Syllabus

Department of Chemical Sciences, Biology and Biochemistry, working curriculum of the module "Molecular Biology, Medical Genetics"
Name and code of the specialty
"6B10115" Medicine

1.	**General information about the discipline**		
1.1	**Module code: MVGE-1203**	1.6	**Academic year: 2025/2026**
1.2	Name of the module's disciplines: "Molecular biology, medical genetics"	1.7	Course:1
1.3	Prerequisites: a school course in biology, physics, and chemistry	1.8	Semester:1
1.4	Postrequesites: "Biochemistry, histology"	1.9	Number of credits (ECTS): 6
1.5	Cycle: DB	1.10	Component: VK
2.	Description **of the** discipline		
Integrated discipline: formation of knowledge about cell structure, polymorphism, biomembranes, tissue organization, molecular mechanisms of biopotentials, regulation of acid-base states and their role in pathologies; about the basic concepts and principles of genetics: structure and function of genes, mechanisms of inheritance and mutation; skills: analyze and interpret genetic data; explain hereditary laws and their application in practical situations, such as predicting the risk of developing genetic diseases in children. The acquired knowledge will allow in medical practice: to successfully prevent genetic diseases in children; proper patient counseling and the development of individual treatment plans; to effectively interact with patients and colleagues in the field of genetics and heredity.			
3	**The form of the summative assessment**		
3.1	**Testing +**	3.5	Coursework
3.2	Written form	3.6	Essay
3.3	**Verbal**	3.7	Project
3.4	OSPE/OCE or the reception of practical skills	3.8	Other (indicate)
4.	**Objectives of the discipline**		
Formation of **students' modern knowledge about** the **basic molecular genetic and cellular mechanisms** of **body functioning,** the **basics** of **genetics and embryology,** the **biological foundations** of the **vital** activity of **organisms and their application for** the **subsequent assimilation** of **biomedical, clinical disciplines and in practical medicine.**			
5	**Final learning outcomes (RO disciplines)**		
		PO1. Applies in practice fundamental knowledge in the field of biomedical, clinical, epidemiological and socio-behavioral sciences.	

		RO11. Analyzes the effectiveness of diagnosis and treatment outcomes, applying the principles of personalized medicine. **RO13.** Evaluates the health indicators of the population and its physical, radiological, chemical, and biological-environmental determinants, using advanced technologies to identify hidden patterns and predict risks.				
5.1	**RO disciplines**	**Learning outcomes of the OP, which are related to the following disciplines**				
	RO1, RO11-RO1	**Applies in practice fundamental knowledge in** the **field** of **molecular biology**, **medical genetics and embryology. Understands** the **molecular foundations** of **cell structure and function, regulation** of **gene** expression**, matrix syntheses,** and **mutation.** **Demonstrates knowledge and understanding about** cell **structure and cell components.**				
	RO1, RO11-RO2	Knows and able to apply the knowledge of the hereditary apparatus in the diagnosis of hereditary diseases; the principle of karyotype analysis, performs its differential diagnosis, as well as the diagnosis of gene, chromosomal and genomic mutations. Demonstrates knowledge and understanding about destructive changes in cellular components leading to diseases.				
	RO11, RO13-RO4	Provides identification of the mechanisms of human hereditary diseases, familiarization with the methods of their diagnosis and prevention. Demonstrates knowledge of the origins and classifications of mitochondrial, lysosomal, and perixisomal diseases				
	RO13, RO13-RO14	Understands the essence of the pathological processes that occur in the process of embryogenesis, is able to recognize them. Explains the etiology, pathogenesis, and morphogenesis of various hereditary diseases				
6.	**Detailed information about the discipline**					
6.1	**Venue (building, auditorium): main building, 4th floor. 420 office.** Phone : 8 (72552) 408-212 (inner) 272. E-mail: **biology_biochemistry@mail.ru**					
6.2	**Number of hours**	**Lectures**	**Practical lessons**	**Lab. lessons**	**IWST**	**IWS**
	Molecular Biology	4	16	-	6	34
	Medical Genetics	4	16	-	6	34
	Embryology	4	16	-	6	34
		12	**48**	**-**	**18**	**102**
6.3						

№	Week/day	Lecture	Practical lessons	IWST	IWS
1 Week	Molecular Biology	1	1	2	5
	Medical Genetics	-	1	-	-
	Embryology		1	-	-
2 Week	Molecular Biology	-	1	-	-
	Medical Genetics	1	1	1	6
	Embryology	-	1	-	-
3 Week	Molecular Biology	-	1	1	-
	Medical Genetics	-	1	-	-
	Embryology	1	1	1	6
4 Week	Molecular Biology	1	1	1	5
	Medical Genetics	-	1	-	-
	Embryology		1		-
5 Week	Molecular Biology	-	1	-	-
	Medical Genetics	1	1	1	6
	Embryology	-	1	-	
6 Week	Molecular Biology	-	1		
	Medical Genetics	-	1	-	-
	Embryology	1	1	1	6
7 Week	Molecular Biology	1	1	1	5
	Medical Genetics	-	1	-	-
	Embryology	-	1	-	-
8 Week	Molecular Biology	-	1	-	-
	Medical Genetics	1	1	2	5
	Embryology	-	1	-	2
9 Week	Molecular Biology	-	1	-	-
	Medical Genetics	-	1	-	-
	Embryology	1	1	1	6
10 Week	Molecular Biology	1	1	1	5
	Medical Genetics	-	1	-	
	Embryology	-	1	-	-
11 Week	Molecular Biology	-	1	-	-
	Medical Genetics	1	1	1	6
	Embryology	-	1	-	-
12 Week	Molecular Biology	-	1		
	Medical Genetics	-	1	-	-
	Embryology	1	1	1	6
13	Molecular Biology	-	2	-	-

Week	Medical Genetics	-	1	1	6
	Embryology	-	1	-	-
14	Molecular Biology	-	1	1	6
Week	Medical Genetics	-	2	-	-
	Embryology	-	1	-	-
15	Molecular Biology	--	1	-	
Week	Medical Genetics	-	1	-	
	Embryology	-	2	2	5
		12	48	18	102

7.	**Information about teachers**		
№	Name, Surname	Degrees and positions	Email address
1.	Temirbekov A.N.	Candidate of Medical Sciences, Acting Professor	temirbekov52@mail.ru
2.	Kulbaeva B.Zh.	Candidate of Medical Sciences, Acting Professor	kbj04@mail.ru
3.	Alipbaeva G.S.	Senior Lecturer	
4	Daripbek A.Zh.	Senior Lecturer	daj.ai@mail.ru
5	Yerkekulova K.K.	Senior Lecturer	Ekk.33@mail.ru

8.	**Thematic plan**					
Week/day	Topic	Brief content	RO of discipline	Number of hours	Forms/methods/ technologies of teaching	Assessment forms/ methods
1	**Molecular Biology Lecture No. 1** Topic. Introduction to molecular biology. Structure and functions of proteins and nucleic acids. Ways of transmitting genetic information.	Definition of the concept of molecular biology and medical genetics. The structure and functions of proteins. Structures of proteins. Protein folding. Classification of proteins. Protein families. The structure and functions of NC. Classification. Forms of DNA and types of RNA. Telomeric DNA. mtDNA.	RO1	1	Overview	Feedback
	Molecular Biology Practical lesson No. 1.	Protein monomers. Primary, secondary, and tertiary cell structures.	RO1	1	Working in small groups,	Testing is an oral and

	Topic: Structure and functions of proteins. Protein folding. Protein modification and sorting.	Folding, folding factors. Foldases and chaperones. Classification of proteins and their functions.			discussing the main issues	written survey. Working with CIS materials
	Medical genetics Practical lesson No. 1 Topic: Fundamentals of classical genetics. Patterns of discrete inheritance of traits. Basic genetic terms and concepts. The laws of G. Mendel. Problem solving Basics of classical genetics.	Patterns of discrete inheritance of traits. Formulation, characteristics and concepts of the first, second and third Mendelian laws. Solving genetic problems based on Mendelian laws. Drawing up a Pennet grid. Record the task conditions.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 1 General characteristics of human ontogenesis. Stages of ontogenesis.	Definition of the concepts of developmental biology and ontogenesis. Basic concepts in the biology of individual development. Classifications of ontogenesis. Stages of ontogenesis	RO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Molecular Biology SROP/SRO No. 1 Topic:1.1 DNA sequences. 1.1.1DNA sequences: unique and repetitive. DNA repeats: tandem, dispersed, and reversed 1.1.2Simple tandem satellite repeats. Palindromes. Highly repetitive and moderately repetitive sequences 1.1.3DNA sequences of centromeric and	DNA sequences: unique and repetitive (DNA repeats). Tandem repeats. Dispersed repeats: SINE and LINE sequences, etc. The operon theory of Jacob and Mono. Inducible and repressible operons. Lactose and tryptophan operons Mechanisms Definition of the concept of cytoskeleton and motor organelles of a cell. Transport of substances through membranes: transmembrane transport	RO 1	2/5	Oral interview, presentation discussion, glossary compilation .	Oral interview

