



## SYLLABUS OF THE DISCIPLINE «MEDICAL GENETICS»

<b>1. General information</b>	
<b>Faculty</b>	Faculty of Foreign Students
<b>Education Programme</b> (Education sector, speciality, level of high education, form of study)	22 Healthcare, 221 Dentistry, 2 nd (master's) degree of Higher Education, full-time
<b>Year</b>	2023-2024
<b>Discipline, code</b> (e-mail on the website of the Danylo Halytsky Lviv National Medical University)	Medical genetics, BB1.26 <i>e-mail</i> <a href="mailto:Kaf_medicalbiology@meduniv.lviv.ua">Kaf_medicalbiology@meduniv.lviv.ua</a>
<b>Department</b> (name, address, 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 <i>e-mail</i> <a href="mailto:Kaf_medicalbiology@meduniv.lviv.ua">Kaf_medicalbiology@meduniv.lviv.ua</a> <i>e-mail</i> <a href="mailto:kaf_med_biol@ukr.net">kaf_med_biol@ukr.net</a>
<b>Head of the Department</b> ( <i>e-mail</i> )	Vorobets Zinovij Dmytrovych, Doctor of Biological Sciences, Professor <i>e-mail</i> <a href="mailto:Kaf_medicalbiology@meduniv.lviv.ua">Kaf_medicalbiology@meduniv.lviv.ua</a>
<b>Academic year</b> (year, when the study of the discipline is realized)	I course
<b>Semester</b> (semester, when the study of the discipline is realized)	I
<b>Type of discipline</b> (obligatory / selective)	Selective
<b>Educators</b> (names, surnames, Scientific Degree and Academic Titles, e-mail)	1. Paryzhak S.Ya. – Ph.D., Associate Professor sola.paryzhak@gmail.com 2. Onufrovych O.K. – Ph.D., Associate Professor onufrovychok@gmail.com <i>e-mail</i> <a href="mailto:Kaf_medicalbiology@meduniv.lviv.ua">Kaf_medicalbiology@meduniv.lviv.ua</a>
<b>Erasmus</b> yes/no (availability of the discipline for students in framework of Erasmus+ program)	No
<b>Person, responsible for syllabus</b> (person, who is to be given comments concerning syllabus, contact e-mail)	Olena Onufrovych – Ph.D., Associate Professor onufrovychok@gmail.com
<b>Quantity of ECTS credits</b>	3,5
<b>Quantity of hours</b> (lectures/ practical classes/ individual work)	Total – 60 (Practical classes – 20, Individual work – 40)
<b>Language of Instruction</b>	English
<b>Information about consultations</b>	According to the schedule
<b>2. Brief review of the subject</b>	

The discipline «Medical genetics» (elective course) is studied by students of the first year of study. The course is based on previously studied by students at secondary school subjects such as «General Biology», is integrated with the discipline «Medical Biology». The rapid development of medical genetics has been made possible by the development of embryology, human anatomy and physiology, cytology, biochemistry and classical genetics. The realization of the international project «Human Genome» has led to the fact that today man is one of the best studied objects of molecular genetics. In a short time, genetic diagnosis and gene therapy of many hereditary anomalies, which until recently were considered incurable, became possible. This determines the relevance of in-depth study of general genetics and medical genetics in particular.

Knowledge of the basics of medical genetics are necessary to understand the basic principle that any human pathology is to some extent related to heredity. The discipline provides general biological training for the study of modern problems and achievements of genetics, including molecular genetic diagnostics, pharmacology, gene therapy. Teaching the discipline includes lectures, practical classes, independent work of students and ends with a credit. «Medical genetics» (elective course) lays the foundation for further mastering by students of knowledge and skills in specialized theoretical and clinical professional and practical disciplines (bioorganic chemistry, pharmacology, physiology, medical genetics, clinical immunology, infectious diseases, pediatrics, etc.).

