

Department of «Biology and Biochemistry», «Chemical disciplines»,
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Syllabus

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Working educational program of discipline (Syllabus) "Structural organization of human physiological processes"

Educational program 6B10115 "Medicine"

1. General information about the discipline			
1.1	Discipline code: SOFPCH 1203	1.6	Academic year:2023-2024
1.2	Name of the discipline:"Structural organization of human physiological processes"	1.7	Course:1
1.3	Prerequisites: a school course in biology, chemistry, physics.	1.8	Semester:1
1.4	Post-requirements: «Genes and heredity».	1.9	Number of credits (ECTS):6
1.5	Cycle: basic disciplines	1.10	Component: internal/structural component
2. Description of the discipline (maximum 50 words)			
<p>Understands the role of molecular genetics and cellular mechanisms of the functioning of the body in norm and pathology for the effective diagnosis and prevention of common diseases, the principles of the use of molecular genetic methods and technology in medicine.</p> <p>He knows molecular genetic methods and technologies for the diagnosis of diseases; uses the genealogical method for the prediction of hereditary human diseases; is able to distinguish between types of chromosomes for the recognition of normal and pathological human karyotypes.</p>			
3. Summative assessment form			
3.1	Testing +	3.5	Coursework
3.2	Written	3.6	Essay
3.3	Oral	3.7	Project
3.4	OSPE or Practical skills reception	3.8	Other (specify)
4. Objectives of the discipline			
<p>Formation of students' modern knowledge of molecular biology as a complex discipline combining the latest knowledge on the molecular organization of animal cells and DNA technologies, as well as the formation of basic knowledge in the field of modern biology and high technologies necessary for the development of general professional disciplines and in clinical practice.</p>			
5. Final learning outcomes (LO disciplines)			
LO1.	Demonstrates knowledge and understanding of biomedical sciences for diagnosis, treatment, and dynamic observation of the most common diseases in children.		
LO2.	Demonstrates knowledge about the structure and function of informational macromolecules, mechanisms of transfer and expression of genetic information.		
LO3.	Demonstrates knowledge of the origins and classifications of mitochondrial, lysosomal, peroxisomal diseases		
LO4.	-demonstrates knowledge of chemical processes (basic types of reactions) in the body, obeying general laws and regularities of chemistry, as well as general energetic and kinetic laws of chemical processes;		
LO5.	applies knowledge of calculating formulas (mass fraction, molar concentration, molar equivalent concentration, molar concentration, molar concentration, molar fraction, titer) in		

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	preparing solutions of given concentrations and understands the methods of determining the quantitative Content of substances in the systems under study, including biological fluids.
LO6.	- formulates the general theoretical foundations of chemistry for knowledge, skills and abilities in their subsequent professional activities.
LO7.	Demonstrates knowledge of the classification and biological properties of microorganisms (morphologic, physiologic, antigenic) and their ecology; methods of isolating pure cultures and identification; principles of determining the sensitivity/resistance of microorganisms to antimicrobial agents;
LO8.	Demonstrates knowledge of/about the basics of microorganism genetics; the essence of biotechnology; effects of environmental factors on microorganisms, purposes and methods of asepsis, antisepsis, sterilization, disinfection, chemotherapy and disinfection. methods of asepsis, antisepsis, sterilization, disinfection; chemotherapy and antibiotics; basics of epidemiology of infectious diseases, routes of infection, localization of microorganisms in the human body;
LO9.	Possesses skills in preparation of native smears, staining of smears by simple and complex methods and interpretation of microscopy results; virus cultivation; determination of sensitivity/resistance of microorganisms to antimicrobial agents; and interpretation of microscopy results. antimicrobial agents;
LO10.	-Demonstrates knowledge of the subject matter and objectives of anatomy, histology and physiology, their importance to medicine; -knows the structure and general regularities of functioning of cells, tissues, mechanisms of regulation, considered from the standpoint of general physiology and integrative behavioral human behavioral activity;
LO11.	-distinguishes, describes, compares features of the structure of various cells, tissues, organs of the organism and explains their functions; - possesses the skills of conducting laboratory studies of cells and methods of processing results;
LO12.	-Capable of visualizing and logically presenting information in the form of a presentation. - compares physiological parameters (constants) of a healthy and sick organism; - analyzes the information obtained during experimental observations, determines its Significance for characterizing the state of the organism.
5.1	LO disciplines
	The results of the training of the OP, with which the LO disciplines are associated
	LO 1, LO4, LO6, LO7, LO10
	LO1 Applies fundamental knowledge in biomedical, clinical, epidemiologic and socio-behavioral sciences. biomedical, clinical, epidemiological and socio-behavioral sciences.
	LO11, LO8, LO5
	LO2 Provides patient-centered care in the biomedical, clinical, epidemiologic sciences, aimed at the diagnosis, treatment, and prevention of the most common diseases.
	LO1, LO4, LO7, LO10
	LO3 Carries out its activities within the framework of legislation RK in the field of health care to ensure quality medical services.
	LO4, LO7, LO12
	LO4 Communicates effectively with patients, their families and health care providers in an ethical and health care provider in an ethical and deontological manner, leading to effective information sharing, ethics, and deontology, resulting in effective information sharing and collaboration.