	telomeric regions of chromosomes; 1.1.4 Regulation of gene expression in prokaryotes. 1.1.5 Regulation of gene expression in eukaryotes. Topic 1.2: The cell and its functions. 1.2.1 The cell cycle. Molecular mechanisms of its regulation. 1.2.2 Mitosis. Atypical mitosis and its causes. 1.2.3 Transport of substances through membranes: transmembrane transport of low molecular weight substances 1.2.4 Transport of substances through membranes: vesicular transport of substances. 1.2.5 Cytoskeleton of the cell and motor organelles of the cell.	of low molecular weight substances. The cell cycle. Mitosis. Atypical mitosis and its causes. Mechanisms of intracellular transport of substances: transport of low molecular weight compounds, simple diffusion, facilitated diffusion, active transport (pumps, channels) Definition of the concept of cytoskeleton and motor organelles of a cell. Structure and functions of microtubules, microfilaments, cilia, and flagella				
2	**Medical genetics** **Lecture No. 1** An introduction to genetics. Fundamentals of general genetics.	The subject and tasks of genetics. The material foundations of heredity. The role of cytoplasmic factors in the transmission of hereditary information. The basic laws of inheritance. Objectives and principles of genetic analysis. Fundamentals of the hybridological method. The laws of inheritance under the monogenic control of each trait. The	RO1	1	Overview	Feedback

		general formula of splits in independent inheritance. The interaction of genes: allelic and non-allelic. Chromosomal sex determination and inheritance of sex-linked traits. The concept of hereditary and non-hereditary (modification) variability.				
	Molecular Biology Practical lesson No. 2 Topic. Structure and functions of nucleic acids.	NC monomers. Nucleoside mono-, di- and triphosphates, formation of a 3,5-phosphodiester bond. The spatial model of DNA. Primary, secondary, and tertiary structures of DNA and RNA. Primary structure of mRNA, secondary structure of tRNA. Ribosomal RNA.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 2 Topic. Patterns of discrete inheritance of traits. Basic genetic terms and concepts. The laws of G. Mendel. Problem solving	Patterns of discrete inheritance of traits. Solving genetic problems based on Mendelian laws. Drawing up a Pennet grid. Recording task conditions	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 2 Topic: Cytology. The structure of the cell.	Definition of the concept of a cell. Cytoplasm. Cytolemma, Simplast, syncytium. Organelles. Definition, classification, structure, and functions of membrane-type and non-membrane-type organelles. Classification of inclusions. Types and structure.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics of SROP/SRO No. 1 Topic: Patterns of inheritance of traits.	Definition of the concept of genetics. Definition of the basic terms of genetics. G., Mendel and his role in	RO1	1/6	Oral interview, presentation discussion,	Oral interview

	1.1. Basic concepts of genetics and karyotype. Chromosomes. Levels of organization of chromosomes. Karyotype. 1.2 Patterns of inheritance of traits established by G.Mendel. 1.3 The chromosomal theory and its main provisions. Concatenated inheritance. Morgan's Law. 1.4 Gender-related inheritance. The genetics of sex. 1.5Types of inheritance: discrete (independent) and linked; autosomal and sex-linked; monogenic and polygenic.	establishing patterns of inheritance. The chromosomal theory and its main provisions are linked inheritance. Morgan's Law. Types of inheritance: discrete (independent) and linked; autosomal and sex-linked; monogenic and polygenic.			glossary compilation .	
3	**Embryology** **Lecture No. 1** Introduction to embryology	Biology of the development of organisms. Definition of the concept. Ontogenesis is the individual development of an individual. Basic concepts in the biology of individual development. Ontogenesis and its periodization. Progenesis: gametogenesis, structure and functions of germ cells, fertilization	RO13	1	Overview	Feedback
	Molecular Biology **Practical lesson No. 3** Molecular mechanisms of realization of genetic	Three types of transfer of hereditary information. The basic dogma of molecular biology. DNA replication: basic principles. Replication	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey.

	information. DNA replication.	methods. Replication stages: initiation, elongation, and termination. The composition of the replicome. Factors of initiation, elongation, and termination of replication. Definition of the concept and function of telomeres. Replication of telomeric DNA sections. Telomerase. Role in the processes of aging and oncogenesis				Working with CIS materials
	Medical genetics. Practical lesson No. 3 Topic. Genotype and phenotype. The interaction of genes. The role of the interaction of genes and heredity in the formation of the phenotype. Problem solving.	Definition of the concept of genotype and phenotype. The interaction of allelic genes: dominance, codominance, overdominance, incomplete dominance. Interaction of non-allelic genes: epistasis: polymerization, its role in the formation of quantitative traits; complementarity. Solving genetic problems based on Mendelian laws.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 3 Cell division	Mitosis and meiosis. Phases. Features and differences. Atypical mitosis.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology SROP/SRO No. 1 Topic: Introduction to embryology and progenesis	The views of Hippocrates and Aristotle. Embryology of the XVII-XVIII centuries. Preformists and epigenetics. Works by K.F.Wolf. The development of	RO13	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview

	1.1 The history of embryology as a science. 1.2. Ontogenesis 1.3. Cell division. 1.4. Germ cells are gametes.	embryology in the 19th century. The significance of K. Baer's works. The influence of Darwinism on embryology. Comparative evolutionary direction (A.O. Kovalevsky, E. Haeckel, I.I. Mechnikov). Historical roots of experimental embryology, its modern tasks. Definition of the concept. Basic concepts in the biology of individual development: epigenesis, preformism, modernity. Periodization of ontogenesis: general biological and anthropological. Stages of development: germ cell formation, fertilization. Multicellularity, cell differentiation, and organ formation (morphogenesis). Mitosis and meiosis. Phases. Biological role. Differences between meiosis and mitosis. Anomalies of mitosis. The primary germ cells are gonocytes. Formation of primary germ cells (gonocytes) in various groups of animals (sponges, coelenterates, roundworms, crustaceans, vertebrates). Gonad differentiation in higher vertebrates: the main factors regulating gonadal sex. Migration of gonocytes to the gonad. Gametes. Evolution of germ cells.				

4	**Molecular Biology Lecture No. 2 Topic.** Matrix synthesis of nucleic acids. Mechanisms of replication, transcription, and translation.	Types of transfer of genetic information. General transfer. Replication. Stages: initiation, elongation and termination. Factors. telomere underreplication. The structure of telomerase and its function. Telomeres, aging, and carcinogenesis. Transcription and translation. Factors. gj-RNA and its maturation. mna-RNA, mRNA, splicing. Alternative splay sing. The genetic code and its properties. Ribosomes. Active centers of ribosomes.	RO1	1	Overview	Feedback
	Molecular Biology Practical lesson No. 4 Topic. Molecular mechanisms of realization of genetic information. DNA transcription.	Biosynthesis of nucleic acids. Gene expression: DNA transcription. Stages and mechanisms. Transcription factors: DNA and RNA polymerases, general and specific factors. Gna-RNA processing. RNA processing in eukaryotes. Splicing. Informosomes, spliceosomes.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Medical genetics Practical lesson No. 4 Topic. The concept of genetic homeostasis. Violation of genetic homeostasis. Gene mutations. Chromosomal and genomic mutations	Definition of the concept of genetic homeostasis. Violation of homeostasis is the cause of diseases. Mutations. Definition. Classification of gene mutations. Classifications of chromosomal and genomic mutations. Biological antimutagenic barriers of the cell. Homogenous dysomias, imprinting. Single nucleoid polymorphism. The concept of chromosomal aberrations; Mutagenesis and species. Mutagenic factors.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 4 Progenesis. Gametogenesis.	Definition of the concept. Gonocytes. Zones of gametogenesis. The essence of the process. Spermatogenesis and oogenesis. Ovogenesis: localization, stages, age-related changes. The construction of a mature human egg. Classification of eggs.Spermatogenesis: localization, stages, age-related changes. The structure and number of spermatozoa. Male fertility. The main events occurring in human ovogenesis and spermatogenesis.	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Molecular Biology of SROP/SRO No. 3 Topic: DNA transcription. 3.1Eukaryotic and prokaryotic transcription factors. 3.2.gnRNA processing. Splicing, spliceosomes, 3.3. DNA departments. Types of RNA. 3.4Transcription factors of prokaryotes and eukaryotes. 3.5. The mechanism of splicing of RNA, infosomes, spliceosomes, and U-RNPs, U-RNA. Alternative splicing.	DNA transcription. Eukaryotic and prokaryotic transcription factors. DNA transcription. gnRNA processing. Splicing, spliceosomes, Departments of DNA. Types of RNA. Transcription factors of prokaryotes and eukaryotes. The mechanism of RNA splicing, informosomes. Spliceosomes, U-RNP, and U-RNA. Alternative splicing.	PO1	1/5	Oral interview, presentation discussion, glossary compilation .	Oral interview
5	**Medical genetics Lecture No. 2** The topic is An introduction to medical genetics. Methods of human genetics research.	The subject and objectives of medical genetics. Features of the study of human genetics. Methods of studying human genetics: twin, dermatoglyphics and palascopy, genetics of somatic cells, population-static, biochemical, cytogenetic, clinical and genealogical. The principle of pedigree analysis	PO1	1	Overview	Feedback
	Molecular Biology Practical lesson No. 5 Topic. Molecular mechanisms of realization of genetic information Translation of RNA. Types of RNA. The genetic code and its properties.	Protein biosynthesis. The genetic code and its properties. Types of RNA. Ribosomes. Functional centers of ribosomes. Stages of protein biosynthesis: initiation, elongation, and termination. Protein modification.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Medical genetics Practical lesson No. 5 Topic. The chromosomal theory of heredity. Gender-related inheritance. Types of inheritance. Problem solving.	Definition of the concept of inheritance linked to gender. Characteristics of inheritance types. Solving problems of linked inheritance and gender-linked inheritance	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 5 Progenesis. Morphology of germ cells	Egg cell: structure, types according to the amount of yolk and its location, shell. Spermatozoon: the head of the spermatozoon, the acrosome and the tail section	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics SROP/SRO No. 2 Topic: Monogenic diseases 2.1Monogenic diseases resulting from changes in protein structure. 2.2Monogenic diseases with an unconventional form of inheritance. Definition of heredity, causes, classification, clinical signs, types. 2.3 Genocopies and phenocopies. 2.4 Monogenic diseases with an unconventional type of inheritance: motherhood-some heredity, genetic and genomic imprinting, expansion of three-nucleotide repeats.	The state of protein metabolism is normal. Changing the protein balance in the process of individual development. Changes in protein metabolism in pathological conditions. Monogenic diseases. General characteristics of monogenic pathology. Classification of monogenic diseases: by type of inheritance, by organ and systemic form: by etiology; by metabolic disorders.	PO1	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview
6	**Embryology Lecture No. 2**	Fragmentation of the human zygote. The concept	PO13	1	Overview	Feedback

