Syllabus
Department of Biology and Biochemistry, Chemical Disciplines, Microbiology, Virology and Immunology, Morphophysiology
Working curriculum of the discipline "Structural organization of human physiological processes"
Name and code of the educational program "6B10115" Medicine

1.	**General information about the discipline**		
1.1	Discipline code: SOFPCH 1203	1.6	Academic year: 2024/2025
1.2	Discipline name: "Structural organization of human physiological processes"	1.7	Course:1
1.3	Prerequisites: school course of biology, chemistry, physics.	1.8	Semester: 1
1.4	Post-Questions: "Genes and Heredity"	1.9	Number of credits (ECTS): 6
1.5	Cycle: BD	1.10	Component: VK
2.	**Description of the discipline**		
Formation of fundamental knowledge aimed at understanding metabolic processes, cell structure, their polymorphism, the relationship between their structure and functions. Biological membranes. Principles of tissue level organization of living matter. Molecular, chemical and biochemical mechanisms of the emergence of biopotentials, regulation of acid-base states, their role in the formation of pathological changes in tissues, organs and microorganisms. Qualitative, quantitative and microbiological indicators of biochemical substances.			

3.	**Summative Assessment Form**		
3.1	**Testing +**	3.5	Coursework
3.2	Writing	3.6	Essay
3.3	Oral	3.7	Project
3.4	OSPE/OSKE or practical skills assessment	3.8	Other (specify)

4.	**Objectives of the discipline**
"Structural Organizations of Human Physiological Processes" - master the structural and functional foundations of human physiological systems, integrating knowledge from chemistry, molecular biology, microbiology and histology for a comprehensive understanding of the vital functions of the organism and its interaction with the environment.	

5.	**Final learning outcomes (LO of the discipline)**
RO1.	Demonstrates knowledge and understanding of cell structure and cell components.
PO2.	Demonstrates knowledge and understanding of destructive changes in cellular components that lead to disease
PO3	Demonstrates knowledge of the origins and classifications of mitochondrial, lysosomal, and perixisome diseases

PO4	- demonstrates knowledge of chemical processes (basic types of reactions) in the body, subject to the general laws and patterns of chemistry, as well as general energy and kinetic patterns of chemical processes;	
RO5	- applies knowledge of calculation formulas (mass fraction, molar concentration, molar concentration of equivalent, molal concentration, molar fraction, titer) when preparing solutions of given concentrations and understands methods for determining the quantitative content of substances in the systems under study, including biological fluids.	
RO6	- formulates general theoretical foundationschemistryfor knowledge, skills and abilities in their subsequent professional activities.	
RO7	Demonstrates knowledge of the classification and biological properties of microorganisms (morphological, physiological, antigenic) and their ecology; methods of isolating pure cultures and identification; principles of determining the sensitivity/resistance of microorganisms to antimicrobial drugs;	
RO8	Demonstrates knowledge of the basics of microbial genetics; the essence of biotechnology; the influence of environmental factors on microorganisms, the goals and methods of asepsis, antisepsis, sterilization, disinfection; chemotherapy and antibiotics; the basics of infectious disease epidemiology, routes of infection, localization of microorganisms in the human body;	
RO9	Possesses the skills of preparing native smears, staining smears using simple and complex methods and interpreting microscopic results; culturing viruses; determining the sensitivity/resistance of microorganisms to antimicrobial drugs;	
RO10	- knows the structure and general patterns of functioning of cells, tissues, regulatory mechanisms, considered from the standpoint of general physiology and integrative behavioral activity of a person;	
RO 11	- distinguishes, describes, compares the structural features of various cells, tissues, organs of the body and explains their functions; -has the skills to conduct laboratory research of cells and methods of processing the results;	
RO12	-Able to present information clearly and logically in the form of a presentation. - compares physiological parameters (constants) of a healthy and sick organism; - analyzes information obtained during experimental observations, determines its significance for characterizing the state of the organism.	
5.1	**RO discipline**	**Learning outcomes of the OP, which are associated with the discipline RO**
	PO1, PO4, PO6, PO7, PO10	PO1 Apply fundamental knowledge in biomedical, clinical, epidemiological and social-behavioural sciences in practice.
	PO11,PO5,PO8,PO9	PO2 Provides patient-centered care in the biomedical, clinical, and epidemiological sciences aimed at diagnosing, treating, and preventing the most common diseases.
	PO2,PO3,PO12	RO 13 Assesses population health indicators and its physical, radiological, chemical and biological-ecological determinants
6.	**Detailed information about the discipline**	
6.1	**Venue (building, auditorium): main building, 4th floor.**	

6.2	**Number of hours**	**Lectures**	**Practical. les.**	**Lab. Zan.**	**SRO**	**SROP**
	Molecular biology	3	12		25/22	5
	Chemistry	4	16	-	34/28	6
	Microbiology	2	8		17/14	3
	Histology	3	12		26/20	4
6.3						**Study plan for the discipline:**

No.	Week/day	Lecture	Practical classes	SROP	SRO
1 week	Molecular biology	1	1	1	3
	Histology	-	1	-	-
	Chemistry	-	1	1	2
	Microbiology	-	-	-	-
2 week	Molecular biology	-	1	-	-
	Histology	1	1	1	6
	Chemistry	-	1	-	-
	Microbiology	-	-	-	-
Week 3	Molecular biology	-	1	-	-
	Histology	-	1	-	-
	Chemistry	1	1	1	6
	Microbiology	-	-	-	-
4 week	Molecular biology	-	-	-	-
	Histology	-	1	-	-
	Chemistry	-	1	-	-
	Microbiology	1	1	1	5
5 week	Molecular biology	1	1	-	-
	Histology	-	1	-	-
	Chemistry	-	1	1	6
	Microbiology	-	-	-	-
6 week	Molecular biology	-	1	1	6
	Histology	1	1	-	-
	Chemistry	-	1	-	-
	Microbiology	-	-	-	-
7 week	Molecular biology	-	1	1	5
	Histology	-	1	-	-
	Chemistry	1	1	-	-
	Microbiology	-	-	-	-
8 week	Molecular biology	-	-	-	-
	Histology	-	1	1	3
	Chemistry	-	1	1	2
	Microbiology	1	1	-	-
9 week	Molecular biology	1	1	-	-
	Histology	-	1	1	6

10 week	Chemistry	-	1	-	-
	Microbiology	-	-	-	-
	Molecular biology	-	-	-	-
	Histology	-	1	-	-
11 week	Chemistry	1	1	-	-
	Microbiology	-	1	1	5
	Molecular biology	-	1	-	-
	Histology	1	-	-	-
12 week	Chemistry	-	1	1	6
	Microbiology	-	1	-	-
	Molecular biology	-	1	1	6
	Histology	-	-	-	-
13 week	Chemistry	1	1	-	-
	Microbiology	-	1	-	-
	Molecular biology	-	1	-	-
	Histology	-	1	-	2
14 week	Chemistry	-	1	-	-
	Microbiology	-	1	1	4
	Molecular biology	-	1	-	-
	Histology	-	-	-	-
15 week	Chemistry	-	1	1	6
	Microbiology	-	1	-	-
	Molecular biology	-	1	1	2
	Histology	-	-	1	3
	Chemistry	-	2	-	-
	Microbiology	-	1	-	-

7.	Information about teachers		
No.	Full name	Degrees and Position	Email address
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7. Thematic plan

Week/ day	Topic Title	Summary	RO discipline	Number of hours	Forms/methods/ learning technologies	Forms/ evaluation methods
1	**Molecular Biology of the Cell #1** Lecture. Topic. Molecular biology of the cell. Structure and functions of the main components. cell products. Transport of substances through biomembranes. Adhesive	Structure of a eukaryotic cell. Surface structure cell apparatus: biomembranes, Mechanisms of intracellular transport of substances, passive and active transport. Ion channels and ion pumps. Families of adhesive membrane proteins. Adhesive function of membranes The main	RO1	1	Overview	Feedback

	membrane function. Transmission of an external signal into the cell. Types of signaling pathways and signaling systems.	stages of signal transmission.				
	Molecular biology of the cell Practical lesson.№1 Topic.Molecular biology of the cell. Structure and functions of the main components cell tov.	Structure of prokaryotic and eukaryotic cells. Structure, functions.	RO1	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Histology Practical lesson No. 1. Topic: Basic principles of making histological preparations.	The main stages of production of fixed and paintedhistologicalpreparation. Principles of operation and use of special microscopy devices.	RO 11	1	Work in small groups, familiarization with work in a histolaboratory	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #1. Topic:***Chemistry in medicine. Chemical elements in the cells of living organisms.	Chemistry and human health. Topography of the most important elements in the human body. Elemental composition of the cell. Content of chemical elements in the human body. How chemistry affects the human body.	RO6	1	work in small groups	Control of the initial level of knowledge / test control
	Chemistry SROP/SRO **Consultation on the implementation of SRO 1.*Task SRO№1.1*** Chemical bonding and its importance in human life.	Chemical bond. Main types of chemical bonds. Mechanism of formation of covalent bond. Properties of covalent bond: saturation, direction ity, polarizability. Types of covalent bonds by the method of overlapping electron clouds. Hydrogen bond and its varieties. Biological role of hydrogen bond.	RO5 RO6	1/2	Presentation	Oral survey

