



SYLLABUS OF THE ACADEMIC DISCIPLINE
«MODERN PROBLEMS OF MOLECULAR BIOLOGY»

1. General Information	
Faculty	Faculty of Foreign Students
Education Programme	22 Healthcare 221 Dentistry 2 nd (master's) degree of Higher Education full-time
Academic year	2023-2024
Discipline, code	Modern problems of molecular biology, code ББ 1.25 e-mail: Kaf_medicalbiology@meduniv.lviv.ua
Department	Department of Medical Biology, Parasitology and Genetics Adress: 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	Vorobets Zinovij Dmytrovych, Doctor of Biological Sciences, Professor e-mail: Kaf_medicalbiology@meduniv.lviv.ua
Studying year	1 st course
Semester	I, II
Type of discipline (<i>obligatory / selective</i>)	selective
Educators	1. Solomiya Paryzhak – Ph.D., Assoc. Prof. sola.paryzhak@gmail.com; 2. Olena Onufrovych – Ph.D., Assoc. Prof. onufrovychok@ukr.net
Erasmus yes/no	No
Person, responsible for syllabus	Solomiya Paryzhak – Ph.D., Assoc. Prof. sola.paryzhak@gmail.com Olena Korchynska – Ph.D., Assoc. Prof. olenakorhynska@ukr.net
Quantity of ECTS credits	3.5
Quantity of hours (<i>lectures/ practical classes/ individual work</i>)	Total – 105 h; Lectures – 10 h; Practical classes – 30 h; Individual student's work – 65 h

Language of instruction	English
Information about consultations	According to the schedule
2. Course overview	
<p>The Working Program contains the following chapters: Chapter 1 «Molecular basis of heredity», Chapter 2 «Molecular basis of hereditary diseases», Chapter 3 «Modern issues of genetic technologies».</p> <p>This discipline provides the study of modern problems and achievements of molecular medicine, including molecular-genetic diagnostics, pharmacology, gene therapy, laying the basement for further students mastering the basic methods of chemical analysis of the structure and function of biopolymers (proteins and nucleic acids); understanding of the molecular-genetic basis of the development of hereditary and multifactorial diseases and prospects for the application of the achievements of molecular biology in practical medicine.</p> <p>Mastering the discipline includes lectures, practical classes, individual student's work and is ended with a credit. The study of the discipline «Modern problems of molecular biology» (elective course) lays the foundation for further knowledge and skills improvement in specialized theoretical and professional-practical clinical disciplines (bioorganic chemistry, pharmacology, physiology, medical genetics, etc.).</p>	
3. Aim and goals of the course	
<p>The aim of the course is to form knowledge and practical aptitudes for further students' mastering the block of relevant disciplines, which provide natural-science (NS unit) and professional-practical (PP unit) preparation for understanding modern problems as well as achievements of molecular medicine.</p> <p>The ultimate goals of the course «Modern problems of molecular biology» are:</p> <ol style="list-style-type: none"> 1. To explain the the patterns of human organism vital functions manifestation at the molecular-biological and cellular levels. 2. To identify the manifestations of general biological laws during human ontogenesis. 3. To understand the molecular-genetic basis for the development of hereditary and multifactorial diseases, prospects for the application of advances in molecular biology in practical medicine. 4. To be able to explain the nature and mechanisms of inherited human diseases phenotypic manifestation. <p>Competencies and studying process results:</p> <p>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.</p> <p>- general (3K):</p> <ol style="list-style-type: none"> 3K 1. The ability for abstract thinking, analysis and synthesis. 3K 2. Knowledge and understanding of the subject area and understanding of professional activity. 3K 3. The ability to apply knowledge in practical situations. 3K 4. Ability to communicate in the state language both orally and in writing. 3K 5. The ability to communicate in English. 3K 6. Skills to apply information and communication technologies. 3K 7. The ability to search, determine and analyze information from various sources. 3K 8. The ability to adapt and act in a new situation. 3K 9. The ability to reveal, determine and solve problems. 	

3K 10. The ability to be critical and self-critical.
 3K 11. The ability to work in a team.
 3K 12. The striving to preserve the environment.
 3K 13. The ability to act socially responsibly and consciously.
 3K 14. The ability to realize own rights and responsibilities as a member of society, to understand the values of civil (free democratic) society and the need for its sustainable development, the rule of law, human rights and freedoms.
 3K 15. The ability to preserve and multiply 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, use different types and forms of physical activity for an active recreation and leading 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 environmental on the health of the people (individual, family and population).

