,7 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-8	Medical and biological basis of parasitism. Protozoa as the parasites of human. Phylum *Sarcomastigophora*, Classis *Lobozea*. Phylum *Ciliophora*. Representatives of the Classis *Rimostomatea* – parasites of human.	General characteristic of Protozoa. Characteristic of the Class *Lobozea*. The forms of pathogenic and nonpathogenic representatives of Classis. Characteristic of the Class Ritostomatea. Morpho-anatomical features, life cycle, pathogenic significance of intestinal balantidium.	*Зн-7,8 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-9	Representatives of the Classis *Zoomastigophora* – parasites of human.	Characteristics of the Classis Zoomastigophora. Morphological peculiarities of lamblia, urogenital and intestinal trichomonads, their pathogenic effect on the human organism. Methods of laboratory diagnosis and prophylaxis of diseases caused by parasitic flagellates.	*Зн-7,8 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-10	Phylum *Apicomplexa*. Representatives of	Characteristics of the Classis Sporozoa. Existance forms of Plasmodium. Life cycle of	*Зн-7,8 Ум-1,2,9-14*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih

	the Classis *Sporozoa* – human parasites.	Plasmodium. Peculiarities of the structure of Toxoplasma Life cycle of Toxoplasma gondii	*К-3,4 АВ-1,2*	L.O., Assoc.Prof. Onufrovych O.K.
П-11	Phylum Flat worms (*Platyhelminthes*). Classis *Trematoda*: liver, cat's, lancet-like and lung flukes.	General characteristics of Phylum Plathelminthes. General characteristics of Classis Trematoda. Morpho-anatomical peculiarities of cat's, blood and lung flukes. Geographical distribution, pathogenic action and prophylaxis of fasciolosis, opistorchosis, dicrocoeliosis and paragonimiasis. Characteristics of the concepts «biohelminth», «zoonosis», «anthropozoonosis», «anthroponosis».	*Зн-7,8 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-12	Classis *Cestoidea*: beef, pork, dwarf tapeworms and echinococcus – causative agents of human diseases.	Peculiarities of the structure of tapeworms. Due to their parasitic way of life. Morpho-anatomical peculiarities of the structure and life cycles of armed, unarmed and dwarf tapeworms. Geographical distribution, pathogenicity and prophylaxis of taeniosis, taeniarhinchosis, hymenolepidosis and echinococcosis. Medical importance of cestodes.	*Зн-7,8 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-13	Phylum *Nemathelmintes*. Classis *Nematoda*: large intestinal roundworm, pinworm (seatworm), whipworm and trichinella – causative agents of human diseases.	General characteristics of Phylum Nemathelminthes.. Morpho-anatomical peculiarities of the structure of large intestinal roundworm, pinworm (seatworm), whipworm and trichinella. Life cycles of these helminthes. Geographical distribution, pathogenic action and prophylaxis of representatives. Characteristics of the definitions «geohelminth», «contact helminthiasis».	*Зн-7,8 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
П-14	Phylum *Arthropoda*. Classis *Arachnoidea*. Ticks (Acarina) are activators and vectors of human diseases.	General characteristics of phylum Arthropoda. Classis Arachnoidea. Main features of organization Structural peculiarities of ticks and mites. Morphology, life cycle,	*Зн-7,9 Ум-1,2,9-14 К-3,4 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

		epidemiological importance of dog's tick, itch mite and follicle mite and settlement tick. Basic methods of ticks and mites control, preventive measures.		
П-15	Classis *Insecta*: lice (*Anoplura*), fleas (*Aphaniptera*), *Diptera* – causative agents and vectors of human diseases.	General characteristics of Classis lnsecta. Morphology, biology development of the representatives of the order lice and Diptera. Measures of pediculosis prophylaxis. Epidemiological importance of flies. Ways of getting rid with arthropods. Application of pharmaceuticals in pediculosis and the presence of other ectoparasites.	*Зн-7,9* *Ум-1,2,9-14* *К-3,4* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
СРС-1	Organization of flows of matter and energy in the cell	The cell is an open system. Cell organelles involved in the flow of substances and energy. Characteristics of plastic and energy metabolism. Cell energy supply, the role of ATP	*Зн-1,2,3* *Ум-2,3* *К-1* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
СРС-2	Cell membranes. Transport of substances through the plasmalemma.	Mechanisms of gene expression regulation in prokaryotes. The structure of the lactose operon of Escherichia coli. Exon-intron structure organization of eukaryotic genom. Mechanisms of transcription regulation in eukaryotes.	*Зн-1,2,3* *Ум-1,2* *К-1* *АВ-1,2*	проф. Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
СРС-3	Characteristics of nucleic acids. Organization of information flow in the cell.	Nucleic acids, their structure, spatial organization and functions. The concept of "repair", "replication" of DNA. Chargaff's rule Genetic code, its properties. Mechanisms of transcoding biological information in the cell	*Зн-1,2,3* *Ум-2,3* *К-1* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
СРС-4	Coronavirus SARS-CoV-2: structure, methods of diagnosis and prevention of coronavirus disease.	Structure and main mutations of the coronavirus SARS-CoV-2. Proteins and enzymes of the virus. Methods of diagnosis and prevention of coronavirus disease	*Зн-1,2,3* *Ум-2,3* *К-1* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