	Task SRO№1.2 Thermodynamics of living systems.	Fundamentals of chemical thermodynamics. Thermodynamics of living systems. Exoergonic ky and endoergonic processes occurring in the human body.				
	Molecular biology of the cell SROP/SRO No. 1 1.1Molecular structure of cells and diseases that arise when their functioning is disrupted. 1.2 Molecular structure and functions of cell membranes organelles	Definition of the concept of organelles and their classification. Diseases of lysosomes, perixisomes, disorders of protein sorting in the ER, mitochondrial diseases no. Definition and mechanism of development. Membrane organelles of the cell. Structure and functions: mitochondria, Golgi complex. Three-dimensional model of the dictyosome of the Golgi complex. EPS.	RO1	1/3	Work in small groups, presentation defense, compilation of a glossary.	Presentation glossary, abstract
2	**Histology** Lecture No. 1. Topic: Cytology.	Subject of study of cytology, histology, its sections. Research methods in cytology and histology.	RO 11	1	Overview	Answers to security questions.
	Molecular biology of the cell Practical lesson No. 2 Topic. Eukaryotic cell. Surface cell apparatus. Plasma membrane.	Surface apparatus of the cell. Supramembrane apparatus and submembrane layer of supporting-contractile structures. Membrane lipids.	PO2	1	Work in small groups, discussion of key issues, presentation	Testing, oral and written survey.

	Histology Practical lesson No. 2. Topic: Cell and non-cellular structures.Plasmalemma.	Definition of a cell. Biological membrane. Plasmalemma and itsderivatives. Methodspenetrationssubstances into the cell. Types of non-cellular structures.	RO10	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #2. Topic:*** Fundamentals of chemical thermodynamics. The relationship of system parameters (temperature, internal energy, enthalpy, free energy, entropy) with living matter. Thermochemistry ical calculations.	Thermodynamics of biology processes. Bioenergetics. System. The concept of enthalpy. pii. The doctrine of thermochemistry. Hess's law. Change in enthalpy during various chemical and physicochemical processes. The second law of thermodynamics. Entropy. Gibbs free energy.	RO5	1	work in small groups	Oral survey/ test control
	Histology SROP/SRO 1 Microscope.Microscopy technique	The structure of the microscope. Operating principles of the light and electron microscope.	RO 11 RO 12	1/6	Work in small groups, presentation defense, glossary compilation.	Checklist for SRO assessment
3	**Chemistry** ***Lecture No. 1. Topic.*** Introduction. Thermodynamics of biological processes. Basic concepts and laws of thermodynamics. Chemical kinetics and enzymatic catalysis.	Subject and objectives of chemistry. Chemical thermodynamics is the theoretical basis for studying the metabolism and energy. Laws of thermodynamics Miki. The human cell as a complex thermodynamics ical system. Thermochemistry. Hess's law. Entropy. Gibbs energy.	RO5 RO6	1	overview/computer technology	Feedback
	Molecular biology of the cell Practical lesson #3Topic Plasma membrane. Transport	Monolayer, bilayer and vesicles (liposomes and vesicles). Membrane proteins: peripheral and integral. Transfer of high-	PO2	1	Work in small groups, discussion of key issues, presentation	Testing, oral and written survey.

	of substances through the membrane we: passive and active ny, vesicular.	molecular compounds across membranes endocytosis and exocytosis.				
	Chemistry ***Practical lesson #3. Topic:*** Chemical kinetics and its importance in medicine.	Kinetics of chemical reactions. Factors influencing the reaction rate. Predicting the shift of chemical equilibrium. Concepts of the kinetics of biological processes in living organisms.	PO4 RO5	1	work in small groups, lab work	Oral survey/problem solving, defense of results of laboratory experiments
	HistologyPractical lesson #3 Topic: Cytoplasm. Organelles. Inclusions	The concept of a cellular conveyor. Classification of organelles based on their structure. Classification of inclusions.	RO 10 RO 11	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry SROP/SRO **Consultation on the implementation of SRO 2. Task SRO№2.1** Enzymatic catalysis. Features of enzyme action. ***Task SRO№2.2*** Water. Chemical reactions in aqueous solution. Biological role of water in a living organism.	Enzymatic catalysis. Nature and classification of enzymes. Features of enzyme action in living organisms. The importance of enzymes in metabolic processes of life. Water, structure of the molecule. Properties of water. Distilled water, apyrogenic. The importance of water for the vital activity of organisms.	PO4 RO5 RO6	1/6	Presentation	Oral survey
4	**Microbiology** Lecture. General microbiology and virology. Morphology of bacteria and viruses.	Microbiology as a fundamental and applied science. Stages of microbiology development. Nomenclature and classification of microorganisms. The concept of virion and virus.	RO9	1	Overview	Feedback

		Morphological features and structure of bacterial cell and virus.				
	Histology Practical lesson #4. Topic: Cell division. Cell cycle.	Characteristics of the cell life cycle. Mitosis. Endomitosis. Endoreproduction. Polyploidy.	RO 10 RO 11	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #4. Topic:*** Solutions. The importance of solutions in the vital activity of organisms.	Concentration of solutions and methods of expressing them. Preparation of solutions of a given concentration. The importance of solutions in medicine, biology and human practical activity.	PO4 RO5 RO6	1	work in small groups, lab work	Solving problems, defending the results of laboratory experiments
	Microbiology Practical lesson. General microbiology and virology. Morphology of bacteria. Microscopic method of research.	Morphological features bacteria. Classification and taxonomy of microorganisms. mov. Microscopic method of research in microbiology. Technique of smear preparation. Simple staining methods.	RO7 RO9	1	Test interview, laboratory work	Checklist for assessing a practical lesson.

	Microbiology SROP/SRO. Medical microbiology and its role in medicine. Organization and rules of operation of microbiological and virological laboratories.	The role of medical microbiology in the progress of medicine. The goals and objectives of microbiology, virology and immunology in their historical development. The importance of these disciplines in the practical activities of a doctor. Equipment and rules for working in a microbiological laboratory. Methods of microbiological diagnostics of bacterial and viral infections. The concept of the bacterioscopic method of research and its use for laboratory diagnostics. The importance of the bacteriological method of research.	RO7	1/5	Presentation, essay	Criteria-based assessment
5	**Molecular biology of the cell Lecture No. 2 Topic.**Molecular biology of the cell. Adhesive function of membranes. Transmission of external signal to the cell.	Families of membrane adhesive proteins. Adhesive function of membranes. Main stages of signal transmission. Types of signaling pathways and signaling systems.	RO1	1	Overview	Feedback connection
	Molecular Biology of the Cell Practical LessonNo. 4Topic. Structure and operation of ion channels and pumps.	Ion channels and ion pumps. Uniport, symport and antiport. Na+, K+ pump. Apoptosis.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	HistologyPractical lesson #5 Topic: Epithelial tissues. Glands.	Morphofunctional and histogenetic features of epithelia. Classification. Structure of different types of epithelium. Glands. Histophysiology of the	RO10 RO11	1	Work in small groups, checklist of histo preparations and	Practical Lesson Assessment Checklist.

		secretory process. Types of secretion.			microphotographs	
	Chemistry ***Practical lesson #5. Topic:*** Colligative properties of solutions. The role of osmosis in biological processes.	Osmosis. Osmosis in blood cells. Van't Hoff's law. Plasmolysis, hemolysis, turgor and isotonicity. Classification preparation of injection solutions (hypotonic, hypertensive (physiological and isotonic solutions). Preparation of physiological solutions.	PO4 RO5 RO6	1	work in small groups, lab work	Oral survey/ test control, protection of the results of laboratory experiments
	Chemistry SROP/SRO **Consultation on the implementation of SRO 3.** ***Task SRO№3.1*** The importance of solutions in the vital activity of organisms. Electrolytes in a living organism. ***Task SRO№3.2*** Acid-base balance disorders. Homeostasis.	Types of solutions. Solubility. Solubility dependence on temperature. Electrolytes. Strong and weak electrolytes. Degrees of dissociation and concentration of ions in solutions of weak electrolytes. Biological fluids of the body in the form of solutions of electrolytes and non-electrolytes. Types of acid-base balance disorders. Types of acidosis and alkalosis. Homeostasis. Blood acid balance disorders.	PO4 RO5	1/6	Presentation	Oral survey
6	***Histology*** Lecture No. 2. Topic: Fundamentals of the study of tissues.	Regularitiesoccurrenceand tissue evolution. Classification of tissues. Mechanisms for ensuring tissue homeostasis.Limitstissue	RO11	1	Overview	Answers to security questions.