4. Preliminary requirements

For successful learning and gaining necessary competencies in the discipline being studied, fundamental knowledge of biology (such subjects as «General Biology», «Human Biology»,) in accordance with State standard for basic general secondary education is advisable.

5. Program learning results

List of the learning results

Code of education results	Essence of education results	Matrix of competencies
3H – knowledge Y _M – skills AB – independence and responsibility K – competencies		IIP – program learning outcomes
3H-1	To know how to interpret the importance of molecular-genetic methods for hereditary and infectious diseases diagnosis in forensic medicine.	IIPH-7, 15, 17, 18
3H-2	To know and to use in the dentist practice knowledge of the molecular basis of heredity, the developmental mechanisms of hereditary and acquired human diseases. To know and to understand the modern advances in molecular biology.	
3H-3	To know how to conduct the own professional activities to preserve the environment.	
Y _M -1	Be able to solve situational problems, to identify the primary structure of the protein, the number of amino acids, the molecular weight of the polypeptide according to the gene structure encoding it.	
Y _M -2	Be able to analyze the structure of pro- and eukaryotic genes, to determine the types of mutations (gene or chromosomal). Be able to analyze the complex mechanisms of human traits inheritance.	

<i>Y_M-3</i>	To choose the appropriate methods of human heredity studying to diagnose different hereditary diseases		
<i>K-1</i>	The ability to apply knowledge of modern achievements in molecular biology in practical medicine of dentists.		
<i>K-2</i>	To apply knowledge of molecular basis of heredity and developmental mechanisms of hereditary and acquired human diseases in practical activities of dentists. To know and to understand modern advances in molecular biology.		
<i>K-3</i>	To know how to apply one's own professional activities for the protection of the environment.		
<i>AB-1</i>	Be responsible for mastering the relevant knowledge and content.		
<i>AB-2</i>	Be responsible for the measures that preserve the environment within its own competence.		
Programme learning outcomes			
<i>IPPH 7</i>	To analyze the epidemiological situation and provide mass and individual, general and local drug and non-drug prevention measures for dental diseases.		
<i>IPPH 15</i>	To evaluate the environmental impact on human health in order to assess the morbidity of the population.		
<i>IPPH 17</i>	To adhere a healthy lifestyle, to apply self-regulation and self-control techniques.		
<i>IPPH 18</i>	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 content			
Course format	Full-time Course		
Classes	Hours	Groups	
lectures	10		
practical	30		
individual student's work	65		
7. Topics and content of the Course			
Code of the classes type	Topic	Content	Code of the learning outcomes
			Educator

Л – lecture П – practical class СРС – individual student's work				
Л-1	Subject and tasks of molecular biology. The main stages of development. Prospects for the application of modern advances in molecular biology in clinical medicine.	To acquaint students with the basis of molecular biology. To consider the main developmental stages of molecular biology. To point out on application of molecular biology in medical practice.	ЗН-1, ЗН-2, АВ-1, К-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
Л-2	Genomic organization in non-cellular and cellular organisms. Regulation of gene expression.	To consider the structure and functions of viral genomes, the Lac operon of <i>E. coli</i> and the exon-intron organization of the eukaryotic genomes. To draw students' attention to the realization of genetic information, which is carried out through the transfer of information encoded by DNA to RNA information molecules (transcription) and the subsequent decoding of this information during synthesis of proteins (translation).	ЗН-2, К-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
Л-3	Cell cycle. Genetic mechanisms of carcinogenesis.	To acquaint students with the basic concepts of the cell cycle and its regulation. To draw students' attention to the general characteristics of the genes involved in carcinogenesis.	ЗН-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
Л-4	Genetic engineering. Transgenic organisms. Gene therapy: prospects for application in medicine.	To acquaint students with modern methods of DNA diagnostics and basis for the application of these methods in forensic medicine. To draw students' attention to the methods of searching for specific recombinant DNA. To study the principles of gene therapy.	ЗН-3, К-2, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