	The actual embryonic stage of human embryogenesis	of morula and blastula. Implantation of the human embryo. Gastrulation: phases of human gastrulation. The concept of gastrula. Neurulation. Formation of germ layers: derivatives of the embryonic ecto-, meso-, endoderm and mesenchyme. Elementary cellular mechanisms of ontogenesis: determination (ooplasmic regression and embryonic induction), proliferation, differentiation, migration of cells and plateaus, selective cell sorting, programmed cell death. Differentiation of the germ layers: derivatives of the germ ecto-, meso-, endoderm and mesenchyme. Organo-, histo, and morphogenesis.				
	Molecular Biology Practical lesson No. 6 Topic. Regulation of gene expression in prokaryotes and eukaryotes.	Regulation of gene activity in prokaryotes at the transcription level: by the mechanism of induction (lactose operon) and repression (tryptophan operon). Regulation of gene activity in eukaryotes: at the level of DNA, transcription, mRNA processing, translation, posttranslation regulation	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 6 Topic. The concept of genetic homeostasis. Violation of genetic homeostasis. Gene mutations.	Definition of the concept of genetic homeostasis. Violation of homeostasis is the cause of diseases. Mutations. Definition. Classification of gene mutations. Classifications of chromosomal and	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with

		genomic mutations. Biological antimutagenic barriers of the cell. Homogenous dysomias, imprinting. Single nucleoid polymorphism. The concept of chromosomal aberrations; Mutagenesis and species. Mutagenic factors. Definition of concepts. Phases of fertilization. Conditions of fertilization. The gamoons. Capacitation, Monospermia. Acrosome and cortical reactions. Dicarion, Syncarion. The zygote. Parthenogenesis. Gynogenesis and androgenesis.				CIS materials
	Embryology Practical lesson No. 6 Progenesis. Fertilization and parthenogenesis.	Definition of concepts. Phases of fertilization. Conditions of fertilization. The gamoons. Capacitation, Monospermia. Acrosome and cortical reactions. Dicarion, Syncarion. The zygote. Parthenogenesis. Gynogenesis and androgenesis.	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology SROP/SRO No. 2 **Topic:** Progenesis and early embryogenesis 2.1. Gametogenesis. 2.2. Fertilization 2.3. Parthenogenesis. 2.4. Fragmentation.	The main periods of oogenesis and spermatogenesis are reproduction, growth, and gamete maturation. Comparison of spermatogenesis with oogenesis. Distant interactions of gametes. Sperm capacitation: the importance of this process for ensuring the fertilization process. Contact interactions of	PO13	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview

		gametes. Sperm activation is an acrosome reaction. Features of the acrosome reaction in mammals. Egg activation is a cortical reaction. Parthenogenesis. Classification of types of parthenogenesis. Parthenogenesis in vertebrates and invertebrates. Induced mammalian parthenogenesis. Gynogenesis. Androgenesis. Characteristics of crushing. The biological meaning of crushing. Features of cell cycles during crushing: synchronous and asynchronous crushing. Features of crushing in humans. fragmentation. The moments of inclusion of maternal and paternal genes. Spatial organization of fragmentation. The value of the yolk quantity and distribution. The Sachs-Hertwig Rules. Formation of a blastula. The blastocyst.Blastocyst formation. Hatching blastocysts. Implantation of a blastocyst.				

7	**Molecular biology of the cell** **Lecture No. 3** **Topic.** Molecular biology of the cell. Plasmolemma and its functions Transport of substances through biomembranes. The adhesive function of membranes.	Cytoplasm. Membrane and non-membrane organelles of the cell. Structure and functions. The adhesive function of membranes. Adhesive membrane proteins. Intercellular contact. Definition of the concept of cellular signaling. Mechanisms of intracellular transport of substances. Passive and active transport, endocytosis and exocytosis.	PO1	1	Обзорная	Обратная связь
	Molecular Biology **Practical lesson No. 7** **Topic.** The genetic apparatus of the cell. The structure of eukaryotic and prokaryotic genes. The gene and chromosome level. Karyotype.	The genetic apparatus of the cell. The gene, its classification, fine structure and properties. The structure of the genes of prokaryotes and eukaryotes. Cluster genes. The genome, DNA departments, and the organization of the human genome. Chromosomes, morphology, classification. Human karyotype. Karyotype classifications.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics **Practical lesson No. 7** **Topic:** Violation of genetic homeostasis. Chromosomal and genomic mutations.	Violation of genetic homeostasis. Definition of the concept of chromosomal and genomic mutations. Mechanisms of development of chromosomal and genomic mutations. Classification of mutations: intra-chromosomal and inter-chromosomal, aneuploidy, Polyploidy.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology **Practical lesson No. 7** Subject: Fragmentation.	Fragmentation and its types; the difference between embryo fragmentation and mitotic division of somatic cells;	PO13	1	Working in small groups, discussing	Testing is an oral and written survey.

		structure and types of blastulas; blastocyst.			the main issues	Working with CIS materials
	Molecular Biology of SROP/SRO No. 4 Translation of RNA. The genetic code and its properties 4.1 Translation of RNA. Principles of encoding genetic information 4.2 Ribosomes. Structure and functional centers of ribosomes. Types of ribosomes. Polyribosomes. 4.3 Stages of RNA translation. 4.4. Protein folding. 4.5 Modification of proteins	1. Properties of the genetic code. Functional regions of mr RNA. Ribosomes. A model of ribosome structure, functional sections of ribosomes. 2. Activation of amino acids. initiation of a polypeptide chain, elongation of a polypeptide chain, termination of a polypeptide chain and dissociation; folding of a protein molecule, modification of a protein. To summarize the results of mastering the theoretical and practical material	RO1	1/5	Oral interview, presentation discussion, glossary compilation .	Oral interview
	Term control No. 1	Testing, situational problem solving, oral interview. Assessment of test results and situational tasks. (checklist for the assessment of the TC).				Testing, situational problem solving, oral interview. Assessment of test results and situational tasks.

8	**Medical genetics Lecture No. 3 Topic:** Hereditary human diseases. Monogenic, polygenic, or multifactorial diseases. Chromosomal diseases and diseases with an unconventional type of inheritance	Hereditary diseases. Genetic mechanisms of occurrence. General characteristics of monogenic pathology. Classification of monogenic diseases. Polygenic diseases (MB). Molecular and genetic analysis of the mechanisms of MB development. Definition of the concept and chromosomal diseases. MB classification. Multiple congenital malformations (MVP). Etiology, clinic and genetics of syndromes. Definition of the concept of diseases with a non-Mendelian type of inheritance.	PO1	1	Overview	Feedback
	Molecular Biology Practical lesson No. 8 Topic. The cell cycle and the molecular mechanisms of its regulation.	The cell cycle and its periods. Cell cycle regulation: cyclins and cyclin-dependent kinases (CCK), mitosis-stimulating factor (MCF). Control points of the cell cycle. The regulatory role of p-53 proteins. Apoptosis.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 8 Topic. The influence of the environment on the formation of the phenotype. Variability. The reaction rate. Genocopies and phenocopies.	Definition of the concept of environment and environmental factors. The reaction rate. Forms of reaction norms. Definition of the concept of genocopy and phenocopy. Definition of the concept of variability. Types of variability: genotypic, phenotypic, modification and random, combination and mutation. Generative and somatic variability	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Embryology Practical lesson No. 8 Embryogenesis. Gastrulation.	Definition of the concept, structure of gastrula; methods of gastrula formation. Differentiation of the mesoderm. Formation of axial and pharmacological organs. Germ layers and their derivatives. Mesoderm and mesenchyme, their derivatives.	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics SROP/SRO No. 3 Topic:1 Chromosomal diseases. 3.1.1 The role of heredity and environment in the formation of diseases. Chromosomal diseases and their place in general human pathology. Teratogenesis. VPR 3.1.2 The concepts of genotype and phenotype. Types of interaction of allelic genes 3.1.3.Chromosomal diseases. Etiology and classification. Manifestations of chromosomal abnormalities in ontogenesis. 3.1.4. Genotype and phenotype. Interaction of non-allelic genes. Topic 2: Population genetics 3.2.1 Fundamentals of population genetics. Evolutionary factors in the human	Definition of the concepts of genotype and phenotype. Definition of the concept of environment and environmental factors. The reaction rate. Types of reaction rates. Definition of the concept of genocopy and phenocopy. Definition of the concept of allelic and non-allelic genes. To characterize the allelic interaction of genes: dominance, incomplete dominance, overdominating, codominating To characterize the non-allelic interaction of genes: complementarity, epistasis, polymerization.	PO1	2/5	Oral interview, presentation discussion, glossary compilation .	Oral interview