		variability. Epithelial tissue. Connective tissue.				
	Molecular biology of the cell Practical lesson. No. 5 Topic. Structure and functions of cellular non-membranes organelles and the cell cytoskeleton.	Molecular structure and functions of cellular non-membrane organelles. Cell center, ribosome, cilia and flagella. Cytoskeleton and motor organelles of the cell.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing nie, oral and written survey.
	HistologyPractical lesson No. 6 Topic: Blood and lymph.	Morphofunctional characteristics of blood as a tissue. Morphology and function of formed elements of blood. Composition of lymph.	RO10 RO11	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #6. Topic:*** Acid-base balance in life processes. Ionic product of water. Hydrogen index pH.	Acid-base theories according to Arrhenius and Bronsted-Lowry. Degree and constant of dissociation. Ostwald's dilution law. Ionic product of water. Hydrogen index.	PO4 RO5 RO6	1	work in small groups lab work.	Oral survey/ test control, protection of the results of laboratory experiments
	Molecular biology of the cell SROP No.21.1 Molecular structure and functions of cellular non-membrane organelles 1.2 Molecular mechanisms of cell cycle regulation	Non-membrane cell organelles. Structure and functions: ribosomes, cytoskeleton. The concept of regulatory molecules of the cell cycle. Cyclin-dependent protein kinases and their function. Cyclins and their function.	PO3	1/6	Work in small groups, presentation defense, glossary compilation.	Presentation, glossary, abstract
7	**Chemistry** ***Lecture No. 2. Topic:*** The doctrine of solutions. Osmosis in biological systems. Buffer systems	Solution as a basis for the vital activity of body cells. Changes in boiling and freezing temperatures of solutions. Ebuliometry. Cryometry. Osmosis. Osmosis in blood cells. Van't Hoff's law. Plasmolysis, hemolysis, turgor and isotonicity.	RO5 RO6	1	overview/computer technology	Feedback

		Hypertonic and hypotonic solutions. Buffer systems. Biological functions of buffer systems in living organisms.				
	Molecular biology of the cell Practical lesson No. 6 Topic. Molecular structure and functions of cellular membrane organelles and nucleus.	Membrane organelles of the cell. Structure and functions of the mitochondria, Golgi complex. Three-dimensional model of the Golgi complex, ER. Nuclear apparatus of the cell, structural organization of chromatin, karyoplasm.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	HistologyPractical lesson #7 Topic: Loose, unformed fibrous connective tissue. Dense connective tissue.	Principles of classification of connective tissues. Cellular elements of connective tissues and their function. Types of connective tissue fibers. Chemical composition, function and origin of the main amorphous substance.	RO10 RO11	1	Work in small groups, checklist of histological preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #7. Topic:*** Buffer systems. The importance of buffer systems in the human body	Buffer systems. Buffer action zone, its calculation. Determination of pH of acidic and basic buffer systems. The importance of buffer systems in the human body	RO5 RO6	1	work in small groups	Oral questioning/problem solving
	Molecular biology of the cell SROP/SRO No.3 Consultation on the implementation of the RK. Boundary control No. 1.	Control over the acquisition of theoretical knowledge and practical skills on the topics covered in lectures and practical classes	PO2	1/5		Testing, solving situational problems, organization survey. Evaluation of test results, situation ational tasks.
8	**Microbiology** Lecture. Physiology and biochemistry of bacteria and viruses.	Metabolism of bacteria and viruses. Respiration and nutrition of bacteria. Cultivation of bacteria. Isolation and indication of viruses.	RO7	1	Overview	Feedback

	Histology Practical lesson No. 8 Topic: Connective tissues with special properties.	Reticular connective tissue. Pigment, white and brown adipose tissue, mucous tissue. Location, functional significance.	RO10 RO11	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Chemistry ***Practical lesson #8. Topic:***Hydrolysis. Hydrolysis of salts. The biological role of hydrolysis in the processes of vital activity of the organism	Hydrolysis of salts. Types of hydrolysis. Degree of hydrolysis. Factors affecting the degree of hydrolysis. Biological role of hydrolysis in the processes of vital activity of the organism	RO5	1	work in small groups	Oral survey/test control
	Microbiology Practical lesson. Structure of a bacterial cell.	Morphology and structure of bacteria. Complex staining methods. Gram staining. Immersion microscopy method.	RO7 RO9	1	Test interview, laboratory work	Practical Lesson Assessment Checklist
	Histology SROP/SRO2 Border control - 1	To summarize the mastery of theoretical and practical material.	RO10 RO11	1/3	1. Ability to determinehistological drugs. 2. Skill fill inchecklisthistopreparations and microphotographs	Diagnostics of microphotographs and micropreparations (checklist for RK assessment).
	Chemistry SROP/SRO 4 **Consultation on the implementation of RK 1.**Border control #1	Control of assimilation of theory knowledge and practical skills on the topics covered in lectures, practical classes and assignments (topics 1-7).	RO5	1/2	Oral and written questioning on tickets or computer testing	Oral and written survey
9	**Molecular biology of the cell Lecture No. 3 Topic.**The molecular structure of cells and diseases that arise when their	Definition of the concept of organelles and their classification. Diseases of lysosomes, perixisomes, disorders of protein sorting in the ER, mitochondrial diseases. Definition and	RO1	1	Overview	Answers to security questions.

	functioning is disrupted.	mechanism of development.				
	Chemistry ***Practical lesson #9. Topic:*** Biogenic s-, p-, d-elements and their importance for living organisms.	Classification of chemical elements. Location s-, p-, d-elements in the periodic table. Content of chemical elements in the body. Biological role of chemical elements in the vital activity of a living organism.	RO5 RO6	1	Work in small groups	Oral survey/ test control
	Molecular biology of the cell Practical lesson No. 7 Topic. Intercellular interactions. Contacts.	Intercellular contacts: simple junction, interdigitation, adhesive belt. Tight junction: nexuses or gap junctions.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Histology Practical lesson #9. Topic: Cartilaginous tissues	Determine the types of cartilaginous tissues based on the structural features of the intercellular substance and know the histofunctional features.	RO11 RO10	1	Work in small groups, checklist of histological preparations and microphotographs	Practical Lesson Assessment Checklist.
	Histology SROP/SRO3 Cell response to damaging effects. Cell aging and death.	A set of signs of cell vital activity. Cell response to damage. Morphological signs of apoptosis and necrosis.	RO11	1/6	Work in small groups, presentation defense, glossary compilation.	Checklist for SRO assessment
10	**Chemistry** ***Lecture No. 3. Topic:***The importance of surface phenomena in medicine. Adsorption.	Surface energy and surface tension. Adsorption. Surfactants and PIV. The role of adsorption in biology and medicine.	PO4 RO6	1	overview/computer technology	Feedback
	Chemistry Practical lesson #10. Topic: Complex compounds and their properties. Medical and biological role of complex compounds.	Structure of complex compounds. Nomenclature and types of complex compounds. Chemical bonding in complex compounds. Equilibrium in solutions and dissociation of complex compounds.	PO4 RO5 RO6	1	work in small groups, laboratory work	Oral survey/ test control, protection of the results of laboratory experiments

	Histology Practical lesson #10. Topic: Muscle tissue.	Morphofunctional characteristics of muscle tissues. Smooth and striated muscle tissues. Structural differences in the organization of slow and fast muscle fibers.	RO11 RO10	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Microbiology Practical lesson. Physiology and biochemistry of bacteria. Microbiological research method.	Nutrition, respiration, growth and reproduction of bacteria. Methods for isolating pure cultures of aerobic and anaerobic bacteria and methods for identifying pure cultures of bacteria used in bacteriological diagnostics of infectious diseases. diseases. Suitable preparation of nutrient media for cultivation, seeding of microorganisms.	RO7	1	Work in small groups, completing laboratory work.	Checklist for assessing a practical lesson.
	Microbiology SROP/SRO. Concept of biotechnology. Microorganisms participating in biotechnological processes. Biological preparations obtained by genetic engineering.	Biotechnology. Brief history of biotechnology development. Processes used in biotechnology. Genetic engineering and design. Genetics of bacteria and viruses. Microorganisms, cells and processes used in genetic engineering.	RO9	1/5	Abstract, presentation, essay on the topic	Criteria-based assessment
11	**Histology** Lecture No. 3 Topic: Muscle tissue. Nervous tissue.	Structure of muscle tissue. Nerve cells and neuroglia. Nerve fibers, nerve endings, synapses.	RO10	1	Overview	Answers to security questions.
	Molecular biology of the cell Practical lesson No. 8 Topic. Adhesive function of membranes. Transmission of external signal to the cell.	General idea of the mechanism of intercellular interaction. Families of adhesive membrane proteins. Adhesive function of membranes. Types of signaling pathways The main stages of signal transmission. Signal transmission in the cell.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.