### **3. Aim and goals of the subject**

**The aim** of teaching the discipline «Medical Genetics» follows from the objectives of the educational and professional training program for graduates of higher medical education and is determined by the content of those systemic knowledge and skills that must be mastered by a dental student. The study of modern problems of molecular biology generates in students a holistic idea of the formation of knowledge and practical skills for further study by students of a block of disciplines that provide scientific and professional training for mastering modern problems and achievements of molecular medicine.

**1.2. The ultimate goals** of educational discipline «Medical genetics» are:

1. To explain regularities of the vital functions of organism of a human at the molecular-genetic and cellular levels.
2. To determine the displays of action of general biological laws in ontogenesis of human.
3. To understand the molecular-genetic basis for the development of hereditary and multifactorial diseases, prospects for the application of the achievements of medical genetics in practical medicine.
4. Be able to explain the nature and mechanisms of manifestation in the phenotype of hereditary human diseases.

#### **1.3 Competencies and learning outcomes.**

The discipline «Medical genetics» provides students with the acquisition of competencies:

**Integral:** the ability to interpret the general biological patterns that underlie the processes of human life.

#### **General (3K):**

- 3K 1. Ability to 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 the acquired knowledge in their practice.
- 3K 4. Ability to communicate in the state language both orally and in writing.
- 3K 5. Ability to communicate in English.
- 3K 6. Skills in the use of information and communication technologies.
- 3K 7. Ability to search, process and analyze information from different sources.
- 3K 8. Ability to adapt and act in a new situation.
- 3K 9. Ability to identify, pose and solve problems.

3K 10. The ability to be critical and self-critical.  
 3K 11. Ability to work in a team.  
 3K 12. The desire to protect the environment.  
 3K 13. The ability to act socially responsibly and consciously.  
 3K 14. The ability to exercise their rights and responsibilities as a member of society, to realize 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 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.

**Special (ΦK):**

ΦK 2. The ability to interpret the results of laboratory and instrumental research.  
 ΦK 13. Ability to assess the impact of the environment on the health of the population (individual, family, 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**

<b>List of the learning results</b>		
<b>Code of education results</b>	<b>Essence of education results</b>	<b>Matrix of competencies</b>
<i>The code is created when filling the syllabus (category: 3H - knowledge, YM - ability, K - competence, AB - autonomy and responsibility)</i>		Symbol of the Program Learning Outcome Code in the Higher Education Standard (IIPH – program learning outcomes).
<i>3H-1</i>	Molecular mechanisms of storage and realization of hereditary information. Molecular mechanisms of intercellular signaling and transmembrane transport. Molecular mechanisms of human variability Types of mutational variability. Molecular mechanisms of action of certain mutagenic factors and methods of studying mutagenic activity, mechanisms of action of antimutagens. Organization of structural eukaryotic genes, principles of regulation of gene expression in pro- and eukaryotes. Peculiarities of the organization of genomes of viruses, prokaryotes, eukaryotes. Modern methods of studying the human genome. Regulation of the mitotic cycle, molecular mechanisms of oncogenesis, main mechanisms of apoptosis.	IIPH 7, 15, 17, 18.