Л-5	Cell engineering. Cloning of organisms. Biological and ethical problems of cloning.	To consider the basic methods of cloning organisms. Prospects for the application of cell engineering in medicine.	3H-3, K-3, AB-1 AB-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-1	General characteristic of macromolecules.	Acquaint students with the structure and functions of proteins, adenosine triphosphate and nucleic acids. To introduce the concept of proteomics. Viroids and prions - infectious agents.	3H-1, 3H-2, УМ-1, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-2	Nucleic acids and their role in the storage of hereditary information.	To consider types of nucleic acids. To study the gene structure of pro- and eukaryotes. Structure of nucleic acids. Functions of nucleic acids as the unit of the genetic code, which ensures the organisation of the flow of biological information in the cell; characteristics of the genetic code and its properties.	3H-1, 3H-2, 3H-3 УМ-1, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-3	Molecular mechanisms of DNA replication.	Characteristics of the DNA replication process, enzyme systems that ensure DNA replication.	3H-1, 3H-2, УМ-1, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-4	DNA repair. Mechanisms of damaged DNA repair. Hereditary diseases with defects in DNA repair.	To consider the types and molecular mechanisms of DNA repair. Excisional, non-excisive, recombinant reparation. The concept of DNA repair diseases.	3H-2, 3H-3, УМ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-5	Genome structure and molecular mechanisms of gene expression in viruses.	Organization of the viral genomes. Types of viral genomes, lysogenic and lytic cycles of viruses, features of genomes and life cycles of HIV and SARS CoV-2.	3H-2, УМ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-6	Molecular mechanisms of gene expression in prokaryotes.	Structure and function of the prokaryotic operon, cytoplasmic genetic structures and mobile genetic elements of the prokaryotic genome.	3H-2, УМ-2, K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-7	Molecular mechanisms of gene expression in eukaryotes.	Exon-intron organisation of the eukaryotic genome. Levels of expression regulation of the eukaryotic genome and their	3H-2, УМ-2,	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof.

		characteristics. Mitochondrial genome.	K-1	Onufrovych O.K.
II-8	Organization of human genome	«Human Genome» Project. Nuclear and mitochondrial genome. Features of the human genome. The main types of human genome research: structural, functional, comparative, informative.	3H-2, 3H-3, YM-1, K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-9	Molecular mechanisms of mutations.	Classification of gene mutations. The concept of monogenic hereditary diseases. Molecular and cytological mechanisms of chromosomal mutations. Classification of mutations. Generative and somatic mutations. Mutagenic factors, methods of determining the mutagenic activity of substances. Commutagens and antimutagens.	3H-2, YM-2, K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-10	Cell cycle regulation. Molecular bases of oncogenetic.	To consider the mitotic cycle, its regulation. The role of cyclins and cyclin-dependent kinases in changing the phases of the mitotic cycle. Mitogenic signaling pathways. Characteristics of genes involved in carcinogenesis: viral oncogenes, protooncogenes, tumor suppressor genes, mutator genes. Carcinogenic factors.	3H-2, YM-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-11	Methods of DNA diagnosis. Recombinant DNA.	Methods of DNA isolation from plant and animal tissues. Characteristics of enzymes used for genetic engineering research. Indications for DNA diagnostics. Direct and indirect methods. DNA chips. Genetic identification of a person in forensic examination.	3H-2, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-12	Gene therapy.	Principles of gene therapy. Ex vivo and in vivo gene therapy. Viral and non-viral vectors in gene therapy. Prospects and limitations of gene therapy. DNA vaccines: method of production; advantages and disadvantages.	3H-3, YM-3, K-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-13	Transgenic organisms.	Transgenic bacteria, plants, animals: principles of their construction and directions of their use in economy and medicine. Problems and	3H-3, YM-3, K-2, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof.

		prospects of application of gene therapy, use of transgenic organisms in the national economy.		Onufrovych O.K.
П-14	Molecular-genetic methods in medicine and dentistry.	Modern molecular-cytogenetic methods: FISH method, comparative genomic hybridization, spectral karyotyping, etc. Advantages and disadvantages of molecular genetic methods for studying human heredity.	3H-2, УМ-3, K-3, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-15	Cloning of organisms and cells. Therapeutic cloning and its prospects in medicine and dentistry.	The concept of cloning. Natural and artificial clones. History of cloning organisms. Therapeutic cloning and its prospects in medicine and dentistry. Biological and ethical issues of cloning.	3H-3, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-1	Proteins, their role in providing of biological specificity. The concept of proteomics. Prion diseases	The role of proteins in providing of biological specificity. Formation of a polypeptide chain. The structure of protein molecules. Classification of proteins according to biological functions. To consider prion diseases.	3H-2, 3H-3, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-2	Mobile genetic elements. Molecular mechanisms of general genetic recombination.	To consider the mechanisms of genetic recombination. To find out the concept of mobile genetic elements and their significance in the genome organization of an organism.	3H-1, 3H-2 K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-3	Extranuclear heredity. Mitochondrial genome.	Extranuclear heredity: DNA of mitochondria and plastids. Mitochondrial genome, structure peculiarities. Mitochondrial diseases. Using mtDNA analysis to study maternal lineage, human evolution, population migration, human identification.	3H-2, K-2, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-4	Molecular mechanisms of cell aging.	Telomeric regions of chromosomes, their functions. Replication of telomeric regions of DNA. Telomerase, its activity in germ and stem cells. Participation of telomerases in the processes of cell aging and cancer therapy. Aging processes: characteristics of structural-functional and biochemical changes. Basic theories of ageing. Premature ageing syndromes in children and	3H-3, K-3, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