		Characteristics of signaling molecules. Secondary messengers				
	Chemistry ***Practical lesson #11. Topic:*** Oxidation-reduction processes and their biological role. Electrode potentials.	Redox reactions. Electrode potentials. Galvanic cells. Electromotive force (EMF) of a galvanic cell. Nernst equation. Direction of redox processes. Membrane potential. The importance of redox reactions in human life.	RO5 RO6	1	Work in small groups	Oral survey/test control
	Microbiology Practical lesson. Physiology of viruses. Virological research methods.	Methods of culturing viruses. Indication and identification of viruses. Phages and phage typing. Stages of preparation of a single-layer cell culture. Technique of infecting with viruses and dissection of a chicken embryo, methods of isolating phages from environmental objects and their identification.	RO 7	1	Let's expand the conversation	Practical Lesson Assessment Checklist.
	Chemistry SROP/SRO **Consultation on the implementation of SRO 5.*Task SRO№5.1*** Biogenic elements in the human body.	Biogenic elements are non-metals that are part of the human body. Biogenic elements are metals that are part of the human body. Elemental composition of the human body. The content and biological role of chemical elements in the human body.	PO4 RO5	1/6	Presentation	Oral survey
	Task SRO№5.2 Biological role of complex compounds. Biocomplexes. Concept of the structure of metalloenzymes (hemoglobin,	Biological role of complex compounds in the human body. Concepts and biocomplexes. Structure of hemoglobin, chlorophyll, vitamin B12 (cyanocobalamin) and their biological role.				

	chlorophyll) their biological role.					
12	**Chemistry** ***Lecture No. 4. Topic:*** Colloidal-dispersed system. Properties of dispersed systems. Stability and coagulation of colloidal solutions.	Concepts: dispersed system, dispersed phase, dispersion medium. Classification of dispersed systems. Micelle structure. Methods of obtaining and purifying colloidal solutions. Optical and electrokinetic properties of colloidal solutions. Tyndall effect. Coagulation, its medical and biological significance. Schulze-Hardy rule. Dialysis, electroosmosis and electrophoresis in medical practice.	RO5 RO6	1	overview/computer technology	Feedback
	Molecular biology of the cell **Practical lesson.**№9 Topic. Cell cycle. Mitosis. Meiosis.	Cell cycle. Cell cycle periods. Direct and indirect cell division. Mitosis. Typical and atypical mitosis. Phases of mitosis. Similarities and differences between mitosis and meiosis. Stages of prophase I of meiotic division.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Chemistry ***Practical lesson #12. Topic:*** Surface phenomena at the phase boundary. Biological significance of adsorption processes. Adsorption therapy.	Surface energy and surface tension. The concept of sorption, adsorption, absorption. Adsorption at the phase boundary, factors influencing adsorption. Surface-active and surface-inactive substances. Duclos-Traube rule. Types of adsorbents. Selective adsorption. Paneth-Fajans rule. Adsorption therapy. The role of surface-active substances in medicine.	RO5 RO6	1	Work in small groups	Oral survey/test control

	Microbiology Practical lesson. Genetics of bacteria and viruses. Genotypic and phenotypic variability of microorganisms.	Genotypic and phenotypic variability. Plasmids. Practical significance of variability. Essence, goals and objectives of biotechnology. Microorganisms and processes used in biotechnology. Genetic engineering and its application in biotechnology. Genetic recombination in bacteria in experiments of transformation, transduction and conjugation. Genotyping.	RO8	1	Extended conversation	Checklist assessment of the practical lesson.
	Molecular biology of the cell **SROP**. №4 **8.1**Cell cycle. Mitosis. Atypical mitosis and its causes we. 8.2 Transport of substances through membranes: transmembrane transfer of low-molecular cular substances. 8.3 Cell cytoskeleton and cell motor organelles.	Definition of the concept of cytoskeleton and motor organelles of the cell. Transport of substances through membranes: transmembrane transfer of low-molecular cular substances. Cell cycle. Mitosis. Atypical mitosis and its causes.	RO1	1/6	Work in small groups, completing laboratory work.	Presentation glossary, abstract
13	**Molecular biology of the cell** **Practical lesson #10**Topic. Molecular Mechanisms we apoptosis and oncogene for. Carcinogenesis.	General idea of the mechanism of apoptosis and necrosis. Definition of the concept of carcinogenesis.	PO2	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Histology Practical lesson #11. Topic: Nervous tissue	Identify different types of neurocytes. Explain the cytological features of	RO10 RO11	1	Work in small groups, checklist of	Practical Lesson

	1. Nerve cells and neuroglia.	nerve cells, neuroglia at the microscopic and ultramicroscopic levels.			histo preparations and microphotographs	Assessment Checklist.
	Chemistry ***Practical lesson #13. Topic:*** Colloidal-dispersed system. Nature, classification of colloidal systems. Properties of dispersed systems.	Concepts: dispersed system, dispersed phase, dispersion environment. Classification of dispersed systems. Structure of the micelle. Methods of obtaining and purifying colloidal solutions. Dialysis in medicine. practice. Optical and electrokinetic properties of colloidal solutions. Tyndall effect. Electro osmosis and electrophoresis, their application in medicine.	RO5 RO6	1	Work in small groups	Oral survey/test control
	Microbiology Practical lesson. Drug resistance of bacteria. Determination of sensitivity of bacteria to antibiotics.	Primary and acquired resistance of microorganisms to chemotherapeutic drugs. Ways to overcome drug resistance of bacteria. Quantitative and qualitative determination of bacterial sensitivity to antibiotics.	RO8	1	Test interview, laboratory work. Testing	Checklist assessment of the practical lesson.
	Microbiology SROP/SRO. Boundary control No. 2	Control over the acquisition of theoretical knowledge and practical skills on the topics covered in lectures and practical classes	RO7 RO8 RO9	1/6	Colloquium	Oral survey (tickets)
14	**Chemistry** ***Practical lesson #14. Topic:*** Stability and coagulation of colloidal systems. Coagulation and peptization of sols.	Coagulation of colloidal systems, its medical and biological aspects ical significance. Schulze-Hardy rule. Aerosols, suspensions, powders, emulsions and their properties.	PO4	1	Work in small groups	Oral survey/test control

	Sedimentation analysis.					
	Molecular biology of the cell Practical lesson No. 11 Topic. Cell cycle and molecular mechanisms of its regulation. https://www.youtube.com/watch?v=U053VjkuFaY&feature=youtu.beCell. Cycle.	Cell cycle. Cyclins and cyclinza dependent kinases (CZK), mitosis-stimulating factor (MSF). Control points of the cell cycle. Regulatory role of p-53 proteins.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Histology Practical lesson #12. Topic: Nervous tissue2. Nerve fibers. Synapses.	Explain the differences in the microscopic structure of myelinated and unmyelinated nerve fibers. Interneuronal synapses.	RO10 RO11	1	Work in small groups, checklist of histo preparations and microphotographs	Practical Lesson Assessment Checklist.
	Microbiology Practical lesson. Ecology of microorganisms. Microflora of various organs and systems of the human body.	Spread of microbes in the environment. The concept of normal human microflora. Microflora of various organs and systems of the human body. Causes of dysbiosis. Bacteriological diagnostics, treatment and prevention of dysbiosis.	RO7 RO 8	1	Discussion, essay	Practical Lesson Assessment Checklist
	Chemistry SROP/SRO 6 ***Task SRO№6.1*** Potentiometry in medical practice.	Potentiometry. Use of potentiometry methods in clinical analysis and in the practice of sanitary and hygienic research. Determination of the concentration of physiologically active ions in biological fluids and tissues using potentiometric methods.	RO6	1/6	Presentation	

	Task SRO№6.2 **Consultation on the implementation of RK 2.**Border control-2	Monitoring the acquisition of theoretical knowledge and practical skills on the topics covered in lectures, practical classes and assignments (topics 9-14).			Oral and written. questionnaire on tickets or computer testing	Oral and written survey
15	**Chemistry** ***Practical lesson #15. Topic:*** HMC. Viscosity of HMC solutions. Swelling.	Features of high-molecular solutions. Properties of high-molecular compounds. Swelling. Factors influencing swelling, biological significance of swelling. Salting out, gelation. Syneresis.	PO4	2	Work in small groups	Oral survey/test control
	Molecular biology of the cell **Practical lesson #12** **Topic**. Cell cycle and molecular mechanisms of its regulation. https://www.youtube.com/watch?v=U053VjkuFaY&feature=youtu.be Cell. Cycle.	Cell cycle. Cyclins and cyclin-dependent kinases (CDK), mitosis-stimulating factor (MSF). Cell cycle checkpoints. Regulatory role of p-53 proteins.	PO3	1	Work in small groups, discussion of key issues, presentation	Testing: oral and written survey.
	Microbiology Practical lesson. Infection, infectious process. Biological research method.	Infection, infectious process, infectious disease. Forms of infection and their characteristics. Periods of infectious disease. Nature of the relationship between micro- and macroorganisms. Forms and stages of the infectious process. Characteristic features of infectious diseases. Pathogenicity, virulence, toxicity of		1	Discussion	Checklist assessment of practical lesson

		bacteria. Experimental methods infection and immunization of animals. Biological methods for studying pathogenicity and virulence factors, as well as methods for determining the virulence of bacteria and the activity of bacterial toxins.				
	Histology SROP/SRO 4 Consultation on the implementation of the RK. Boundary control - 2	To summarize the mastery of theoretical and practical material.	RO 10 RO 11	1/5	1. Skill determine histopreparations. 2. Skill fill inchecklisthistopreparations and microphotographs	Diagnostics of microphotographs and micropreparations (checklist for RK assessment).
	Molecular biology of the cell SROP/SRO№5 Consultation on the implementation of the RK. Boundary control №2.	Control over the acquisition of theoretical knowledge and practical skills on the topics covered in lectures and practical classes	PO2	1/2	Oral and written survey, testing	Testing , solving situational problems, organization survey. Evaluation of test results, situation ational tasks.