	population. Genetic polymorphism 3.2.2 Methods of laboratory diagnosis of hereditary diseases 3.2.3 Modern molecular genetic methods in medicine.					
9	**Embryology** **Lecture No. 3** Genetics of embryonic development	Gene regulation of ontogenesis. Ontogenesis and genes of the maternal organ. Fundamental patterns of development and growth based on genetic influences. The genetic basis of differentiation. Genes are morphogens. Segmentation genes. Homeotic genes. Genes of the development program and the environment. Gene mutations and hereditary diseases. Teratogenesis. Critical periods.	PO13	1	Overview	Feedback
	Molecular Biology **Practical lesson No. 9** **Topic.** Molecular genetic methods of genome research.	Molecular genetic methods of genome research and their medical significance. Sequencing, DNA hybridization, PCR, and gene detection. Restriction enzymes. Vectors. Plasmids. Cloning without host cells is a PCR method. Molecular cloning. FISH method	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics **Practical lesson No. 9** **Topic.** Medical genetics, definition, subject and objectives. Methods of studying human genetics.	The subject and objectives of medical genetics. Features of the study of human genetics. Methods of studying human genetics: twin method, dermatoglyphics and palascopy, genetics of somatic cells, popularly static, biochemical,	PO11	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

		cytogenetic, clinical and genealogical.				
	Embryology Practical lesson No. 9 Actually, embryogenesis. Gastrulation. Germinal leaves.	Definition of the concept. Differentiation of ectoderm, endoderm. Methods of mesoderm formation. Mesenchyme. Their derivatives	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology of SROP/SRO No. 3 Topic: Actual embryogenesis 3.1. Stem cells 3.2. Gastrulation. 3.3. Extraembryonic or provender organs in mammals and humans. 3.4. Embryonic induction.	Modern ideas about stem cells. Types of stem cells and their use in medicine. Factors regulating the development and functioning of a stem cell (microenvironment, cytokines). Colony-forming ability of stem cells in the body. A.A.Maksimov's teaching about the stem cell. Its origin, characteristics, and circulation in the body. The concept of the gastrulation process and its biological meaning. The main processes leading to the division of the embryo into germ layers. The functional significance of adhesion molecules. Types of cellular movements that carry out the gastrulation process: immigration, delamination, epibolia, invagination and their various combinations. Types of gastrulation. Methods of mesoderm closure: bodyblastic and enterocellular. The main processes underlying the epithelial-mesenchymal	PO13	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview

		transition during gastrulation. The concept of maps of presumptive beginnings. Amnion, education, biological significance, functions. Allan is tois. chorion, placenta, Structure, types of placentas. The yolk sac. The umbilical cord. The functional mother–fetus system. The role of sensory organs in the development and protection of the embryo. The main stages of the development of experimental embryology: the experiments of V.Roux, G.Driesch, H.Mangold and G. Shpeman et al. The concept of embryonic regulation. Basic concepts, properties and mechanisms of inductive interactions. The concept of competence of the embryonic bookmark. Mechanisms of induction interactions: paracrine and juxtacrine signaling methods. Embryonic induction in early amphibian development: forming. Primary embryonic induction (according to G. Spemann).				
10	**Molecular Biology Lecture No. 4** The molecular structure of cells and diseases that occur when their functioning is disrupted.	Diseases of cellular organelles: causes and types of cell damage. Pathologies of the nucleus, biomembranes, lysosomes, peroxisomes, mitochondria, EPS. The Golgi apparatus and others.	PO1	1	Overview	Feedback

		Diseases resulting from these pathologies.				
	Molecular Biology Practical lesson No. 10 **Topic.** Molecular biology of the cell. Cell membrane: structure, structural features and functions of Cytoplasm.	Cell membrane: glycocalyx, biomembrane, submembrane layer of musculoskeletal structures. Structure and functions. Lipids of membranes. Types, properties and functions of Micelles and liposomes. Proteins of membranes. Types and functions. Cytoplasm. Structure and chemical composition.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 10 **Topic.** The genealogical method of studying human genetics. Compilation and analysis of pedigrees.	Diseases with a non-Mendelian type of inheritance: mitochondrial, genomic imprinting; expansion of trinucleotide repeats.	PO11	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 10 The actual embryogenesis. Implantation	The genealogical method, symbols, the principle of compiling pedigrees and its analysis. Calculation of the genetic risk of the disease	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Molecular Biology of SROP/SRO No. 5 Cell and diseases of cellular organelles 5.1 The molecular structure of cells and diseases arising from the pathology of the nucleus; with impaired functioning and structure of EPS, Golgi apparatus; 5.2 The molecular structure and functions of cellular membrane and non-membrane organelles. 5.3 The molecular structure of cells and diseases that occur when the functioning and structure of mitochondria are disrupted; lysosomes, peroxisomes. 5.4 The molecular structure of cells and diseases that occur when membranes malfunction, with changes in the structure and number of cytoskeleton elements.	Cell membrane: glycocalyx, biomembrane, submembrane layer of musculoskeletal structures. Structure and functions. Lipids of membranes. Types, properties and functions of Micelles and liposomes. Proteins of membranes. Types and functions. Cytoplasm. Structure and chemical composition. Definition of the concept of organoids and their classification. Molecular structure and functions of cellular membrane organelles. Definition of the concept. Stages and terms of implantation. The placenta. Types of mammalian placentas. Development and structure of the placenta. The connection of the human embryo with the maternal organism. The placenta and its formation, structure and functions. The umbilical cord. Diseases associated with: pathology of the nucleus; with disruption of the functioning and structure of EPS; with a violation of the functioning and structure of the Golgi apparatus; with a violation of the functioning and structure of mitochondria; with a violation of the functioning and structure of lysosomes; with a violation of the functioning and structure of	PO1	1/5	Oral interview, presentation discussion, glossary compilation .	Oral interview

		peroxisomes; with a violation of the functioning membranes; with a change in the structure and number of elements of the cytoskeleton.				
11	**Medical genetics Lecture No. 4.** Fundamentals of molecular genetic diagnostics, prenatal diagnosis and prevention of hereditary diseases	Methods of molecular genetic diagnostics. Genetic foundations of the prevention of hereditary diseases: Medical and genetic counseling. Prenatal diagnosis. Invasive and non-invasive methods: reimplantation diagnostics. Preclinical diagnostics, screening programs.	PO1	1	Overview	Feedback
	Molecular Biology Practical lesson No. 11 **Topic.** Molecular biology of the cell. The molecular structure and functions of cellular membrane organelles and the nucleus.	The molecular structure and functions of cellular membrane organelles: The nucleus, the nuclear apparatus of the cell, the structural organization of chromatin, karyoplasm. EPS, synthesis of EPS proteins. The Golgi apparatus, a three-dimensional model of the Golgi complex. Mitochondria, structural features of the outer and inner membranes. ATP-synthase complex. Lysosomes, classification of lysosomes. Heterophagy, autophagy, and autolysis. Pyroxisomes.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical Genetics Practical lesson No. 11 **Topic:** Hereditary human diseases, definition, causes,	Hereditary diseases. Genetic mechanisms of occurrence. Monogenic diseases. Classification of monogenic diseases.	PO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey.