<i>3H-2</i>	To know modern methods of molecular genetic diagnostics and their use in medicine. The concept of biotechnology and genetic engineering. Principles of creation of transgenic organisms and possibilities of their use. Principles of animal cloning and the importance of the method for biology and medicine. Principles of gene therapy, its achievements and prospects.	
<i>3H-3</i>	To know and apply knowledge of modern advances in medical genetics in practical medicine and dentistry.	
<i>3H-4</i>	To know how to use your own professional activities to preserve the environment.	
<i>YM-1</i>	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.	
<i>YM-2</i>	To be able to determine the type of gene, chromosomal and genomic mutations.	
<i>YM-3</i>	To be able to explain to the patient and his family the main causes of mutations and their connection with hereditary diseases	
<i>YM-4</i>	To be able to form the requirements of environment protection	
<i>K-1</i>	Ability to use in the dentist's practice the knowledge of the molecular basis of heredity, the mechanisms of development of hereditary and acquired human diseases	
<i>K-2</i>	Apply knowledge of the peculiarities of human ontogenesis and its connection with phylogeny in the diagnosis and treatment of human diseases.	
<i>K-3</i>	To be able to explain to the patient and his family the molecular and biological basis of the use of methods of medical cell genetics, the biological basis of aging.	
<i>K-4</i>	To assess the impact of environmental factors on human health, use your own professional activities to preserve the environment.	
<i>AB-1</i>	Be responsible for mastering the relevant knowledge and skills.	
<i>AB-2</i>	To manifest responsible attitude and care for the environment.	
	<b>Program learning outcomes (IPPH)</b>	
IPPH 7.	To analyze the epidemiological situation and carry out mass and individual, general and local drug and non-drug prevention measures for dental diseases.	
IPPH 15.	To assess the impact of the environment on the state of the population health in the conditions of a medical institution according to standard methods.	
IPPH 17.	To lead a healthy lifestyle, use self-regulation and self-control techniques.	

ИПН 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.	
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### 6. Course content

<b>Discipline format</b> ( <i>day-time, or extramural</i> )	Day-time	
<b>Classes</b>	Hours	Quantity of groups
<b>lectures</b>	10	2
<b>practical classes</b>	30	2
<b>seminars</b>	-	-
<b>individual works</b>	65	2

### 7. Topic content of the course

Code of class	Topic	Content	Code of education results	Educator
Л-1 ( <i>lecture-1</i> )	Subject and tasks of medical and molecular genetics.	To acquaint students with the basics of medical genetics, to consider the mechanisms of preservation and realization of hereditary information, as well as molecular mechanisms of human variability. The place of medical genetics in the system of medical knowledge. The practical significance of medical genetics.		
Л-2	Methods of human inheritance investigation.	Consider the main methods of studying heredity used in medical genetics. Practical use of methods in medicine.		
Л-3	Hereditary diseases: classification, mechanisms of occurrence	To acquaint students with the basic concepts and classifications of hereditary diseases. Describe the mechanisms of their occurrence. To draw students' attention to the general characteristics of the genes involved in carcinogenesis.		
Л-4	Peculiarities of the human mitochondrial genome. Human	Mitochondrial diseases are a heterogeneous group of diseases caused by genetic, structural, biochemical		

	mitochondrial pathologies.	defects of mitochondria and tissue respiration disorders.		
Л-5	Medical and genetic counseling and prenatal diagnostics.	Consider ways and types of prevention of hereditary diseases. To study the methods of medical and genetic counseling, the principles of assessment of genetic development in various pathologies. Also find out the general indications to the MGC.		
П-1 (practical class 1)	The subject and tasks of medical genetics. Cytological basics of human heredity	The role of medical and genetic knowledge in the practical work of a doctor. The place of medical genetics in the system of medical knowledge, the relationship of medical genetics with other clinical disciplines. The growth of the share of hereditary pathology in the structure of morbidity, mortality and disability of the population. Relative growth in the number of hereditary diseases: population-genetic, environmental, socio-economic and demographic aspects. Consider the cytological basis of heredity.	ЗН-1, ЗН-2, УМ-1, К-1, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-2	Mutations as the main etiological factor in the development of hereditary pathology	Types of gene mutations. Variety of manifestations of mutations at the clinical, biochemical, molecular-genetic levels. Effects of pre- and postnatal realization of mutant genes. General questions of etiology and pathogenesis of monogenic diseases.	ЗН-2, УМ-2, К-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
П-3	Drug mutagenesis, teratogenesis, carcinogenesis Testing of substances for mutagenicity	Ecogenetic diseases. Etiology and pathogenesis. Classification. Nosological forms with various provoking factors (medicines, food, climate). Occupational diseases as ecogenetic in the case of small doses. Assessment of	ЗН-2, УМ-3, К-1, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