	9.	Methods of learning and teaching	
	9.1	Lectures	- Overview. In distance learning, online lectures are held in the form of presentations on the Zoom and Webex platforms. For feedback, students are given the opportunity to ask questions on the topic. - Survey/computer technology
	9.2	Practical classes	- Work in small groups, discussion of the main questions, presentation; - work in small groups, completing laboratory assignments

		works. - testing, work in small groups, checklist of histological preparations and microphotographs
9.3	SRO/SROP	- Presentation, glossary, abstract; - Discussion and evaluation of SRO; - abstract, presentation, essay on the topic; - work in small groups, presentation defense; - compiling a glossary;
9.4	Border control	- Testing, solving situational problems, oral questioning. Evaluation of test results, situational problems; - oral and written questioning on tickets or computer testing - diagnostics of microphotographs and micropreparations (checklist for assessing RK).
10.	**Evaluation criteria**	
10.1	**Criteria for assessing the learning outcomes of the discipline**	

No. RO	Name of learning outcomes	Unsatisfactory	Satisfactorily	Fine	Great
RO 1	Demonstrates knowledge and understanding of cell structure and cell components	1) Does not describe the structure of the cell and cell components 2) Does not understand the mechanisms of cell components	1) Describes the structure of the cell and cell components 2)Understands the mechanisms of cell components	1)Applies knowledge of cell structure using the karyotyping method 2)Interprets the principles of cell theory	1) Assesses the possibility of using pathological changes in the hereditary apparatus for diagnosing diseases using the 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.

PO 2	Demonstrates knowledge and understanding of destructive changes in cellular components that lead to disease	1) Cannot reveal the etiology, pathogenesis and morphogenesis of various cellular diseases	1) Does not fully explain the etiology, pathogenesis, morphogenesis of various cellular diseases	1) Explains the etiology, pathogenesis, morphogenesis of various cellular diseases	1)Applies knowledge of the etiology, pathogenesis, and morphogenesis of various cellular diseases to diagnose hereditary diseases
RO 3	Demonstrates knowledge of the origins and classifications of mitochondrial, lysosomal, and perixisome diseases	1) Cannot define mitochondrial, lysosomal, perixisome diseases 2) Does not differentiate between changes in the hereditary apparatus in various mitochondrial, lysosomal, perixisome diseases	1) Allows inaccuracies in the description of mitochondrial, lysosomal, perixisome diseases. 2) Poorly distinguishes between classifications of mitochondrial, lysosomal, perixisome diseases.	1) Describes the classification of mitochondrial, lysosomal, perixisome diseases 2) Distinguishes well between various mitochondrial, lysosomal, perixisome diseases	1) Independently describes the classifications of mitochondrial, lysosomal, perixisome diseases 2) Conducts differential diagnostics for mitochondrial, lysosomal, perixisome diseases
PO 4	- demonstrates knowledge of chemical processes (basic types of reactions) in the body, subject to the general laws and patterns of chemistry, as well as general energy and kinetic patterns of chemical processes;	- is not familiar with the theories, concepts and directions on the topic, does not demonstrate his knowledge, does not answer questions.	- is not clearly oriented in theories, concepts and directions on the topic, poorly demonstrates his knowledge, answers questions with fundamental errors.	- competently, navigates theories, concepts and directions on the topic, demonstrates his knowledge, answers questions with minor errors.	- logically, clearly, competently, navigates the theories, concepts and directions on the topic, demonstrates his knowledge, answers all questions. Also logically and competently answers additional questions.

	RO 5	- applies knowledge of calculation formulas (mass fraction, molar concentration, molar concentration of equivalent, molal concentration, molar fraction, titer) when preparing solutions of given concentrations and understands methods for determining the quantitative content of substances in the systems under study, including biological fluids.	does not know the calculation formulas for expressing the concentration of solutions. Does not know how to choose formulas when preparing solutions. Does not know how to draw conclusions about the quantitative content of substances in the liquids being studied.	does not clearly know the calculation formulas for expressing the concentration of solutions. Reasons poorly in choosing formulas when preparing solutions. And does not know how to draw conclusions about the quantitative content of substances in the liquids being studied.	does not clearly know the calculation formulas for expressing the concentration of solutions. Reasons poorly in choosing formulas when preparing solutions. And does not know how to draw conclusions about the quantitative content of substances in the liquids being studied.	clearly knows the calculation formulas for expressing the concentration of solutions. Logically, he reasons correctly in choosing formulas when preparing solutions. And he can draw conclusions about the quantitative content of substances in the liquids being studied.
	RO 6	- formulates general theoretical foundationschemistryfor knowledge, skills and abilities in their subsequent professional activities.	does not understand the general theoretical foundations of chemistry on the topic, does not answer the teacher's questions Cannot draw conclusions and cannot connect the topic with the future profession.	not competently, navigating the general theoretical foundations of chemistry on the topic, answers the teacher's questions. Gives an unclear conclusion and cannot connect the topic with the future profession.	unclearly, but competently, being guided by the general theoretical foundations of chemistry on the topic, answers the teacher's questions. Gives a vague conclusion and is able to connect the topic with a future profession.	logically, clearly, competently, and being familiar with the general theoretical foundations of chemistry on the topic, answers additional questions from the teacher. Provides a clear, independent conclusion and is able to connect the topic with a future profession.
	RO 7	Demonstrates knowledge of the classification and biological	1) does not describe the morphological, physiological and	1) describes the morphological, physiological	1) uses knowledge about the morphological,	1) can classify microorganisms according to their morphological,

		properties of microorganisms (morphological, physiological, antigenic) and their ecology; methods of isolating pure cultures and identification; principles of determining the sensitivity/resistance of microorganisms to antimicrobial drugs;	antigenic properties of microorganisms; 2) does not understand the results of studies conducted to determine the morphological, physiological and antigenic properties of microorganisms; 3) does not have knowledge of methods for determining the sensitivity of microorganisms to antimicrobial drugs.	and antigenic properties of microorganisms; 2) understands the results of studies conducted to determine the morphological, physiological and antigenic properties of microorganisms; 3) has knowledge of methods for determining the sensitivity of microorganisms to antimicrobial drugs.	physiological and antigenic properties of microorganisms; 2) explains the results of studies conducted to determine the morphological, physiological and antigenic properties of microorganisms; 3) describes methods for determining the sensitivity of microorganisms to antimicrobial drugs.	physiological and antigenic properties; 2) interprets the results of studies conducted to determine the morphological, physiological and antigenic properties of microorganisms; 3) uses quantitative and qualitative methods to determine the sensitivity of microorganisms to antimicrobial drugs.
	RO 8	Demonstrates knowledge of the basics of microbial genetics; the essence of biotechnology; the influence of environmental factors on microorganisms, the goals and methods of asepsis, antisepsis, sterilization, disinfection; chemotherapy and antibiotics; the basics of infectious disease	1) cannot talk about methods of asepsis, antisepsis, sterilization and disinfection; 2) does not know about CTP and antibiotics used in the treatment of infectious diseases.	1) can talk about methods of asepsis, antisepsis, sterilization and disinfection; 2) knows about CTP and antibiotics used in the treatment of infectious diseases.	1) is proficient in the methods of asepsis, antisepsis, sterilization and disinfection; 2) can tell about CTP and antibiotics used in the treatment of infectious diseases.	1) shows effective methods of asepsis, antisepsis, sterilization and disinfection; 2) substantiates the effectiveness of chemotherapy and antibiotics used in the treatment of infectious diseases.