	classification. Monogenic, polygenic, or multifactorial diseases.	Polygenic (multifactorial) diseases (MB). General characteristics and classification of MB. Approaches to the study of hereditary predisposition to human diseases. Molecular genetic analysis of the mechanisms of MB development.				Working with CIS materials
	Embryology Practical lesson No. 11 The actual embryogenesis. Histo-, organo-, and morphogenesis.	Definition of concepts. Cellular mechanisms underlying the processes of ontogenesis. The concept of determination. Differentiation of cells during embryogenesis. The molecular genetic basis of differentiation. Potency: totipotence, pluripotence, multipotence, Unipotence. Integration in ontogenesis. The concept of embryonic induction. Proliferation is the multiplication of cells. Cell migration. Sorting and clumping of cells (adhesion). Programmed cell destruction during embryogenesis is apoptosis. Types of programmed cell death. The role of apoptosis in morphogenesis. Polypotence (totipotence), unipotency, and cell determination	PO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Medical genetics SROP/SRO No. 5 Modern molecular genetic methods in medicine. 5.1 Molecular cytogenetic methods for the diagnosis of hereditary diseases 5.2 Methods for detecting mutations: 5.3 PCR (polymerase chain reaction) 5.4 Molecular cytogenetic method: Fish method 5.5 Genome mapping	Molecular cytogenetic methods for the diagnosis of hereditary diseases: -direct and indirect methods of studying DNA - obtaining DNA samples -amplification of DNA fragments in vitro – PCR method -restriction of DNA into fragments - electrophoresis of DNA fragments -visualization and identification of DNA fragments -methods of DNA diagnostics. Methods for detecting mutations: - gene sequencing: - by hybridization; - using microchips; 3. PCR (polymerase chain reaction) 4. Genome mapping	PO1	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview
12	**Embryology Lecture No. 4** Fetal stage of human embryogenesis	Characteristics of the fetal period of human development. Human extra-germ organs: amnion, yolk sac, chorion. The functioning of the mother-fetus system. The umbilical cord. The structure of the hemato-placental barrier. Growth and development. The main features of human embryogenesis.	RO13	1	Overview	Feedback
	Molecular Biology Practical lesson No. 12 Topic: Structure and functions of cellular non-membrane organelles and the	The molecular structure and functions of cellular non-branded organelles: ribosomes, cytoskeleton of the cell (microtubules, interstitial and actin filaments). Proteins of the cytoskeleton. The cellular	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with

	cytoskeleton of the cell.	center. Cilia and flagella. A general idea of the mechanisms of transport of substances.				CIS materials
	Medical genetics Practical lesson No. 12 **Topic:** Chromosomal diseases and their place in general human pathology. Developmental anomalies. Congenital malformations – VPR.	Chromosomal diseases. Classification of chromosomal diseases: Multiple congenital malformations (MVP). Etiology, clinic and genetics of syndromes.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 12 **Topic:** The provender organs of vertebrates. The mother-fetus system	Definition of the concept. The structure, topography, and functions of the extra-embryonic organs of the human embryo. amnion, yolk sac, allantois, chorion, placenta. The fetal part of the human placenta. Sources of extra-germ organ tissue development	RO13	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology of SROP/SRO No. 4 **Topic:** Histo and organogenesis 4.1. Neurulation 4.2. Morphogenesis 4.3. Elementary cellular mechanisms of ontogenesis. 4.4. Features of early mammalian development.	Stage characteristics and basic concepts. The main regulatory mechanisms that ensure the neuralization of the ectoderm on the dorsal side of the embryo. The main methods of neural tube formation are primary and secondary neurulation. The main pathologies caused by a violation of the closure of the neural tube in humans. Neural tube differentiation: the formation of anteroposterior and dorsal axes (molecular and genetic mechanisms of the process). Neural crest formation: Successive stages of trunk differentiation. Definition	RO13	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview

		of the concept. Mechanisms of morphogenesis: formation of a cellular layer, its bending, thickening, thickening, cavitation, protrusion, programmed cell death – apoptosis. Modern concepts of cell apoptosis. Causes and mechanisms of apoptosis. The concept of determination. Differentiation of cells during embryogenesis. Molecular is the genetic basis of differentiation. Integration in ontogenesis. The concept of embryonic induction. The concept of an inductor and a reacting system. The competence of embryonic tissue germs is Proliferation - cell reproduction. Correlation of proliferation and development. Cellular displacement is the migration of cells. Sorting and clumping of cells (adhesion). The mechanism of cell sorting and adhesion. Intercellular adhesion molecules. Germ cell structure; egg cell types; fertilization and its biological essence; fragmentation and its types; the difference between embryo fragmentation and mitotic cell division. Structure and types of blastula; gastrula structure; gastrula formation; histo- and organogenesis.				

13	**Molecular Biology Practical lesson No. 13** **Topic:13.1** Functions of the plasma membrane: membrane transport. Topic:13.2 Transport structures. The structure and operation of ion channels, translocases, and pumps.	Membrane transport: passive and active. The direction of membrane transport. The structure and operation of ion channels, translocases, and pumps.	RO1	2	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 13 Topic: Diseases with an unconventional type of inheritance	Diseases with a non-Mendelian type of inheritance: mitochondrial, genomic imprinting; expansion of trinucleotide repeats.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 13 Human embryonic development	Periods of development: initial, embryonic and fetal. Features of fertilization, implantation, cleavage, and blastocyst. Fragmentation, neurulation. Formation of axial organs. Separation of the embryo body. The timing of embryo development. Growth and development	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics SROP/SRO No. 6 **Topic:**Methods of laboratory diagnostics of hereditary diseases. 6.1Cytogenetic method. Karyotyping method. Molecular cytogenetic Fish method. 6.2 Biochemical methods. Immune – histochemical method	Karyotyping method. Cytogenetic method. Molecular cytogenetic Fish method. Biochemical methods Immune – histochemical method. Methods of DNA diagnostics: direct and indirect. Methods of prenatal diagnosis: A) amniocentesis B) cordocentesis	RO11	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview

	6.3Methods of DNA diagnostics: direct and indirect 6.4 Methods of prenatal diagnosis. 6.5Medical and genetic counseling	C) chorionic biopsy D) Ultrasound Medical and genetic counseling				
14	**Molecular Biology Practical lesson No.14.** Functions of the plasma membrane: vesicular transport.	Definition and essence of the vesicular transport process. Vesicles. Three ways of vesicle formation. Endocytosis: pinocytosis, phagocytosis, and receptor-mediated endocytosis. Exocytosis: secretion, excretion: recreation: Transcytosis.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Medical genetics Practical lesson No. 14 **Topic:14.1.** Prenatal diagnosis. Medical and genetic counseling Topic: 14.2 Fundamentals of human ecogenetics and pharmacogenetics. Predictive medicine, definition, genetic foundations (genetic certification), prospects, medical significance	The genetic basis of the prevention of hereditary diseases. Prenatal diagnosis. Preimplantation diagnostics of the basics of human ecology. Definition of the concept of biotransformation. Oxidative stress. Pharmacogenetics. The effect of medicinal preparations on the human hereditary apparatus. Definition of the concept of predictive medicine. Genetic foundations (genetic certification), prospects, medical significance.	RO1	2	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 14 Genetic control of development	Ontogenesis and genes of the maternal organism are fundamental patterns of development and growth based on gene influences. The genetic basis of differentiation. Genes are morphogens. Segment genes.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

	Molecular Biology SROP/SRO No. 6 **Topic:** The hereditary apparatus of the cell. 6.1 The genetic level of the hereditary apparatus; 6.2 The chromosomal level of the hereditary apparatus; 6.3 The genomic level of the hereditary apparatus;	Definition of the concept of hereditary apparatus. Classification of genes. The structure of eukaryotic genes: coding site and non-coding site of eukaryotic genes. Cluster of histone genes, ribosomal RNA, hemoglobins. Operon structure of prokaryotic genes. Understanding the genome: DNA regions, genetic elements, explanation of DNA polymorphisms, species (polymorphism of single nucleotides), characterization of DNA fraction, tandem organization of cluster genes. The genome of cytoplasmic DNA, the genome of viruses, and bacteria. Morphology of metaphase chromosomes, types: metacentric; submetacentric; acrocentric. The function of chromosomes. Definition of the concept of karyotype; classification of karyotypes: Denver; Paris.	RO1	1/6	Oral interview, presentation discussion, glossary compilation .	Oral interview
15	**Molecular Biology Practical lesson No. 15** **Topic.** Plasma membrane functions: adhesion and intercellular interactions. Adhesive proteins. Contacts.	Intercellular interactions: adhesion, contacts. Families of adhesive membrane proteins. Contacts. Types of contacts: simple type contacts: adhesive and interdigitation; interlocking type contacts – desmosomes and adhesive belts; locking type contacts -tight connection	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

		communication contacts – nexuses and synapses, cell–matrix contacts: semi-desmosomes and focal contacts				
	Medical genetics Practical lesson No. 15 Fundamentals of population genetics. The genetic structure of the population. The Hardy-Weinberg Law.	Definition of the concept of population genetics. Population structure. The gene pool. The genetic unity of the population is panmixia. The genetic unity of the population. The Hardy-Weinberg Law. Elementary evolutionary factors: mutations, gene migration, gene drift, natural selection, population waves.	RO1	1	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials
	Embryology Practical lesson No. 15 **Topic** 15.1 Teratogenesis. Congenital malformations Topic 15.2 Prenatal diagnosis of congenital and hereditary diseases	Causes of development and classification of congenital malformations. Pathogenesis of congenital malformations. Critical periods. Diagnostic methods of VPR. Prevention of congenital malformations. development. Definition of the concept. Dates of the event. Methods of prenatal diagnosis of genetic and congenital diseases. Non-invasive (without surgical intervention) methods of prenatal diagnosis: ultrasound, X-ray (feto-amneography).Invasive methods of prenatal diagnosis: amniocentesis, choriocentesis (chorionic biopsy), cardiocentesis (vascular puncture) of the umbilical cord of the fetus. Indirect methods: investigation of the concentration of alpha-	RO1	2	Working in small groups, discussing the main issues	Testing is an oral and written survey. Working with CIS materials