		professional suitability from an ecogenetic point of view. Hereditary factors of susceptibility to infectious diseases. Hereditary pathological reactions to drugs.		
II-4	Gene (molecular) diseases, mechanisms of their occurrence and principles of laboratory diagnostics	To find out the main mechanisms of genetic diseases: changes in the structure of the genetic species; changes at the level of transcription, changes at the level of translation. Consider the principles of laboratory diagnosis of molecular diseases.	3H-2, 3H-3, УМ-1, K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-5	Characteristics of molecular diseases	The basic principles of classification of human molecular diseases are based on the study of metabolism and characterization of metabolic processes.	3H-2, 3H-3 УМ-2, K-1, K-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-6	Methods of human inheritance investigation.: biochemical methods and their application in the study of genetic (molecular) human diseases.	Biochemical methods as the main modern methods of research of genetic (molecular) diseases. General characteristics of diseases included in the program of extended mass screening of newborns and stages of their diagnosis.	3H-1, 3H-2, УМ-3, K-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-7	Human chromosomal diseases	To consider the mechanisms of occurrence and classification of human chromosomal diseases.	3H-1, УМ-1, K-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-8	General characteristics of human mitochondrial pathology. Clinic, diagnosis, treatment.	Classification of mitochondrial diseases. Mitochondrial heredity. Mitochondrial diseases caused by mutations in mitochondrial DNA.	3H-2, 3H-3 УМ-3, K-3, AB-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-9	Methods of human chromosomal diseases investigation	Consider the basic research methods used by medical genetics. Practical use of methods in medicine.	3H-3, УМ-3, K-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

II-10	Genetics of ontogenesis	Genetics of ontogenesis as a science. Its tasks. Peculiarities of the genetics of prenatal ontogenesis. The concept of morphogens. Congenital defects. Types, examples. Peculiarities of the genetics of postnatal ontogenesis.	3H-3, УМ-3, К-3, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-11	General characteristics of multifactorial diseases. Determination of genetic predisposition. Prevention measures. Fundamentals of ecological genetics, pharmacogenetics	Characteristics of multifactorial diseases: high frequency in the population; the nature of gender and age differences; features of the spread of predisposition genes and the prevalence of diseases in families.	3H-3, 3H-4, УМ-4, К-3, К-4	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-12	Congenital defects: classification, etiology, diagnosis and prophylaxis	The study of the classification of hereditary diseases is the basis for better early diagnosis of metabolic diseases and increases the possibility of correction of certain metabolic diseases through certain diets.	3H-4, УМ-4, К-4, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-13	Methods of prenatal diagnosis of a human	To consider non-invasive and invasive methods of human prenatal diagnosis, their importance in the early detection of malformations and hereditary diseases.	3H - 1 - 3 УМ - 3 - 5 К-1,4 АВ - 1,2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-14	The concept of gene therapy	Prospects and reality of the use of gene therapy in oncology. 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.	3H-4, УМ-4, К-4, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
II-15	Levels and ways of hereditary diseases prophylaxis	Consider the main indications for medical and genetic counseling, levels and ways of prevention of hereditary diseases.	3H-1-4, УМ-3, 4, К-3,4, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.