		epidemiology, routes of infection, localization of microorganisms in the human body;				
	RO 9	Possesses the skills of preparing native smears, staining smears using simple and complex methods and interpreting microscopic results; culturing viruses; determining the sensitivity/resistance of microorganisms to antimicrobial drugs;	1) does not describe the technique of preparing a native preparation, staining using simple and complex staining methods, microscopy, or the method of culturing microbes.	1) describes the technique of preparing a native preparation, staining using simple and complex staining methods, microscopy, and the method of culturing microbes.	1) has knowledge of the preparation of native preparations, staining with simple and complex staining methods, microscopy, and microbial cultivation techniques	1) applies in practice the technique of preparing a native preparation, staining with simple and complex staining methods, microscopy, and the method of culturing microbes
	RO 10	- demonstrates knowledge of the subject and objectives of histology and physiology, their importance for medicine; - knows the structure and general patterns of functioning of cells, tissues, regulatory mechanisms, considered from the standpoint of general physiology and integrative behavioral activity of a person;	- does not demonstrate knowledge of the subject and objectives of histology and physiology; - does not know the structure and general patterns of functioning of cells, tissues, regulatory mechanisms	- demonstrates partial knowledge of the subject and tasks of histology and physiology, - does not fully know the structure and general patterns of functioning of cells, tissues, regulatory mechanisms, makes gross errors.	- demonstrates knowledge of the subject and objectives of histology and physiology, their importance for medicine; - knows the structure and general patterns of functioning of cells, tissues, regulatory mechanisms	- demonstrates brilliant knowledge of the subject and tasks of histology and physiology, their significance for medicine; - has excellent knowledge of the structure and general patterns of functioning of cells, tissues, and regulatory mechanisms

	RO 11	- distinguishes, describes, compares the structural features of various cells, tissues, organs of the body and explains their functions; -has the skills to conduct laboratory research of cells and methods of processing the results;	- does not distinguish, does not describe, does not compare the structural features of various cells, tissues, organs of the body and does not explain their functions; - Nothas the skills to conduct laboratory research of cells and methods of processing the results	- partially describes, compares the structural features of various cells, tissues, organs of the body and explains their functions, makes gross errors; - partiallyhas the skills to conduct laboratory research of cells;	- distinguishes well, describes, compares the structural features of various cells, tissues, organs of the body and explains their functions, makes minor mistakes; -Finehas the skills to conduct laboratory research of cells and methods of processing the results;	- perfectly distinguishes, describes, compares the structural features of various cells, tissues, organs of the body and explains their functions; - Greathas the skills to conduct laboratory research of cells and methods of processing the results;
	RO 12	-Able to present information clearly and logically in the form of a presentation. - compares physiological parameters (constants) of a healthy and sick organism; - analyzes information obtained during experimental observations, determines its significance for characterizing the state of the organism.	Incapable of presenting information clearly and logically in the form of a presentation. - does not compare physiological parameters (constants) of a healthy and sick organism; - does not analyze the information obtained during experimental observations and does not determine its significance for characterizing the	Able to present information clearly and logically in the form of a presentation. - partially compares physiological parameters (constants) of a healthy and sick organism, allowing gross errors	Able to present clearly and logically put info mation in the form of a presentation. - compares physiological parameters (constants) of a healthy and sick organ Nism, tolerance what an unprincipled pialnye erro ki; - analyzes the information obtained during the experiment	Able to present information clearly and logically in the form of a presentation. - ideally compares physiological parameters (constants) of a healthy and sick organism; - freely analyzes information obtained during experimental observations, determines its significance for characterizing the state of the organism.

			state of the organism.		mental observations, determines its significance for characterizing the state of the organism.	

10.2 Criteria for assessing teaching methods and technologies

Checklist for practical lesson...

Form control	Grade	Evaluation criteria
Work in small groups (practical, laboratory classes)	95-100% (4.0; A)	The student has completed all practical and laboratory work and gives a full answer to all theoretical questions and test assignments. Actively participates, becomes an 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 practical and laboratory work and gives a full answer to all test questions. Actively participates, leads in 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 issues, submitted laboratory work and reports on them on time and made minor mistakes when answering practical lessons; positive assessment on tests. 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, submitted laboratory work and reports on them on time and made fundamental mistakes when answering practical classes; positive assessment on tests. Does not participate very actively in the subgroup, knows how to conduct a dialogue between subgroups, uses self-assessment.
	60-69% (1.67; C-; 2.0; C)	The student experiences some difficulties when answering questions in practical classes, made logical and stylistic errors when answering. Did not complete the laboratory work on time, submitted all reports on them; showed little activity in class and needed the teacher's help, partially completed the test assignments.
	50-59% (1.0; D+)	The student made serious mistakes when answering theoretical questions and does not understand the questions of the topic. Did not fully complete the laboratory work and reports on it, did not complete the test assignments. Did not show activity in the subgroup.
	0-49% (0.24; F; 0.5; FX)	The student is not prepared, does 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 assignments. Did not show activity in the subgroup.

Form of control	Grade	Evaluation criteria
Oral survey	**Great** Corresponds to ratings: A (4.0; 95-100%); A- (3.67; 90-94%)	The student answers all questions logically, clearly, competently, and is guided by the theories, concepts, and directions on the topic. He also answers additional questions from the teacher logically and competently.
	Fine Corresponds to ratings: B+ (3.33; 85-89%); B (3.0; 80-84%); B- (2.67; 75-79%) C+ (2.33; 70-74%)	The student made minor inaccuracies in his answers, non-fundamental mistakes, which he corrects himself. He answers the teacher's additional questions. The student made minor inaccuracies in his answers, minor errors, which he corrects himself. He answers the teacher's additional questions with minor errors.
	Satisfactorily Corresponds to ratings: 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 his answers, which he corrects with the help of the teacher. He answers additional questions with fundamental mistakes. The student made fundamental mistakes in his answers, which he corrects with difficulty with the help of the teacher. He makes gross mistakes in additional questions.
	Unsatisfactory Meets the rating FX (25 - 49%) F (0-24)	The student made gross mistakes in his answers, which he could not correct, even when asked leading questions by the teacher. He could not answer additional questions by the teacher.
Form of control	**Grade**	**Evaluation criteria**
Problem solving	95-100% (4.0; A)	- the correct algorithm for solving the problem has been drawn up, there are no errors in logical reasoning and in the choice of formulas and solution, the correct answer has been obtained, the problem has been solved in a rational way; provides a complete and clear explanation of the solution to 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 drawn up, there are grammatical errors in the logical reasoning and in the choice of formulas and solution, the correct answer has been obtained, 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 drawn up, there are no significant errors in the logical reasoning and solution; the formulas for the solution have been chosen correctly; there is an explanation of 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 obtained.

	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 formulas for the solution have been chosen 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 obtained.
	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 problem is not solved, there is no answer to the task.

Form of control	Grade	Evaluation criteria
Testing	**Great** Corresponds to ratings: A (4.0; 95-100%); A- (3.67; 90-94%)	90-100% correct answers
	Fine Corresponds to ratings: B+ (3.33; 85-89%); B (3.0; 80-84%); B- (2.67; 75-79%)	70-89% correct answers
	Satisfactorily Corresponds to ratings: C+ (2.33; 70-74%); C (2.0; 65-69%); C- (1.67; 60-64%); D+ (1.0; 50-54%)	50-69% correct answers
	Unsatisfactory Meets the rating FX (25 - 49%) F (0-24)	less than 50% correct answers

Checklist for SROP/SRO

Presentation

Form control	Grade	Evaluation criteria
Presentation of the topic	**Great** 95-100 points 90-94 points	The presentation was completed independently, at the appointed time. term, with a volume of at least 20 slides. Not used less than 7 literary sources. Slides are informative and concise. During the defense, the author demonstrates deep knowledge of the topic. Does not make mistakes when answering questions in

		time for discussion.
	Fine 85-89 points 80-84 points 75-79 points 70-74 points	The presentation was completed independently, at the appointed time. term, with a volume of at least 17 slides. Not used less than 6 literary sources. Slides meaningful and concise. When defending the author demonstrates good knowledge of the topic. Makes minor mistakes when answering questions that he corrects it himself.
	Satisfactorily 65-69 points 60-64 points 50-54 points	The presentation was completed independently, at the appointed time. term, with a volume of at least 14 slides. Not used less than 5 literary sources. Slides are not informative. During the defense, the author makes fundamental mistakes answering questions.
	Unsatisfactory 0.5; 25-49 points 0:0-24 points	The presentation was not submitted on time, the volume is less than 10 slides. Less than 5 references used. sources. Slides are not meaningful. When protecting the author makes gross mistakes when answering questions. Not is oriented in his own material.