		adults. Gerontology and geriatrics. Issues of life expectancy and longevity.		
CPC-5	Molecular mechanisms of intercellular signaling and transmembrane transport	To consider the molecular organization and functions of biological membranes; surface receptors of cell membranes. To draw students' attention to the mechanisms of transmembrane signaling. To consider the types of substances transport.	3H-3, K-3, AB-1, AB-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-6	Modern molecular-cytogenetic methods: FISH method, comparative genomic hybridization, spectral karyotyping, etc.	Human karyotype. Obtaining samples of mitotic chromosomes, their differential staining. Molecular cytogenetic methods: FISH-method, comparative genome hybridization, spectroscopic analysis of chromosomes.	3H-2, K-1, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-7	Apoptosis: molecular mechanisms. Ways to realise the apoptosis programme.	Apoptosis as a physiological process of cellular suicide. Morphological manifestations of apoptosis. Molecular mechanisms of apoptosis. Ways to realise the apoptosis program: the role of physiological inducers of mitochondrial proteins, endoplasmic reticulum, granzyme B cytotoxic T-lymphocytes, RGD-peptides. Regulation of apoptosis by external factors and autonomous mechanisms.	3H-3, K-2, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-8	Recombinant DNA, principles of their construction. Cloning of nucleic acid fragments <i>in vivo</i> . The concept of vector in biology definition.	DNA sequencing. Recombinant DNA, principles of their construction. Cloning of nucleic acid fragments <i>in vivo</i> . Definition of the concept of vector in biology. Vectors: plasmids, bacteriophages, cosmids, artificial chromosomes.	3H-3, K-2, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-9	Mechanisms of carcinogenesis.	Carcinogenic factors, their classification. Carcinogens of direct and indirect action. Characteristics of genes involved in carcinogenesis: viral oncogenes, protooncogenes, tumor suppressor genes, mutator genes.	3H-2, K-2, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

CPC-10	Nucleic acid-based vaccines and their application in medicine.	Basic methods and principles of synthesis of vaccines based on nucleic acids. Prospects for their application in medicine.	3H-3, K-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-11	Genetic engineering and its methods.	Principles of work and tasks of genetic engineering; main fields of biotechnology; types of genetic engineering; stages of genetic engineering; the concept of gene therapy.	3H-2, K-3, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-12	Mutagenic factors. Methods for substances mutagenic activity determination.	Mutagenic factors, their classification. Spontaneous and induced mutations. Causes of spontaneous mutations. Chemical mutagens. Methods for determining the genotoxicity of substances: analysis of gene mutations, analysis of chromosomal and genome mutations, analysis of the DNA effect. Antimutagenesis.	3H-3, K-3, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-13	Transgenic organisms. The principle of their construction.	Basic methods and principles of construction of transgenic organisms. Problems of ecological safety.	3H-2, K-2, AB-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-14	Transgenic bacteria, plants and animals. The main areas of application in the national economy and medicine.	Methods used to construct transgenic bacteria. Application of transgenic plants. Transgenic animals as disease models and bioreactors. Application of transgenic organisms in the national economy and medicine. Recombinant drugs: insulin, interferon, somatotropin, interleukins. Genetic engineering techniques of synthesis.	3H-3, K-3, AB-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