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		cooperation
	LO11, LO9, LO3, LO2	LO6 Receives, diagnoses, treats monitors and rehabilitates pediatric and adult patients. Rehabilitation of pediatric and adult patients, including pregnant women, based on the principles of evidence-based medicine. pregnant women based on the principles of evidence-based medicine.
	LO1, LO4, LO6, LO9, LO12	LO12 Apply the results of modern research methods in his/her professional activities, considering bioethics.

6. Detailed information about the discipline

6.1 Place of the event (building, auditorium): main building, 4th floor.

6.2	Number of hours	Lectures	Practical lesson	Laboratory session	IWT	IWLT
	Molecular biology	3	12		21	9
	Chemistry	4	16	-	28	12
	Microbiology	2	8		14	6
	Histology	3	12		21	9

6.3 Discipline Learning Plan:

№	Week/day	Lecture	Practical lesson	IWLT	IWT	Date, time
1 week	Molecular biology	1	1	1	2	
	Histology	-	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	-	-	-	-	
2 week	Molecular biology	-	1	1	2	
	Histology	1	1	-	-	
	Chemistry	-	1	1	2	
	Microbiology	-	1	-	-	
3 week	Molecular biology	-	1	1	2	
	Histology	-	1	1	2	
	Chemistry	1	1	1	1	
	Microbiology	-	1	-	-	
4 week	Molecular biology	-	1	-	-	
	Histology	-	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	1	1	1	2	
5 week	Molecular biology	1	1	-	2	
	Histology	-	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	-	1	1	-	
6 week	Molecular biology	-	1	1	2	
	Histology	1	1	-	-	
	Chemistry	-	1	1	2	
	Microbiology	-	1	1	2	

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7 we ek	Molecular biology	-	1	1	2	
	Histology	-	1	1	2	
	Chemistry	1	1	-	-	
	Microbiology	-	1	1	2	
8 we ek	Molecular biology	-	1	1	2	
	Histology	-	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	1	1		2	
9 we ek	Molecular biology	-	1	1	2	
	Histology	1	1	-	-	
	Chemistry	-	1	1	2	
	Microbiology	-	1	1	-	
10 we ek	Molecular biology	-	-	1	-	
	Histology	-	1	1	2	
	Chemistry	1	1	1	2	
	Microbiology	-	1	-1?	2	
11 we ek	Molecular biology	-	1	-	-	
	Histology	1	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	-	1	1	2	
12 we ek	Molecular biology	-	1	1	2	
	Histology	-	1	1	2	
	Chemistry	1	1	-	-	
	Microbiology	-	1	1	-	
13 we ek	Molecular biology	1	1	1	0.5	
	Histology	-	2	-	-	
	Chemistry	-	1	1	1	
	Microbiology	-	-	1	2	
14 we ek	Molecular biology	-	-	-	-	
	Histology	-	1	2	2	
	Chemistry	-	2	-	-	
	Microbiology	1	-1	1	2	
15 we ek	Molecular biology	-	-	-	-	
	Histology	-	1	1	2	
	Chemistry	-	1	1	2	
	Microbiology	-	1	1	0,5	

7. Information about teachers

№	Full name	Degrees and position	Email address	Research interests, etc.	Progress
1.	Azhibayeva-Kupenova D.T.	Master's degree, Senior teacher	danakupen303@mail.ru	Development of PCR test systems in pharmacogenetics	The author of over 26 publications.