CPC-5	Reproduction and its forms	Reproduction is a universal property of living matter. Asexual reproduction: monocytogenic and polycytogenic, its cytological basis. Types of sexual reproduction in unicellular and multicellular organisms, biological significance and cytological basis. Cytogenetic characteristics of meiosis. Ovogenesis. Spermatogenesischromosomal and multifactorial diseases. Definitions of commutagens and antimutagens. The role of mutations in the evolutionary process.	*Зн-3,4 Ум-6 К-1 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-6	Variability, its forms and manifestations: phenotypic, genotypic	Variability: definitions, forms. Modification variability, its indicators (reaction rate, variation series, variation curve). Phenocopies and genocopies. Multifactorial diseases. Combinatorial variability. Mechanisms of occurrence. Mutagenesis is natural and induced. Mutagens are physical, chemical and biological. Mutations: classification, importance in the development of molecular, chromosomal and multifactorial diseases. The concept of commutagens and antimutagens. Significance of mutations in the evolutionary process	*Зн-3,4 Ум-4,5,6 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-7	Dermatoglyphics and population-statistic methods: importance for diagnosis of hereditary diseases.	Method of Dermatoglyphics, the possibility of use in medicine. Sections of dermatoglyphics: dactyloscopy, palmoscopy, plantoscopy. 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. Hardy-Weinberg law, its value for medicine.	*Зн-3,4,5 Ум-4,6 К-1,2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-8	Peculiarities of prenatal period of	Periodization of ontogenesis.	*Зн-4 Ум-8*	Assoc. Prof. Paryzhak S.Ya.,

	human development. Pre-conditions of congenital developmental anomalies	Types of cleavage. Methods of gastrulation. main stages of embryonic human development. Histogenesis, organogenesis. Provisional organs. Regulation in the process of fragmentation and its violation (twins, malformations). Critical periods of fetal development. Teratogenic factors, their characteristic and significance in Congenital defects development.	*К-1,2 АВ-1,2*	Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-9	Postnatal period of human development and its periodization.	Postnatal period of ontogenesis, its periodization. Juvenile age. Periodization of human ontogenesis. Age periodization of human growth. Hormonal regulation of human growth rate. The role of physical and social factors in human ontogenesis. Signs of acceleration. Influence of harmful substances on the development of the organism. Mature age I and II, its characteristics.	*Зн-5,6 Ум-4,5,6 К-2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-10	Methods of laboratory diagnosis of diseases caused by parasitic protozoa	The essence of methods of diagnosis of parasitic diseases and their possibilities. The value of methods of laboratory diagnosis of diseases caused by protozoa. value of methods. Rules for conducting laboratory tests with biomaterial; basic immunological methods of research of invasive diseases	*Зн-5,6 Ум-4,5,6,7 К-2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-11	The teachings of EN Pavlovsky on natural and focal diseases	The concept of "natural focal diseases". Components of a natural cell. Specific vectors of malaria, leishmaniasis, African sleeping sickness, Chagas disease and their distribution areas. Methods of prevention and control of natural focal diseases	*Зн-5,6 Ум-4,5,6 К-2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-12	Laboratory diagnosis of helminthiasis.	The essence of methods of diagnosis of parasitic diseases and their possibilities. The value of methods of laboratory	*Зн-5,6 Ум-4-7 К-2 АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

		diagnosis of diseases caused by helminthiasis. value of methods. Rules for conducting laboratory tests with biomaterial; basic immunological methods of research of invasive diseases		
CPC-13	Blood sucking insects – causative agents and vectors of human diseases. Midges and its components	Midges and its components. Medical significance. The main methods of control of insects which are vectors and causative agents of the diseases.	*Зн-7-10* *Ум-9-14* *К-3.4* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-14	Poisonous plants and animals.	Examples of poisonous plants, fungi and animals (active-poisonous, passive-poisonous). Medical significance of poisons and their application in medicine.	*Зн-7-10* *Ум-9-14* *К-3.4* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.
CPC-15	The biosphere as a system that ensures human existence. Fundamentals of human ecology.	he concept of the biosphere. The place and role of man in the biosphere. The main races of mankind. Environmental factors. Unity of organism and environment. Adaptive types of human.	*Зн-7,8,10* *Ум-10-14* *К-3.4* *АВ-1,2*	Assoc. Prof. Paryzhak S.Ya., Assoc.Prof. Odnorih L.O., Assoc.Prof. Onufrovych O.K.