CPC-1 ( <i>individual work 1</i> )	Mechanisms of genotypic variability.	Genotypic variability (hereditary variability) is due to the emergence of different types of mutations and their combinations, which are inherited and subsequently manifested in the offspring.	3H-1-3 УМ-1,2 К-1 АВ-1,2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-2	Mobile genetic elements. Molecular mechanisms of general genetic recombination	Mobile genetic elements of the human genome (MGE): transposons, retrotransposons. Structure, distribution and functional role. Chromosomal and gene localization of MGE. The role of MGE in the functioning of the genome, participation in recombination processes, regulation of gene activity and in the formation of new genes.	3H-2, К-1, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-3	. Characteristics of the mitochondrial genome	Extranuclear heredity: DNA of mitochondria and plastids. Mitochondrial genome, structure features. Mitochondrial diseases. Use of mtDNA to study maternal kinship, human evolution, population migration, human identification	3H-2, К-1, АВ-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-4	Immunogenetics and its practical use in medicine	Immunogenetics is a science that combines immunological and genetic research methods. It studies the hereditary condition of blood groups, types of hemoglobin, enzymes, serum proteins, milk and others. Immunogenetics uses methods of immunology to solve genetic problems.	3H-1,2, К-3, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-5	. Embryonic stem cells as a promising therapeutic direction of treatment	Structure and functioning of embryonic stem cells. Their significance for embryogenesis.	3H -4, УМ -4, К-3, АВ -2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

CPC-6	Syndromes of premature aging	<p>Aging processes: features of structural - functional and biochemical changes. Basic theories of aging.</p> <p>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. Syndromes of premature aging in children and adults. Gerontology and geriatrics. Problems of life expectancy and longevity.</p>	3H -4,5, УМ - 3 – 5, K-3, AB -1,2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-7	Modern molecular cytogenetic methods: FISH method, comparative genomic hybridization, spectral karyotyping, etc.	<p>Human karyotype. Obtaining drugs of mitotic chromosomes, their differential color. Molecular cytogenetic methods: FISH method, comparative genome hybridization, spectroscopic analysis of chromosomes.</p>	3H - 1 - 5 УМ - 1 - 5 K-1 - 4 AB -1,2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-8	Recombinant DNA methods, nucleic acid hybridization	The essence of recombinant DNA methods, hybridization of nucleic acids, their application in medicine and dentistry.	3H -3, УМ -2, K-4, AB -2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-9	Genome structure and general characteristics of human genes	<p>Human Genome Project. Nuclear and mitochondrial genome. Features of the human genome. The main directions of research of the human genome: structural, functional, comparative, informative.</p> <p>Knowledge of the human genome opens new avenues in the diagnosis and treatment of hereditary human diseases.</p>	3H-2, УМ-2, K-1	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.

CPC-10	Mutagens. Stages of mutagenesis	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 genomic mutations, analysis of the DNA effect. Antimutagenesis.	3H-4, УМ-4, К-4, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-11	Multifactorial diseases. Fundamentals of ecological genetics	Get acquainted with multifactorial diseases and features of proliferation of predisposition genes.	3H-3, 3H-4, УМ-4, К-3, К-4	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-12	Oncogenetics. Diagnosis of hereditary predisposition to cancer	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-4, УМ-4, К-4, АВ-2	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-13	Amino acid metabolism disorders: phenylketonuria, homocystinuria, albinism and alkaptonuria. Types of inheritance, clinical signs and diagnosis	Consider diseases that occur as a result of impaired amino acid metabolism. Clinical signs, diagnostic methods and prospects of overcoming clinical manifestations of diseases.	3H-2, 3H-3 УМ-2, К-1, К-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-14	Hereditary disorders of lipid metabolism. Diseases of Tay-Sachs, Neiman-Pick, Gaucher. Causes, clinical signs and diagnosis	Consider diseases that occur as a result of impaired lipid metabolism. Clinical signs, diagnostic methods and prospects of overcoming clinical manifestations of diseases.	3H-2, 3H-3 УМ-2, К-1, К-3	Assoc. Prof. Paryzhak S.Ya., Assoc. Prof. Onufrovych O.K.
CPC-15	Hereditary disorders of	Consider diseases that have arisen as a result of	3H-2, 3H-3	Assoc. Prof. Paryzhak S.Ya.,

	carbohydrate metabolism: galactosemia and glycogenosis. Pathogenesis and diagnosis	carbohydrate metabolism disorders. Clinical signs, diagnostic methods and prospects of overcoming clinical manifestations of diseases.	УМ-2, К-1, К-3	Assoc. Prof. Onufrovych O.K.
CPC-16	Methods of prevention of hereditary diseases	Consider ways and types of prevention of hereditary diseases. To study the methods of medical and genetic counseling, the principles of assessment of genetic development in various pathologies. To find out general indications for MGC.		Assoc. Prof. Paryzhak S.Ya., 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