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2.	Erkekulova G.K.	Master's degree, Senior teacher	ekk.33@mail.ru	Anthropoecology of population of Shymkent city	Author of more than 10 publications
3.	Kanzhigitova M.	Master's degree, Senior teacher	Molya_1503@mail.ru	Study of solanaceous and leguminous plants according to the law of homological series	Author of more than 10 publications
4.	Sarsenbekova A.A.	Master's degree, Senior teacher	if_skma@mail.ru	Anthropoecology of population of Shymkent city	Author of more than 10 publications
5.	Santay B.	Master's degree, teacher	bsantaj@mail.ru	Anthropoecology of population of Shymkent city	Author of more than 10 publications
6.	Yusupov Baburkhan Khantureevich	Master's degree, Senior teacher	babur.skma@gmail.com	Morphological characteristics of the wound healing process	Author of 36 international and republican scientific publications
7.	Krishna Hitesh	senior teacher	hiteshgowda405@gmail.com	Morphology of anatomy, histology and embriology	-
8.	Ratbek Saylaubekuly	Candidate of medical sciences	sailaubekuly_r@mail.ru	Fundamentals of clinical parasitology	Author of 45 international and republican scientific publications
9.	Serikpaeva Tamarakhan Tyulkubaevna	Senior teacher	Tomarajan62@mail.ru	Sanitary microbiology	Author of 37 scientific publications, 1 textbook
10.	Nuralieva Gulmira Nurpapaevna	Senior teacher	Nuralieva70bk.ru	Sanitary microbiology	Author of 15 scientific publications, 1 textbook
11.	Abdramanova Aigerim Asylkhanovna	Senior teacher	aigera_0@mail.ru	The state of dysbacteriosis rheumatoid arthritis	Author of 15 scientific publications, 2 textbooks
12.	Polatbekova Shapagat Tolegenkyzy	Senior teacher	p.shapagat@mail.ru	Fundamentals of clinical parasitology	Author of 5 scientific publications, 4 textbooks
13.	Odzyal Dayana Eduardovna	Senior teacher	dayana_odzyal@mail.ru	The relevance of microbiology in the modern world	Author of 5 scientific publications, 1 educational benefits
14.	Serikpaeva Tamarakhan	Senior Lecturer	Tomarajan62@mail.ru	Sanitary microbiology	Author of 37 scientific publications, 1 textbook

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	Tyulkubaeвна				
15.	Daurenbekov K.N.	Head of Department, Candidate of Chemical Sciences, Acting professors	daurenbekov.kanat@mail.ru	1. «Study of medicinal plants used in folk medicine, growing in the flora of the Turkestan region» «Search and implementation of active teaching methods in teaching chemical disciplines»	Has 6 textbooks, over 130 - scientific and methodological publications, 12 teaching aids and the author of 6 standard programs
16.	Dildabekova L.A.	Acting Associate Professor, Candidate of Pedagogical Sciences	Lazzat_D@inbox.ru	«Search and implementation of active teaching methods in teaching chemical disciplines»	9-teaching aids, more than 75 scientific and methodological publications.
17.	Rysymbetova Zh.K.	Master's degree, Senior Lecturer	jansaya_1980@mail.ru	«Study of medicinal plants used in folk medicine, growing in the flora of the Turkestan region»	3 teaching aids, more than 25 scientific and methodological publications.
18.	Kulbaeva M.S.	Master's degree, Lecturer	Mili_0907@mail.ru	«Study of medicinal plants used in folk medicine, growing in the flora of the Turkestan region»	7 scientific publications
19.	Kulbaeva M.S.	Master's degree, Lecturer	Mili_0907@mail.ru	«Study of medicinal plants used in folk medicine, growing in the flora of the Turkestan region»	7 scientific publications
7.	Thematic plan				

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Week/Day	Topic name	Synopsis	LO disciplines	Number of hours	Forms/methods/ technologies of training	Evaluation forms/ methods
1	Molecular biology of the cell Lecture №1 Topic. Molecular biology of the cell. Structure and functions of the main components of the cell. Transport of substances through biomembranes. Adhesive function of membranes. External signal transmission in the cell. Types of signaling pathways and signaling systems.	Structure of eukaryotic cell. Structure of cell surface apparatus: biomembranes, Mechanisms of intracellular transport of substances, passive and active transport. Passive and active transport. Ion channels and ion pumps. Families of adhesive membrane proteins. Adhesive function of membranes Basic stages of signal transduction.	LO1	1	Overview	Feedback
	Molecular biology of the cell Practical lesson No.1 Topic. Molecular biology of the cell. Structure and functions of the main cell components.	Structure of prokaryotic and eukaryotic cell. Structure, functions.	LO1	1	Small group work, discussion of key issues, presentation	Testing, oral and written questioning.
	Histology Practical lesson №1. Topic: Basic principles of manufacturing histological preparations.	The main stages of manufacturing a fixed and stained histological preparation. Principles of operation and use of special microscopy devices.	LO11	2	Working in small groups, getting to know the work in the histolab	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson No. 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. The elemental composition of the cell. The content of chemical elements in the human body. How chemistry affects the human body.	LO6	1	Working in small groups	Control of the initial level of knowledge / test control