		fetoprotein (ACE), estriol, gonadotropin in the blood serum of a pregnant woman.				
	Embryology. SROP/SRO No. 5 **Topic: 5.1.** Anomalies of embryo development 5.1.2 Characteristics of human intrauterine development 5.1.2. Pathologies of embryo development 5.1.3. Pathogenesis of congenital malformations. 5.1.4. Prenatal diagnosis of congenital and hereditary diseases Topic:5.2 Embryology and Medicine 5.2.1 Assisted reproductive technologies 5.2.2. The role of genetics in embryology: genetic mechanisms of body development. 5.2.3 The influence of external factors on embryonic development and their consequences. 5.2.4.Embryology and medicine: 5.2.5. Modern methods of studying embryology	Periodization and characterization of periods (embryonic, fetal). Fertilization. Preim-plantation development. Implantation. The placenta. Twins, types of twins (single and twin twins), variants of the formation of identical twins. Congenital malformations. Classification of malformations. Teratogenesis. Teratogenic factors. Causes of congenital malformations: endogenous and exogenous. Methods of diagnosis of VPR. Changes in reproduction, migration, and differentiation. Death of cell masses, slowing of apoptosis, adhesion disorders. Critical periods of human development. Definition of the concept. The timing of the event. Non-invasive (ultrasound, X-ray (fetoamneography) and invasive (amniocentesis, choriocentesis (chorion biopsy), cardiocentesis (vascular puncture) of the umbilical cord of the fetus), indirect (study of the concentration of alpha-beta protein (ACE), estriol, gonadotropin in the blood serum of pregnant women) methods diagnostics.	RO1	2/5	Oral interview, presentation discussion, glossary compilation .	Oral interview

		Indications for prenatal diagnosis. -IVF (in vitro fertilization). -ICSI (intracytoplasmic sperm injection). -IVM donation of embryos, sperm and eggs, artificial intrauterine sperm insemination, surrogacy, cryopreservation of eggs, sperm and embryos. -PGD (preimplantation genetic diagnosis). The potency of the genome. Genome stability during individual development. The embryonic development program: determination, differentiation, intercellular interactions. Maternal and zygotic genes of individual development. Homeiosis genes. Homeiotic mutations. Levels of regulation of gene expression of individual development. Tissue-specific activity of genes. The role of DNA methylation. Physical factors: radiation, ionizing radiation. Social factors: smoking, drug addiction and alcoholism. poor nutrition, stress. Biological factors: infections. Chemical factors: medicines, etc.; salts of heavy metals, smoke from a campfire. The use of embryological methods in medicine and science. The use of				

		embryological knowledge in treatment and diagnosis.				
	Term control No. 2	Testing, situational problem solving, oral interview. Assessment of test results and situational tasks. (checklist for the assessment of the TC).				Testing, situational problem solving, oral interview. Evaluation of test results, situational tasks.

9.	**Teaching and learning methods**	
9.1	Lectures	- Overview. - Feedback/ computer technology
9.2	Practical lessons	-Working in small groups, discussing the main issues -Oral and written survey testing. Working with CIS materials.
9.3	IWST/IWS	- Oral interview, presentation discussion, glossary compilation - Oral interview
9.4	Term Control	- Testing, situational problem solving, oral interview. Assessment of test results and situational tasks. (checklist for the assessment of the TC).
10.	**Evaluation criteria**	
10.1	**Criteria for evaluating the learning outcomes of a discipline**	

№ LO	**Name of learning outcomes**	**Unsatisfactory**	**Satisfactory**	**Good**	**Excellent**
LO 1	Demonstrates knowledge and understanding of	1)Does not describe the structure of the cell and the	1)Describes the structure of the cell and the	1)Applies knowledge of the cell structure using	1) Evaluates the possibility of using pathological changes in the

	cell structure and cell components	components of the cell 2)Does not understand the mechanisms of cell components	components of the cell 2)Understands the mechanisms of cell components	the karyotyping method 2)Interprets the patterns of cellular theory	hereditary apparatus for the diagnosis of diseases by cytological method and molecular genetic analysis. 2)Compares changes in the karyotype of patients with clinical manifestations of hereditary diseases. 3)Analyzes the patterns of development of morphological changes in various hereditary diseases
LO 11	Demonstrates knowledge and understanding about destructive changes in cellular components leading to diseases	1)Cannot reveal the etiology, pathogenesis and morphogenesis of various cellular diseases	1) Does not fully explain the etiology, pathogenesis, and morphogenesis of various cellular diseases	1)Explains the etiology, pathogenesis, and morphogenesis of various cellular diseases	1)Applies knowledge of the etiology, pathogenesis, and morphogenesis of various cellular diseases to diagnose hereditary diseases
LO 13	Demonstrates knowledge of the origins and classifications of mitochondrial, lysosomal, and perixisomal diseases	1) Cannot give a definition for mitochondrial, lysosomal, perixisomal diseases 2)It does not distinguish between changes in the hereditary apparatus in various	1) Allows inaccuracies in the description of mitochondrial, lysosomal, and perixisomal diseases. 2)It does not distinguish well between	1)Describes the classifications of mitochondrial, lysosomal, and perixisomal diseases 2)It distinguishes well between various	1)Independently describes the classifications of mitochondrial, lysosomal, and perixisomal diseases 2) Performs differential diagnosis for mitochondrial,

		mitochondrial, lysosomal, and perixisomal diseases.	classifications of mitochondrial, lysosomal, and perixisomal diseases.	mitochondrial, lysosomal, and perixisomal diseases	lysosomal, and perixisomal diseases	

10.2 Criteria for evaluating teaching methods and technologies

A checklist for practical training

Forms of control	**Grade**	**Criteria for evaluating**
Work in small groups (practical, laboratory classes)	95-100% (4,0; A)	The student has completed all practical and laboratory work and provides a complete answer to all theoretical questions and test assignments. Actively participates, becomes the absolute leader in the group, knows how to conduct a dialogue between subgroups, uses self-assessment and mutual assessment.
	90-94% (3,67; A-)	The student has completed all the practical and laboratory work and gives a complete answer to all the test questions. Actively participates, leads the subgroup, knows how to conduct a dialogue between subgroups, uses self-assessment and mutual assessment.
	80-89% (3,0; B; 3,33; B+)	The student knows the theoretical questions, has completed laboratory work and reports on them in a timely manner, and has made unprincipled mistakes while answering practical classes; a positive test score. Actively participates in the subgroup, knows how to conduct a dialogue between subgroups, uses self-assessment.
	70-79% (2,33; C+; 2,67; B-)	The student knows the theoretical questions, has passed laboratory work and reports on them in a timely manner, and has made fundamental mistakes during the answer in practical classes; a positive test score. He does not actively participate in the subgroup, knows how to conduct a dialogue between subgroups, and uses self-assessment.
	60-69% (1,67; C-; 2,0; C)	The student experiences some difficulties in answering practical exercises, and has made logical and stylistic mistakes in answering. He completed laboratory work on time, submitted all reports on them; showed little activity in the classroom and needed the help of a teacher, partially completed the test tasks.
	50-59% (1,0; D+)	The student made rude mistakes when answering theoretical questions and does not understand the questions of the topic. I did not complete the laboratory work and reports on it, I did not complete the test tasks. Was not active in the subgroup.

	0-49% (0.24; F; 0.5; FX)	The student did not prepare, did not know the topic and purpose of the lesson, and also did not complete the laboratory work, did not submit reports and did not participate during the lesson, did not complete the test tasks. Was not active in the subgroup.

Forms of control	**Grade**	**Criteria for evaluating**
Verbal	A (4,0; 95-100%); A- (3,67; 90-94%)	The student answered all the questions logically, clearly, competently, guided by theories, concepts and directions on the topic. He also logically and competently answers additional questions from the teacher.
	B+ (3,33; 85-89%); B (3,0; 80-84%); B- (2,67; 75-79%) C+ (2,33; 70-74%)	The student made unprincipled inaccuracies in the answers, not fundamental mistakes that he corrects himself. Answers additional questions from the teacher. The student made unprincipled inaccuracies in the answers, not fundamental mistakes that he corrects himself. He answers the teacher's additional questions with unprincipled errors.
	C (2,0; 65-69%); C- (1,67; 60-64%); D+ (1,33; 55-59%) D (1,0; 50-54%)	The student made fundamental mistakes in the answers, which he corrects with the help of the teacher. He answers additional questions with fundamental errors. The student made fundamental mistakes in the answers, which are difficult to correct with the help of a teacher. He makes blunders on additional questions.
	FX (25 - 49%) F (0-24)	The student made blunders in the answers, which he cannot correct, even with leading questions from the teacher. The teacher cannot answer any additional questions.
Forms of control	**Grade**	**Criteria for evaluating**
Problem solving	95-100% (4,0; A)	- the correct algorithm for solving the problem has been compiled, there are no errors in logical reasoning and in the choice of formulas and solutions, the correct answer has been obtained, the problem has been solved in a rational way; it gives a complete and clear explanation of the solution of the problem, the ability to draw conclusions based on the data obtained.