#### Scoring system

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

Criteria of evaluation:

Education al results code	Kind of class Code	Educational results verification methods	Criteria of passing
		<b>Methods of control</b>	
3H-1, 3H-2, 3H-3, УМ-1, УМ-2, УМ-3, К-1, К-2, К-3,	II-1, II-2, II-3, II-4, II-5, II-6, II-7, II-8, II-9, II-10, II-11, II-12,	<b>Types of educational activities of students are:</b> a) practical classes b) individual work of student (CPC) Thematic plans of practical classes and individual work provide the discipline topics realization in educational process. <b>Practical classes</b> serve for cheking the level of students understanding of theoretical material presented at lectures, and forming practical skills. They also	<b>Criteria for evaluation. Excellent ("5")</b> – the student perfectly mastered the theoretical material of the topic, demonstrates deep and comprehensive knowledge of the topic, the main concepts of

<p>AB-1, AB-2</p>	<p>II-13 II-14 II-15 CPC-1, CPC-2, CPC-3, CPC-4, CPC-5, CPC-6, CPC-7, CPC-8, CPC-9, CPC-10, CPC-11, CPC-12, CPC-13, CPC-14 CPC-15 CPC-16</p>	<p>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.</p> <p>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.</p> <p>At the end of the lesson, the student is supposed to present their solutions of the situational tasks for the teacher to assess the level of their understanding.</p> <p>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.</p> <p>The duration of the practical lesson is 2 academic hours.</p>	<p>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>- <b>Good ("4")</b> – 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.</p> <p>- <b>Satisfactory ("3")</b> – 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</p>
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		<p>phenomena, relate them to future activities, makes mistakes in the implementation of practical skills</p> <p>- <b>Unsatisfactory ("2")</b> – 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>
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#### **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»);
- 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 work** of students is estimated during current control topics at the proper lesson and is a part of the final grade of student.

#### **The final control**

General assessment system	Is performed after the discipline completion in the form of credit.	
Assessment scales	Traditional 4-point scale, 200-point scale, ECTS rating scale	
Requirements for final control access	The student attended all the practical lessons and received not less than 120 points.	
Type of the final control	Credit	<p>Passing criteria. Semester credit in disciplines is held after the end of its study, before the examination session. All topics submitted for current control should be credited.</p>

**Maximum quantity of points**, which student can collect for the current educational activity for

admission to the 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:

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

The assessment of the discipline, the form of final control of which is a credit, is based on the results of the evaluation of current educational activities and is expressed on a two-point scale: "credited" or "not credited". To enroll in the discipline, the student should receive 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). Points and grades ("credited" or "not credited") the teacher enters in the credit-examination sheet and in the student's credit book (except for the grade "not credited"). Points of the discipline are converted into the ECTS scale. Grade F (unsatisfactory with the required re-course) at day of the credit receive students who have attended all classes of the discipline, but did not score the minimum number of points for the current academic activity. Such students receive a grade of "not credited" and are not allowed to take the exam session.

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

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

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

<b>Points from discipline</b>	<b>Estimation on 4-point scale</b>
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 course policy is determined by the requirements of the discipline learning «Medical genetics» 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 inadequate integrity are: missing of references to the used sources, cheating, 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. 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.

### 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/>

## 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.

## 12. Additional information

Responsible for the educational process at 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](mailto:Kaf_medicalbiology@meduniv.lviv.ua)

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