System of classes

- **information sources:** verbal and auditory perception methods of learning information (lecture, conversation, explanation, discussion); methods of presenting information and visual methods (illustration, demonstration of slides, tables, figures, review of literature; visual sources of information); methods of practical application of the information (practical assignment, practical tasks solving, mastering of practical skills).

- **according to individual work:** by means of problems, partial
-searching, research (situational tasks solving, preparing scientific reports)

Interactive methods

-problem-oriental method

-method of individual educational-research and practical tasks

- method of competing groups

- method of training technologies

-«business game» method

- brainstorming method

8. Verification of results

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»); control is carried out using the Misa training 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 micropreparations;

e) control of practical skills;

f) solving of typical problems from molecular biology, genetics and medical genetics.

During the estimation of mastering of each topic for current educational activity student is graded in 4-point (traditional) scale according with the approved assessment criteria for the appropriate discipline. All types of work provided by the program of discipline are considered.. The traditional scores from discipline are converted to the points.

Individual work of students is estimated during current control topics at the proper lesson and is a part of the final grade of student.

Scoring system

Students are being tested and scored at each and every single class.

Criteria of evaluation**:**

Educational results code	Kind of class Code	Educational results verification methods	Criteria of passing
Зн-1	*Л-1 П-1-3 СРС-12*	**Types of educational activities of students are:** a) lectures b) practical classes c) individual work of student (CPC) Thematic plans of lectures, practical classes and individual work provide the discipline topics realization in educational process. **Lecture course** consists of 10 lectures. The course of lectures comprises all problematic issues of relevant chapters of medical biology and parasitology. The lecture course is aimed at presenting basic knowledge of the discipline, motivate and orient the students. Didactic means – multimedia presentations, educational films, and slides are widely used during the lectures. **Practical classes** serve for cheking the level of students understanding of theoretical material presented at lectures, and forming practical skills. They also urge the students to apply the acquired knowledge for solving practical tasks. Every lesson starts with control test for the assessment of the level of output student knowledge. The teacher formulates the aim of the lesson and creates the positive motivation; then answers the questions, which appeared during individual work. The main part of the lesson is dedicated to practical work. Students have practical access to macro- and micropreparations, solve typical situation tasks, problems from molecular biology, genetics and medical genetics, and draw pictures of the studied species in their students' personal albums. At the end of the	**Criteria for evaluation 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
Зн-2	*Л-1 П-1-3 СРС-1,2,6*		
Зн-3	*Л-1,5 П-1-5,7 СРС-1-6*		
Зн-4	*Л-2,4,5 П-4-7 СРС-3-5,7*		
Зн-5	*Л-2-4 П-4-6 СРС-5,8,9*		
Зн-6	*Л-23 П-6,7 СРС-6,8,9*		
Зн-7	*Л-6-10 П-8-15 СРС-11-14*		
Зн-8	*Л-6-8 П-8-13 СРС-10-13*		
Зн-9	*Л-6,7,9 П-14,15 СРС-10,11,14*		
Зн-10	*Л-6,8,10 СРС-10-15*		
Зн-11	*Л-6,10 СРС-15*		
Зн-12	*Л-10*		

	СРС-15	lesson, the student is supposed to present their solutions of the situational tasks for the teacher to assess the level of their understanding. The teacher summarises the lesson, gives home assignment for individual work, points out the basic issues of next topic and gives the list of the recommended literature. The duration of the practical lesson is 2 academic hours.	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
Ум-1	*П-1-3,8,9-15 СРС-1,2,6*		
Ум-2	*Л-1,2,9 П-1-3,6,8-15 СРС-1,2,6*		
Ум-3	*Л-1 СРС-1-6*		
Ум-4	*Л-3,4 П-4-7 СРС-4,8,9*		
Ум-5	*Л-3,4 П-4 СРС-4,5,8,9*		
Ум-6	*Л-3-5 П-6,7 СРС-5,8,9*		
Ум-7	*Л-3-5 П-7 СРС-9*		
Ум-8	*Л-3-5 СРС-7*		
Ум-9	*Л-6-10 П-8-15 СРС-10-12,15*		
Ум-10	*Л-7-9 П-8-15 СРС-10-14*		
Ум-11	*Л-7-9 П-8-15 СРС-10-14*		
Ум-12	*Л-7-9 П-8-15 СРС-10-15*		
Ум-13	*Л-7-10 П-8-15 СРС-10-14*		
Ум-14	*Л-7-10 П-8-15 СРС-10-15*		