G l o s s a r i o n

Form control	**Grade**	**Evaluation criteria**
Preparing a glossary	**Great** Corresponds to ratings: (4.0; 95-100%); (3.67; 90-94%)	- If the students have compiled the glossary themselves; - The volume is not less than 15 terms; - The terms correspond to the topic being protected; - The wording of the term is correct and corresponds biological significance, complete; - Terms are arranged alphabetically, etymology is given term;
	Fine Corresponds to ratings: (3.33; 85-89%); (3.0; 80-84%); (2.67; 75-79%); (2.33; 70-74%).	- If the students have compiled the glossary themselves; - The volume is at least 10-13 terms; - The terms correspond to the topic being protected; - The wording of the term is correct and corresponds biological significance, no etymology. - No alphabetical order; - There are some inaccuracies;
	Satisfactorily Corresponds to ratings: (2.0; 65-69%); (1.67; 60-64%); (1.0; 50-54%)	- If the students have compiled the glossary themselves; - The volume is not less than 10 terms; - The wording of the term corresponds to the biological meaning, but not complete; - No alphabetical order; - Etymology is missing;
	Unsatisfactory Meets the rating (0.5; 25-49%) (0:0-24%)	- If the students have compiled the glossary themselves; - The volume is not less than 10 terms; - The terms do not correspond to the topic; - Serious biological errors are allowed. No

		alphabetical order; - Etymology is missing.

Abstract

Form control	Grade		Evaluation criteria
Preparation and defense of the abstract	**Great** 95-100 points 90-94 points		The abstract was completed neatly and submitted on time. term, written independently for at least 15 pages of typewritten text, using at least 7 literary sources. Provided diagrams, tables and figures corresponding topic of the abstract. When defending the abstract, the text is not read, but told. Confidently and accurately answers all questions asked.
	Fine 85-89 points 80-84 points 75-79 points 70-74 points		The abstract was completed neatly and submitted on time. term, written independently for at least 13 pages of typewritten text, using at least 6 literary sources. Provided diagrams, tables and figures corresponding topic of the abstract. When defending the abstract, the text is not read, but told. When answering questions makes minor mistakes.
	Satisfactorily 65-69 points 60-64 points 50-54 points		The abstract was completed neatly and submitted on time. term, written independently for at least 10 pages of typewritten text, using at least 5 literary sources. When reads the text in defense of the abstract. Answers uncertainly to questions, makes fundamental mistakes.
	Dissatisfied telno 0-49 points		The abstract was written carelessly and was not submitted. appointed time, written independently in less than on 10 pages of typewritten text, with using less than 5 literary sources. When defending an abstract, he reads the text. When answering questions, he makes gross mistakes and is not oriented in material.

Interim assessment

Form control	Grade		Evaluation criteria
Testing/installation oral and written survey	**Great** 95-100 points 90-94 points	-If the student did not make any mistakes or inaccuracies while answering; -ABOUTnavigates the theories, concepts and directions of the discipline being studied and gives them a critical assessment, uses the scientific achievements of other disciplines; - 86-100% of test questions were answered correctly;	

	Fine 85-89 points 80-84 points 75-79 points 70-74 points	-If the students did not make any gross errors in their answer, made minor inaccuracies or fundamental errors the mistakes corrected by the student himself were able to systematize the program material with the help of teacher; - 70-89% of test questions were answered correctly;
	Satisfactorily 65-69 points 60-64 points 50-54 points	- If the student made inaccuracies and minor mistakes during the answer, limited himself to the educational literature specified by the teacher, and experienced great difficulties in systematizing the material; - 50-69% of test questions were answered correctly;
	Unsatisfactory 24-49 points 0-24 points	- If the student made fundamental mistakes during the answer, did not work through 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; - Less than 50% of test questions were answered correctly;

Multi-point system of knowledge assessment

Letter system rating	Digital equivalent of points	Percentage content	Traditional system assessment
A	4.0	95-100	Great
A -	3.67	90-94	
B +	3.33	85-89	Fine
IN	3.0	80-84	
IN -	2.67	75-79	
C +	2.33	70-74	
WITH	2.0	65-69	Satisfactorily
WITH -	1.67	60-64	
D+	1.33	55-59	
D-	1.0	50-54	
FX	0.5	25-49	Not satisfactory
F	0	0-24	

11.	Educational resources
Electronic resources:	1. Electronic library of YUKMA -https://e-lib.skma.edu.kz/genres 2. Republican Interuniversity Electronic Library (RIEL) –http://rmebrk.kz/ 3. Digital library "Aknurpress" - https://www.aknurpress.kz/ 4. Electronic library "Epigraph" -http://www.elib.kz/ 5. Epigraph - portal of multimedia textbookshttps://mbook.kz/ru/index/ 6. **EBS IPR SMART**https://www.iprbookshop.ru/auth 7. information and legal system "Zan" -https://zan.kz/ru 8. Cochrane Library -https://www.cochranelibrary.com/ 9. https://meduniver.com/Medical/Video/predmet_metodi_istoria_gistologii.html 10. https://meduniver.com/Medical/Video/citologia.html

	11. https://meduniver.com/Medical/Video/lekcia_po_citologii.html 12. https://meduniver.com/Medical/Video/lekcia_po_embryologii.html 13. https://meduniver.com/Medical/Video/razvitie_ploda_i_stroenie_placenti.html 14. https://meduniver.com/Medical/Video/gistologia_epitelialnix_tkanei.html 15. https://meduniver.com/Medical/Video/gistologia_rixloi_voloknistoi_tkani.html 16. https://meduniver.com/Medical/Video/gistologia_sobstvenno_soedinitelnix_tkanei.html 17. https://meduniver.com/Medical/Video/osteogenez_i_xondrogenez.html
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Special programs	http://www.biology-questions-and-answers.com "BioloqyQuestionsandAnswers" is a website on biology in the form of questions and answers, including sections on Cytology, Embryology, Histology; contains drawings and microphotographs of cells and tissues. http://humbio.ru/ "HUMAN BIOLOGY KNOWLEDGE BASE" - contains information intended for educational and scientific purposes/ http://www.testland.ru/default.asp?id=555&uid Online testing for registered users.
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Histology

Main literature

1. Histology, embryology, cytology: okulyk / ed. Bask. Yu. I. Afanasyev; N. A. Yurina; Kaz. tiline aud. Zhane zhauapt ed. R. Zh. Yesimova; K. T. Nurseitova. - 6-bass, ond. zhanetolykt. - M.: GEOTAR - Media, 2014. - 896 bet. IL
2. Histology. Complex tests: answers and explanations [Text]: textbook / ed. prof. S. L. Kuznetsova, prof. Yu. A. Chelysheva. - M.: GEOTAR - Media, 2014. - 288 p. : silt
3. Tungyshbaeva, Z. B. Cytology and histology of negyzderi [Matin]: okulyk / Z. B. Tungyshbaeva. - Almaty: AҚHYP, 2019. - 248 bet. With.
4. Danilov, R. K. Histology, embryology, cytology [Text]: textbook / R. K. Danilov, T. G. Borovaya. - M.: GEOTAR - Media, 2018. - 520 p. : silt
5. Yui R. I. Fundamentals of histology of the oral cavity and teeth: a textbook for dentists / R. I. Yui, . - 2nd ed., supplemented and revised. - Almaty: TechSmith, 2023. - 232 p.

6. Inderbir Singh. Textbook of Human Histology.With Color Atlas and Practical Guide/8 th Edition.Jaypee Brothers Medical Publishers .2016.-302 p.Translation Human Histology
7. Dudek Ronald W. Embryology / Ronald W. Dudek. - 5th ed. - [sl]: Wolters Kluwer, 2014. - 158 p. Title translation: Embryology
8. Gartner Leslie P. Cell Biology and Histology / Leslie P. Gartner. - 8th ed. - [sl] : Wolters Kluwer, 2019. - 436 p. - (BRS. Board Review Series) Translation of the title: Cell Biology and Histology

Further reading

1. Tungyshbaeva Z.B. Cytology and histology negizderi: workshop / Z. B. Tungyshbaeva. - Almaty: АҚҺҰР, 2019. - 152 bet. WITH
2.Textbook of Human Histology.Inderbir Singh /Sixth Edition/Inderbir Singh 2010.-386 p.
TranslationTextbook of Human Histology

12. Discipline Policy

Requirements for students:

1. During the period of stay on the territory of the department, comply with the disciplinary requirements specified at the entrance to the department;
2. Mandatory attendance of lectures, practical and laboratory classes according to the schedule;
3. Don't be late for classes;
4. During classes, wear special clothing (robes, caps);
5. Do not miss classes; in case of illness, provide a work-off sheet issued by the dean's office based on a certificate of illness;
6. Missed classes must be made up according to the teacher's schedule of work-offs;
7. Actively participate in the educational process;
8. Comply with the Academy's internal regulations and ethics of conduct;
9. Complete homework and SRO assignments in a timely and accurate manner according to the SRO submission schedule;
10. In case of failure to complete assignments and missing a lecture, the final grade is reduced;
11. Be tolerant, open and friendly towards fellow students and teachers;
12. Treat the department's property with care;
13. In connection with the absence of lectures for an unjustified reason, 1 point is deducted from the overall admission rating for each absence.
14. Due to missing classes on the SRO without a valid reason, 2 points are deducted from the overall admission rating for each absence.
15. If a student receives an unsatisfactory grade (0-49 points) at the midterm assessment, he/she will not be allowed to take the final assessment.
16. If a student receives an unsatisfactory grade in the assessment of practical skills, he/she will not be allowed to take the final assessment.
17. In the context of distance learning: timely familiarize yourself with the tasks that are entered in the "Task" module of the AIS Platonus, complete tasks for the lecture, practical lesson and SRO according to the schedule; participate in the discussion of the main issues of the topic of the classes, complete individual or group tasks in broadcasting platforms in classes organized by the teacher (Zoom, Webex, etc.);
18. In case of absence of a student from lectures, practical classes, or SRO, a note about absence ("n") is entered in the AIS Platonus electronic educational journal.