	90-94% (3,67; A-)	- the correct algorithm for solving the problem has been compiled, there are grammatical errors in logical reasoning and in the choice of formulas and solutions, the correct answer has been received, the problem has been solved in a rational way; the ability to draw conclusions based on the data obtained.
	80-89% (3,0; B; 3,33; B+)	- the correct algorithm for solving the problem has been compiled, there are no significant errors in logical reasoning and solution; the choice of formulas for the solution has been made correctly; there is an explanation for the solution, but the problem has been solved in an irrational way or no more than two insignificant errors have been made, the correct answer has been received.
	70-79% (2,33; C+; 2,67; B-)	- the correct algorithm for solving the problem has been compiled, there are no significant errors in the solution; the choice of formulas for the solution has been made correctly; but there is no complete and clear explanation of the solution, and the problem has been solved in an irrational way or more than two insignificant errors have been made, the correct answer has been received.
	60-69% (1,67; C-; 2,0; C)	- the problem has been solved, but significant errors have been made in the choice of formulas or in mathematical calculations, the problem has not been fully solved
	50-59% (1,0; D+)	- the problem was solved incorrectly, there are significant errors in logical reasoning and in the solution.
	0-49% (0.24; F; 0.5; FX)	- the task has not been solved, there is no response to the task.

Forms of control	**Grade**	**Criteria for evaluating**
Testing	A (4,0; 95-100%); A- (3,67; 90-94%)	90-100 % of correct answers
	B+ (3,33; 85-89%); B (3,0; 80-84%); B- (2,67; 75-79%)	70-89 % of correct answers
	C+ (2,33; 70-74%); C (2,0; 65-69%); C- (1,67; 60-64%); D+ (1,0; 50-54%)	50-69 % of correct answers
	FX (25 - 49%) F (0-24)	less than 50% of correct answers

Check list for IWST/IWS

Presentations

Forms of control	Grade	Criteria for evaluating
Topic presentation	**Excellent** 95-100 90-94	The presentation was completed independently, on time, with a volume of at least 20 slides. At least 7 literary sources were used. The slides are informative and concise. During the defense, the author demonstrates deep knowledge of the topic. Does not make mistakes when answering questions during the discussion.
	Good 85-89 80-84 75-79 70-74	The presentation was completed independently, on time, with a volume of at least 17 slides. At least 6 literary sources were used. The slides are informative and concise. During the defense, the author demonstrates good knowledge of the topic. Makes unprincipled mistakes when answering questions that he fixes it himself.
	Satisfactory 65-69 60-64 50-54	The presentation was completed independently, on time, with a volume of at least 14 slides. At least 5 literary sources were used. The slides are not informative. During the defense, the author makes fundamental mistakes when answering questions.
	Unsatisfactory 0,5; 25-49 0:0-24	The presentation was not completed on time, and the volume is less than 10 slides. Less than 5 literary sources were used. The slides are not informative. During the defense, the author makes gross mistakes when answering questions. Does not know his own material.

G l o s s a r y

Forms of control	Grade	Criteria for evaluating
Preparing the glossary	**Excellent** (4,0; 95-100%); (3,67; 90-94%)	- If the students have compiled the glossary themselves; - The volume is at least 15 terms; - Terms correspond to the protected topic; - The wording of the term is correct, corresponds to biological significance, complete; - The terms are arranged alphabetically, the etymology is given the term;
	Good (3,33; 85-89%);	- If the students have compiled the glossary themselves; - The volume is at least 10-13 terms;

	(3,0; 80-84%); (2,67; 75-79%); (2,33; 70-74%).	- Terms correspond to the protected topic; - The wording of the term is competent, corresponds to biological significance, there is no etymology. - There is no alphabetical order; - There are some inaccuracies;
	Satisfactory (2,0; 65-69%); (1,67; 60-64%); (1,0; 50-54%)	- If the students have compiled the glossary themselves; - The volume is at least 10 terms; - The wording of the term corresponds to the biological the value, but not the full; - There is no alphabetical order; - There is no etymology;
	Unsatisfactory (0,5; 25-49%) (0:0-24%)	- If the students have compiled the glossary themselves; - The volume is at least 10 terms; - The terms do not correspond to the topic; - Serious biological errors are allowed. There is no alphabetical order; - There is no etymology.

Report

Forms of control	**Grade**	**Criteria for evaluating**
Preparation and protection of the abstract	**Excellent** 95-100 балл 90-94 балл	The abstract is carefully executed and submitted on time, written independently on at least 15 pages of typewritten text, using at least 7 literary sources. Are given diagrams, tables and figures corresponding to the topic of the abstract. When defending an abstract, the text is not read, but narrated. Confidently and accurately answers all the questions asked.
	Good 85-89 балл 80-84 балл 75-79 балл 70-74 балл	The abstract is carefully executed and submitted on time, written independently for at least 13 pages of typewritten text, using at least 6 literary sources. Are given diagrams, tables and figures corresponding to the topic of the abstract. When defending an abstract, the text is not read, but narrated. He makes unprincipled mistakes when answering questions.
	Satisfactory 65-69 балл 60-64 балл 50-54 балл	The abstract is carefully executed and submitted on time, written independently for at least 10 pages of typewritten text, using at least 5 literary sources. When

		defending the abstract, the text reads. He answers questions uncertainly and makes fundamental mistakes.
	Unsatisfactory 0-49 балл	The abstract was executed inaccurately and was not submitted on time, written independently on less than 10 pages of typewritten text, using less than 5 literary sources. When defending the abstract, the text reads. When answering questions, he makes gross mistakes and does not understand the material.

Intermediate certification

Forms of control	**Grade**	**Criteria for evaluating**
Testing/ oral and written survey	**Excellent** 95-100 балл 90-94 балл	-If the student did not make any mistakes or inaccuracies during the answer.; -Is guided by theories, concepts and directions in the studied discipline and gives them a critical assessment, uses scientific achievements of other disciplines.; - 86-100% of the test questions were answered correctly;
	Good 85-89 балл 80-84 балл 75-79 балл 70-74 балл	-If the students did not make any gross mistakes during the answer, made unprincipled inaccuracies or fundamental errors corrected by the students themselves, managed to systematize the program material with the help of the teacher.; - The test questions were answered 70-89% correctly.;
	Удовлетворительно 65-69 балл 60-64 балл 50-54 балл	-If the students made inaccuracies and unprincipled mistakes during the answer, limited themselves only to the educational literature indicated by the teacher, and had great difficulties in systematizing the material.; - The test questions were answered 50-69% correctly.
	Неудовлетворительно 24-49 балл 0-24 балл	-If the students made fundamental mistakes during the answer, did not study the main literature on the topic of the lesson; does not know how to use the scientific terminology of the discipline, answers with gross stylistic and logical errors; -The test questions were answered below 50% correctly;

Multi-grade knowledge assessment system

Evaluation of the letter system	The digital equivalent of points	Percentage content	Assessment according to the traditional system
A	4,0	95-100	Excellent

A -	3,67	90-94	
B +	3,33	85-89	Good
B	3,0	80-84	
B -	2,67	75-79	
C +	2,33	70-74	
C	2,0	65-69	Satisfactory
C -	1,67	60-64	
D+	1,33	55-59	
D-	1,0	50-54	
FX	0,5	25-49	Unsatisfactory
F	0	0-24	

11.	**Literature source**
Electronic resource:	**Электронные ресурсы ЮКМА** • Электронная библиотека ЮКМА - https://e-lib.skma.edu.kz/genres • Республиканская межвузовская электронная библиотека (РМЭБ) – http://rmebrk.kz/ • Цифровая библиотека «Aknurpress» - https://www.aknurpress.kz/ • Электронная библиотека «Эпиграф» - http://www.elib.kz/ • Эпиграф - портал мультимедийных учебников https://mbook.kz/ru/index/ • **ЭБС IPR SMART** https://www.iprbookshop.ru/auth • информационно-правовая система «Заң» - https://zan.kz/ru • Medline Ultimate EBSCO • eBook Medical Collection EBSCO • Scopus - https://www.scopus.com/ 1. https://meduniver.com/Medical/Video/predmet_metodi_istoria_gistologii.html 2. https://meduniver.com/Medical/Video/predmet_metodi_istoria_gistologii.html 3. https://meduniver.com/Medical/Video/lekcia_po_citologii.html 4. https://meduniver.com/Medical/Video/lekcia_po_embriologii.html 5. https://meduniver.com/Medical/Video/razvitie_ploda_i_stroenie_placenti.html 6. https://meduniver.com/Medical/Video/gistologia_epitelialnix_tkanei.html 7. https://meduniver.com/Medical/Video/gistologia_rixloi_voloknistoi_tkani.htm 8. https://meduniver.com/Medical/Video/gistologia_sobstvenno_soedinitelnix_tkanei.html 9. https://meduniver.com/Medical/Video/osteogenez_i_xondrogenez.html 10. Матриалы (текст, рисунки, микрофото) по частной гистологии (франц.) http://www.histology-world.com/ 11. «HISTOLOGY-WORLD!»Сайт содержит обширный образовательный материал по гистологии: снимки микропрепаратов с комментариями, интерактивное тестирование, игры, кроссворды и проч. (англ.) http://www.visualhistology.com/ 12. «VISUALHISTOLOGY» Доступны текст, атлас, презентации и другие материалы по гистологии (англ.)