К-1	*Л-1-5 П-1-7 СРС-1-7*		
К-2	*Л-1-9 П-1-4,6,7 СРС-4-9*		
К-3	*Л-7-9 П-8-15 СРС-10-14*		
К-4	*Л-4,5,10 П-8-15 СРС-10-15*		
АВ-1	*Л-1-10 П-1-15 СРС-1-15*		
АВ-2	*Л-1-10 П-1-15 СРС-1-15*		

The final control		
General assessmen t system	Participation in the work during the semester / exam – 60%/40% according to the 200-point scale	
Assessment scales	Traditional 4-point scale, 200-point scale, ECTS rating scale	
Requireme nts for final control access	The student attended all the practical lessons and received not less than 72 points.	
Type of the final control	**Exam**	**Passing criteria**
Exam	**Exam** – a form of final control of mastering of student theoretical and practical material from studying discipline. The final control is performed in the form of a written exam according with exam card tasks, which includes: a) test tasks (50), composed in accordance with the topics (50 points – 1 point for each test task); b) 4 describing questions (20 points – 5 points for each question); c) two situational problems (on molecular biology, and medical genetics) (10 points – 5 points for one problem). Totally – 80 points.	Each test task is evaluated in 1 point Total quantity – 80 points.
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 collect ed 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:

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

Recalculation of the average score for the current activity in multipoint scale for disciplines ending in an exam.
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

Estimation ECTS	Statistics
A	The best 10 % of students
B	The following 25 % of students
C	The following 30 % of students
D	The following 25 % of students
E	The last 10 % of students

„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

The objectivity of the assessment of students' learning activities is checked by statistical methods (correlation coefficient between ECTS assessment and assessment on a national scale).

9. Course policy

The course policy is determined by the requirements of the discipline learning «Medical biology with parasitology» and is based on academic integrity. The students are explained the value of the knowledge and necessity of thorough individual work and fulfill all the tasks included in the syllabus. The examples of inadequet integrity are: missing of references to the used sources, cheeting, sources

fabrication, interference in the work of other students. Any kind of unintegrity, no matter of its volume is unacceptable and results in poor academic mark. Sources that are recommended by the teacher may be used only for academic purposes and transfer this information to third parties is forbidden. Students are encouraged to use other literature sources not provided by the recommended list.

10. Literature

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. Step 1. Lecture notes 2018 Biochemistry and Medical genetics. New York. Kaplan, Inc. – 2018 – 403 c.

Additional:

1. Bogitsh B.J., Carter C.E., Oeltmann T.N. Human parasitology. – 5th ed. Textbook. – Academic Press, 2019. – 407 p.
2. Elsheikha H.M., Jarroll E.L. Illustrated Dictionary of Parasitology in the Postgenomic Era. – Caister Academic Press, 2017. – 332 p.
3. Ghosh S., Chander J. Paniker's Textbook of Medical Parasitology. 8th Edition. – Jaypee Brothers Medical Pub, 2018. – 276 p.
4. Kaplan Medical's USMLE STEP 1. Biochemistry and Medical Genetics. Lecture notes. – 2018. – 432 p.
5. 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.
6. 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 resources:

1. Testing center – database of license tests Krok – 1 htpp://testcentr.org.ua/
2. OMIM (Online Mendelian Inheritance in Man) – An Online Catalog of Human Genes and Genetic Disorders http://omim.org/

11. Equipment, hardware and software resources of the discipline/ course

Methodological support

- Syllabus from the discipline;
- Lecture thesis from the discipline;
- Methodical recommendations for teachers;
- Methodical recommendations for practical classes for students;
- MISA learning platform;
- Methodical manual for students independent work;
- Tests and control tasks for practical classes;
- Questions and tasks for final control (exam).

12. Additional information

Head teacher of the department – Associate Professor O.I. Pershyn.
Scientific students group is organized at the department. Meetings are held in the classroom №1.
The address of the practical lessons is Lviv, Pekarska str., 69 (Shimzeriv, 3a), classrooms of Medical biology, parasitology and genetics department.
Website of the department – e-mail Kaf_medicalbiology@meduniv.lviv.ua

Author of syllabus, Ph.D., Associate Professor_____Olena ONUFROVYCH

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Doctor of Biological Sciences, Professor_____Zinoviy VOROBETS