Academic Policy. Section 4. Student Honor Code

The student strives to become a worthy citizen of the Republic of Kazakhstan,

a professional in his chosen specialty, to develop the best qualities in himself creative personality.
The student treats elders with respect and does not allow rudeness attitude towards others and shows sympathy towards socially vulnerable people and takes care of them as much as possible.
The student is a model of decency, culture and morality, intolerant of manifestations immorality and does not allow manifestations of discrimination based on gender, national or religious characteristics.
The student leads a healthy lifestyle and completely refuses harmful substances habits.
The student respects the traditions of the university, takes care of its property, and keeps it clean. and order in the student dormitory.
The learner recognizes the necessary and useful activities aimed at development of creative activity (scientific, educational, sports, artistic, etc.), to improve the corporate culture and image of the university.
Outside the walls, the student always remembers that he is a representative of the highest schools and makes every effort not to damage his honor and dignity.
The student considers it his duty to fight against all forms of academic dishonesty, including: cheating and turning to other people for assistance in passing knowledge control procedures; submission of any volume of ready-made educational materials (abstracts, term papers, tests, theses and other works), including Internet resources, as the results of one's own work; use of family or official connections to obtain a higher grade; truancy, being late and missing classes without a valid reason.
The student considers all the listed types of academic unfair as incompatible with obtaining quality and competitive education worthy of the future economic, political and managerial elite of Kazakhstan.

Course grading policy

Bachelor's degree

1. Evaluation of students' academic achievements involves evaluation of current control, midterm control and final certification of students.
2. Current monitoring of students' knowledge is carried out within the framework of practical (seminar, laboratory) classes with daily completion of the educational journal students' progress and the electronic journal until the end of the week. The teacher, missed a class, lecture and SRO (if not exempted from classes according to (according to the order of the dean of the faculty) the mark "ж" is put (language of completion - Kazakh); "n" (language of filling - Russian); "a" (language of filling - English).
3. Missed classes for an unjustified reason will not be made up.

Students who miss classes for an unjustified reason or who fail to complete their work in the electronic journal are given a grade of "0" next to the "n" mark in the last week of the academic period.

4. Missed classes for a valid reason are made up when providing a supporting document (due to illness, family circumstances or other objective reasons). The student is obliged to provide a certificate no later than 5 working days from the date of its receipt. In the absence of supporting documents or if they are submitted to the dean's office later than 5 working days after returning to study, the reason is considered invalid. The student submits an application to the dean and receives a work sheet indicating the deadline, which is valid for 30 days from the date of its receipt in the dean's office. Students who missed classes for a valid reason are given a grade in the electronic

journal next to the mark "n" received as a result of working the class. In this case, the mark "n" is automatically canceled.
5. Students who missed classes due to the dean's order to be released,
the mark "n" is not given, the grade received as a result of working through the lesson is given. The form of control is determined by the department (department policy).
6. By the 1st of each month, departments submit information on academic performance to the dean's office.
student attendance.
7. Midterm assessment of students' knowledge is carried out at least twice during
one academic period of 7-8/14-15 weeks of theoretical training with
by entering the results of midterm assessments into the academic progress log and
electronic journal taking into account penalty points for missing lectures (lecture absences in the form of penalty points are subtracted from the midterm assessment grades). The penalty point for missing 1 lecture is 1.0 point. A student who fails to appear for a midterm assessment without a valid reason is not allowed to take the exam in the discipline. A student who fails to appear for a midterm assessment for a valid reason, immediately after starting classes, submits an application to the dean, provides supporting documents (due to illness, family circumstances or other objective reasons), and receives a work-off sheet, which is valid for the period specified in paragraph 12.4. The results of the midterm assessment are submitted to the dean's office in the form of a report before the end of the assessment week.
8. The SRO assessment is given during the SRO classes according to the schedule in the academic year.
progress log and electronic log taking into account penalty points for absences
classes of the SRO (missing SRO classes in the form of penalty points is deducted from the SRO grades).
The penalty point for missing 1 SRO class is 2.0 points.
9. A student who did not achieve a passing score (50%) for one of the types of tests
(current control, midterm control No. 1 and/or No. 2) are not allowed to take the exam
discipline.
10. Adjustment of assessments of current and midterm controls is carried out when
technical errors in filling out the electronic journal based on an explanatory note from the teacher (signed by the head of the department) indicating the reason; submission of supporting documents (academic progress journal, etc.); permission from the vice-rector for academic and methodological work.
11. Assessment of students' knowledge is carried out using a letter-based score-rating system.
system, according to which 60% is current control, 40% is final control.
12. The final grade is calculated automatically based on the average grade.
current control, average grade of midterm controls and final control grade:
Final grade (100%) = Admission rating (60%) + Final control (40%)
Admission rating (60%) = Average grade of final controls (20%) + Average grade of current control (40%)
Average grade of midterm controls = Midterm control1 + Midterm control2/2
Average assessment of current control = arithmetic mean of current assessments taking into account the average assessment according to SRO
Final score (100%) = RKsr x 0.2 + TKsr x 0.4 + IR x 0.4
РКср – average grade of midterm controls
TCSR – average current control rating
IC – final control assessment
13. The level of mastery of the academic discipline by the student is reflected in
examination report on a 100-point scale, corresponding to the one adopted in

international practice of a letter system with a digital equivalent (positive grades, in descending order, from “A” to “D”, and “unsatisfactory” - “FX”, “F”) and grades according to the traditional system.
14. The final control is carried out in two stages if the Standard
The program for the discipline provides for the acceptance of practical skills. During the two-stage final control, the acceptance of practical skills is carried out by the OSPE/OSKE method with the involvement of independent examiners. Students who are not certified in the first stage are not admitted to the second stage of the exam - testing.
15. Based on the results of the midterm assessment, students studying in the state
The educational grant is awarded a scholarship subject to passing all exams
grades from "A" to "C+".
16. A student who entered the Academy after graduating from a university (bachelor’s degree), for receiving a second higher education, has the right to be exempt from attending courses in which he has a positive final result.
17. Results of final assessments in the form of credit for previous education
are taken into account when assigning a scholarship.

14.	Coordination, approval and revision		
Date of agreement with the Library and Information Center	Protocol No. 9	Full name of the head of the BIC	Signature
14.06.24		Darbicheva R.I.	
Date of approval at the department	Protocol No. 13	Full name of the head of the Department of Biology and	Signature

ОҢТҮСТІК-ҚАЗАҚСТАН MEDISINA AKADEMIASY «Оңтүстік Қазақстан медицина академиясы» АҚ
SOUTH KAZAKHSTAN MEDICAL ACADEMY АО «Южно-Казахстанская медицинская академия»
Department of Biology and Biochemistry, Chemical Disciplines, Microbiology, Virology and Immunology, Morphophysiology | 50/11 48 pg.48p.
Working curriculum of the discipline "Structural organization of human physiological processes"

30.05.2024		Biochemistry	
Date of approval at the department	Protocol No. 10	Esirkepov M.M. Full name of the head of the department "Morphophysiology"	Signature
28.05.2024		Tanabaev B.D.	
Date of approval at the department	Protocol No. ___	Full name of the head of the department "Microbiology, Virology and Immunology"	Signature
05.06.2024	109	Seytkhanova B.T.	
Date of approval at the department	Protocol No. ___	Full name of the head of the Department of Chemical Disciplines	Signature
03.06.2024	12	Daurenbekov K.N.	
Date of approval for AK OP	Protocol No. ___	Full name of the Chairman of the Committee of Administrative Offenses	Signature
11.06.2024	11	Kalmenov N.D.	
Date of revision at the department	Protocol No. ___	Full name of the head of the Department of Biology and Biochemistry	Signature
		Esirkepov M.M.	
Date of revision at the department	Protocol No. ___	Full name of the head of the department "Morphophysiology"	Signature
		Tanabaev B.D.	
Date of revision at the department	Protocol No. ___	Full name of the head of the department "Microbiology, Virology and Immunology"	Signature
		Seytkhanova B.T.	
Date of revision at the department	Protocol No. ___	Full name of the head of the Department of Chemical Disciplines	Signature
		Daurenbekov K.N.	
Date of revision on AK OP	Protocol No. ___	Full name of the Chairman of the Committee of Administrative Offenses	Signature
		Kalmenov N.D.	