System of classes organization

- according to 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			
Scoring system			
<i>Students are being tested and scored at each and every single class.</i>			
Criteria of evaluation:			
Learning outcome code	Code of classes type	The method of learning outcomes verification	Criteria of evaluation
		Methods of control	
<p><i>3H-1, 3H-2, 3H-3, YM-1, YM-2, YM-3, K-1, K-2, K-3, AB-1, AB-2</i></p>	<p><i>Л-1, Л-2, Л-3, Л-4, Л-5</i></p> <p><i>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</i></p> <p><i>CPC-1, CPC-2, CPC-3, CPC-4,</i></p>	<p>Types of educational activities of students are: a) lectures b) practical classes c) individual work of students (ISW)</p> <p>Thematic plans of lectures, practical classes, ISW ensure the implementation in the educational process of all topics according to the program.</p> <p>The lecture course consists of 5 lectures. The topics of the lecture course reveal the problematic issues of the relevant chapters of Genetics. During lectures, students develop theoretical basic knowledge, provides a motivational component and a general-indicative stage of mastering scientific knowledge during individual work. The lecture course makes maximum 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.</p> <p>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</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 problems, demonstrates high level of practical skills acquisition.</p> <p>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</p>

	<p><i>CPC-5, CPC-6, CPC-7, CPC-8, CPC-9, CPC-10, CPC-11, CPC-12, CPC-13, CPC-14</i></p>	<p>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 individual 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>the implementation of practical skills.</p> <p>Outstanding ("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 apractical nature, reveals inaccuracies in knowledge, is unable to assess facts and phenomena, relate them to future activities, makes mistakes in the implementation of practical skills.</p> <p>Poor ("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>
--	---	---	---

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 picture or diagram («recognition»). Control can be performed using the Misa distance learning platform.
- b) individual oral examination, interview;
- c) solving of typical situational problems;

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. This takes into account all types of work, provided by the program of the discipline. The traditional scores from discipline are converted to the points.

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

Final control		
General evaluation system	Is performed after the discipline completion 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 final control	The student attended all practical classes and received at least 120 points for current performance	
Type of final control	Credit	Criteria for crediting. The semester credit from disciplines is held after the end of its study, before the exam session. All topics submitted for current control must be included.

Maximum quantity of points, which student can collect for the current educational activity for admission to the exam (differentiated credit) makes 200 points.

Minimum quantity of points, which student can collect for the current educational activity for admission to the credit makes 120 points.

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

$$x = \frac{CA \times 200}{5}$$

The assessment of the discipline, the form of final control of which is credit, is based on the results of the assessment of current educational activities and is marked on a two-point scale: "pass" or "fail". To pass the discipline, the student must collect for the current educational activity not less than 60% of the maximum amount of points (for a 200-point scale - not less than 120 points). Scores and grades ("pass" or "fail") the teacher puts in the examination sheet and in the student's record book (except for a failing grade). The scores from discipline are converted to the ECTS scale. Grade F (failing grade). Grade F (unsatisfactory with obligate repeat of the course) is awarded to students who have attended all classes in the discipline, but did not collect the minimum number of points for the current academic activity. Such students receive a grade "fail" and are not allowed to take the exam session.

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

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

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

Points from discipline	Estimation on 4-point scale
From 170 to 200 points	5
From 140 to 169 points	4
From 139 points to minimal quantity of points, which student must collect	3
Less than minimal quantity of points, which student must collect	2

Estimation of ECTS and traditional scale is not converted because the ECTS scale and 4-point scale are independent.

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 "Modern problems of molecular biology" 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. Recommended 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. Paryzhak S.Ya., Odnorih L.O. Medical biology and parasitology. Manual for the first-year students of the English department, the faculties of medicine and dentistry. – Lviv: Danylo Halytsky Lviv National Medical University, 2021. – 306 p.
4. Step 1. Lecture notes 2018 Biochemistry and Medical genetics. New York. Kaplan, Inc. – 2018 – 403 c.

Additional:

1. Kaplan Medical's USMLE STEP 1. Biochemistry and Medical Genetics. Lecture notes. – 2018. – 432 p.
2. 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.
3. Rautenstrauss B.W., Liehr T. FISH technology. – Berlin: Springer, 2012, 494 p.

Informational resources:

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

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

Methodological support

- Working program 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 (credit).

12. Additional information

Responsible for the educational process at the department – Associate Professor 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

Compilers of Syllabus,

Ph.D., Associate Professor

Solomiya PARYZHAK

Ph.D., Associate Professor

Olena KORCHYNSKA

Head of the Department,

Doctor of Biological Sciences, Professor

Zinoviy VOROBETS