Electronic textbooks	1. Акуленко, Л. В.Биология медициналық генетика негіздерімен [Электронный ресурс]: мед.училищелер мен колледждерге арн. оқулық / Л. В. Акуленко, И. В. Угаров; қазақтіл. ауд. Қ. А. Естемесова. - Электрон. текстовые дан. (43.6Мб). - М.: ГЭОТАР - Медиа, 2016. - 416 б. с. 2. Кульбаева, Б. Ж. Методы геномных технологий [Электронный ресурс]: лекций / Б.Ж.Кульбаева, М.М.Есиркепов, А.А.Амирбеков. - Электрон.текстовые дан. (578 Мб). - Шымкент: Б. и., 2012. - 70 с. эл. опт.диск 3. Жолдасов К.Т.Жасушаның тұқым қуалау негізінің құрылымымен қызметі [Электронды ресурс]: оқу құралы.- Шымкент, 2012.- 1 эл.опт. диск (CD-ROM) 4. Кульбаева,Б.Ж. Генетический материал клетки. Структура и функции [Электронный ресурс]: учеб.пособие; ЮКГФА. - Электрон.текстовые дан. (24,0 Мб). - Шымкент: Б. и., 2011. - 173 эл. опт.диск (CD-ROM). 5. Кульбаева, Б. Ж. Патологическая анатомия генома [Электронный ресурс]: учеб.-наглядное пособ. - Электрон.текстовые дан. (0,98 Мб). - Шымкент: Б. и., 2011. - 86 с. эл. опт.диск (CD-ROM). 6. Кульбаева, Б. Ж. Информационные макромолекулы, Белки и нуклеиновые кислоты. Структура и функции [Электронный ресурс]: учеб.пособие; ЮКГФА. - Электрон.текстовые дан. (17,7 Мб). - Шымкент: Б. и., 2011. - 135 с. эл. опт.диск (CD-ROM). 7. Куандыков Е. О. Молекулалық биология негіздері / Куандыков Е. О., Аманжолова Л. 2020. - 229 с.https://www.elib.kz/ru/search/read_book/884/ 8. Куандыков Е. О. Медициналық биология және генетика / Куандыков Е. О., 2020. - 313 с. https://www.elib.kz/ru/search/read_book/882/ 9. Куандыков Е. О. Молекулалық биология және генетикадан тестік тапсырмалар жинағы / Куандыков Е. О., Альмухамбетова С. К., Кашаганова Ж. А., Нурпеисова И. К., Таракова К. А., 2020.-405 с.https://www.elib.kz/ru/search/read_book/889/ 10. Lodich, H. Moleculargell [Электронный ресурс]: научное издание / H. Lodich. - Электрон.текстовые дан. (10,4 Мб). - Б. м. : Б. и., 2003 11. Primerof MolecularGenetics [Электронный ресурс]: учебник. - Электрон.текстовые дан. (10,5 Мб). - М. :Б. и., 1992 12. Clote, P. Computational molecular biology FP. Clote, R. Backofen [Электронный ресурс]: научное издание / P. Clote, R. Backofen. - Электрон.текстовые дан. (13,2 Мб). - Б. м. : Б. и., 2000 13. Glossary, Lodish H. Molecular Cell biology [Электронный ресурс]: словарь / Lodish H. Glossary. - Электрон. Текстовые дан. (11,1 Мб). - Б. м. : Б. и., 2003 14. Watson, J. D. Molecular Biology of the gene [Электронныйресурс]: научное издание / J. D. Watson. - Fifth edition. - Электрон. Текстовые дан. (30,2 Мб). - Б. м. : Б. и., 2004 15. Сейтембетов Т.С. Химия / Сейтембетов Т. С., 2020. - 273 с. https://elib.kz/ru/search/read_book/2962/ 16. B. T. Seytkhanova, Sh. Zh. Kurmanbekova, Sh.T. Polatbekova, Sh.Zh. Gabdrakhmanova, A.N. Tolegen. CAUSATIVE AGENTS OF ACUTE RESPIRATORY VIRAL INFECTIOUS DISEASES (influenza virus, adenovirus, coronavirus) (I part) http://lib.ukma.kz/wp-content/uploads/2022/10/Illustrated-teach.-material-eng-2.pdf

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Laboratory/physical resources	1. Microscopes, a set of micro-preparations, an atlas of microphotographs
Special programs	http://www.biology-questions-and-answers.com «Bioloqy Questionsand Answers» -сайт по биологии в виде вопросов и ответов, в том числе по разделам Цитология, Эмбриология, Гистология; содержит рисунки и микрофотографии клеток и тканей. http://humbio.ru/ «БАЗА ЗНАНИЙ ПО БИОЛОГИИ ЧЕЛОВЕКА» - содержит информацию, предназначенную для образовательных и научных целей/ http://www.testland.ru/default.asp?id=555&uid Online тестирование для зарегистрированных пользователей.
Magazines (electronic magazines)	www.morphology.dp.ua/hist.php Сайт научного общества анатомов, гистологов, эмбриологов и топографо-анатомов Украины. Содержит аудио лекции по всему курсу гистологии «Гистология. mp3», тестовые задания для контроля знаний по предмету, гистологические кроссворды, гистологическую азбуку А.Г. Кнорре, словарь морфологических терминов (укр, русск., англ.).
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11. Основы медицинской радиобиологии /Под ред. И.Б. Ушакова. – СПб: ООО «Издательство Фолиант», 2004*.
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3. Molecular biology of the cell: textbook / B. Alberts [and etc.]. - 6th ed. – New York: Garland Science, 2015. - 1342 p.
4. Murray P. R., Rosenthal K. S., Pfaller M. A.Medical Microbiology. - Mosby, 2015
5. W. Levinson McGraw-Hill. Review of Medical Microbiology and Immunology, 2014

12. Discipline Policy

1. during the stay on the territory of the department, comply with the disciplinary requirements specified at the entrance to the department.;
2. compulsory attendance of lectures, practical and laboratory classes according to the schedule;
3. Don't be late for classes;
4. wear special clothes (robes, hats) in class;
5. do not miss classes, in case of illness, provide a work record issued by the dean's office on the basis of a medical certificate.;
6. to work out the missed classes according to the schedule of reception by the teacher.;
7. actively participate in the learning process;
8. Comply with the Academy's internal regulations and ethics of conduct;
9. timely and accurately complete homework and SRO according to the SRO schedule;
10. If assignments are not completed and the lecture is missed, the final grade is reduced.;
11. Be tolerant, open and friendly to fellow students and teachers.;
12. take care of the department's property;
13. Due to the disrespectful reason for missing lectures, 1 point is deducted from the overall admission rating for each pass.
14. Due to the disrespectful reason for skipping classes at the SROP, 2 points are deducted from the overall admission rating for each pass.
15. upon receiving an unsatisfactory grade (0-49 points) at the border control, the student is not allowed to take the final control.
16. in case of absence of a student at lectures, practical classes, and training sessions, a note about the absence ("h") is placed in the AIS Platonus educational and electronic journal.

13.	**Academic policy based on the moral and ethical values of the Academy**

Academic Policy p.4 Student's Honor Code

Awareness of the importance of the principles and culture of academic honesty, expressing the student's honesty in performing practical, laboratory work and in the classroom. As well as during exams, expressing one's position in relationships with teachers and the administration.

Online proctoring is used in distance learning, which is a system for verifying the identity and confirming the results of online exams in compliance with academic integrity.

Discipline Grading Policy: The student's final grade at the end of the course consists of the sum of the admission rating (ARD) and the final control assessment (DEC) and is set according to the point-rating letter system.

FG= ARD+DEC

The admission rating (ORD) is 60 points or 60% and includes: an assessment of current control (OTC) and an assessment of border control (ORC).

The assessment of the current control (OTC) consists of the average grade for practical exercises + the average grade of the SRS

The Border Control Assessment (ORC) includes the average score of 2 colloquiums.

The admission rating score (60 points) is calculated using the formula:

ORD sr x 0,2 + ORC sr x 0,4

The final control (IC) is conducted in the form of testing and the student can receive 40 points or 40% of the total score.

During testing, the student is offered 50 questions.

The final control is calculated as follows: if the student answered 45 out of 50 questions correctly, then this will be 90%.

90 x 0,4 = 36 points.

The final grade is calculated if the student has positive grades in both the admission rating (RD) = 30 points or 30% or more, and the final control (IC) = 20% or more.

Final score (100 points) = ORC cp x 0.2 + OTC cp x 0.4 + IC x 0.4 a student who receives an unsatisfactory grade for one of the types of controls (RC1, RC2, TCsr) is not allowed to take the exam.

Penalty points are subtracted from the average score of the current control.

14.	Approval and revision		
Date of approval with the Library and Information Center	Protocol №7 25.06.2025	Full name Head of the BIC Darbicheva R.I.	Signature
Date of approval at the department	Protocol №11 26.06.2025	Full name of the head of the department Daurenbekov K.N.	
Date of approval for the AC OP	Protocol №6 27.06.2025	Full name of the chairman of the CPC Auezkhankyzy D.	
Date of revision at the department	Protocol №	Full name of the head of the department Daurenbekov K.N.	
Date of approval for the AC OP	Protocol №	Full name of the chairman of the CPC Auezkhankyzy D.	