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	<p>Molecular biology of the cell IWLТ.№1 Molecular structure of cells and diseases arising from their dysfunction.</p>	<p>Definition of the concept of organoids and their classification Diseases of lysosomes, peroxisomes, protein-sorting disorders in ER, mitochondrial diseases. Definition and mechanism of development.</p>	LO1	1	Work in small group, presentation defense, glossary compilation.	Presentation, glossary, abstract
	<p>Histology IWLТ. Consultation on the implementation of the IWL 1. The task of the IWL №1 Microscopy. Histological technique.</p>	<p>The device of the microscope. Principles of operation of the light and electron microscope.</p>	LO1 1 LO1 2	1/2	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of IWS
	<p>Chemistry IWLТ/IWL Consultation on the implementation of the IWL 1. The task is IWL: Chemical bonding and its significance in human life.</p>	<p>Chemical bond. The main types of chemical bonds. The mechanism of covalent bond formation. Covalent bond properties: saturation, directivity, polarizability. Types of covalent communication by the method of overlapping electronic clouds. Hydrogen bonding and its varieties. The biological role of hydrogen bonding.</p>	LO5 LO6	1/2	Presentation	Oral
2	<p>Histology Lecture. №1 Topic: Cytology.</p>	<p>The subject of the study of cytology, histology, its sections. Methods of research in cytology and histology.</p>	LO1 2	1	Overview	Answers to security questions.
	<p>Molecular biology of the cell Practical Lesson №2 Topic. Eukaryotic cell. Cell surface apparatus. Plasma membrane.</p>	<p>Cell surface apparatus. The supramembrane apparatus and submembrane layer of supporting and contractile structures. Membrane lipids</p>	LO2	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.

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	Histology Practical lesson №2 Topic: Cytology. Membrane organelles and non-membrane organelles. Inclusions.	Cell definition. Biological membrane. Plasmolemma and its derivatives. Methods of penetration of substances into the cell. Types of non-cellular structures.	LO1 0	1	Work in small groups, checklist of histological preparations and microphotographs	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson №2. Topic: Fundamentals of chemical thermodynamics. Relation of system parameters (temperature, internal energy, enthalpy, free energy, entropy,) with living matter. Thermochemical calculations.	Thermodynamics of biological processes. Bioenergetics. System. The concept of enthalpy. The doctrine of thermochemistry. Hess's law. Enthalpy changes in various chemical and physico-chemical processes. The second law of thermodynamics. Entropy. Gibbs free energy.	LO5	1	Work in small groups	Oral/test control
	Chemistry IWL/IWL Consultation on the implementation of the SIW 1. The task is IWL: Thermodynamics of living systems.	Fundamentals of chemical thermodynamics. Thermodynamics of living systems. Exoergonic and endoergonic processes occurring in the human body.	LO4 LO5 LO6	1/2	Presentation	Oral
3	Chemistry Lecture №1. Topic: Introduction. Thermodynamics of biological processes. Basic concepts and laws of thermodynamics. Chemical kinetics and enzymatic catalysis.	The subject and tasks of chemistry. Chemical thermodynamics is the theoretical basis for the study of metabolism and energy. Laws of thermodynamics. The human cell as a complex thermodynamic system. Thermochemistry. Hess's law. Entropy. Gibbs energy.	LO5 LO6	1	overview/ computer technology	Feedback
	Chemistry Practical lesson №3. Topic: Chemical kinetics and its significance in medicine.	Kinetics of chemical reactions. Factors affecting the reaction rate. Prediction of chemical equilibrium displacement. Concepts of the kinetics of biological processes in living organisms.	LO4 LO5	1	Work in small groups, lab. work	Oral interview/pr oblem solving, protection of the result of

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						experiments .lab.works
	Chemistry IWL/IWL Consultation on the implementation of IWL 3. Task IWL Enzymatic catalysis. Features of the action of enzymes.	Enzymatic catalysis. The nature and classification of enzymes. Features of the action of enzymes in living organisms. The importance of enzymes in the processes of metabolism of vital activity.	LO4 LO5 LO6	1/1	Presentation	Oral interview
4	Microbiology Lecture. General microbiology and virology. Morphology of bacteria and viruses.	Microbiology as a fundamental and applied science. Stages of development of microbiology. Nomenclature and classification of microorganisms. Concept of virion and virus. Morphological characteristics of the structure of bacterial cell virus.	LO9	1	Overview.	Feedback .
	Molecular biology of the cell Practical Lesson №3 Topic. Plasma membrane. Transport of substances through membranes: passive and active passive and active, vesicular.	Monolayer, bilayer and vesicles (liposomes and vesicles). Membrane proteins: Peripheral and integral. Transport of high molecular weight compounds across membranes: endocytosis and exocytosis.	LO2	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.
	Histology Practical lesson. №3 Topic: Cytology. The core organelles. Inclusions	The concept of the cellular conveyor. Classification of organelles based on their structure. Classification of inclusions.	LO1 1 LO1 2	1	Work in small groups, checklist of histological preparations and microphotographs	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson №4. Topic: Solutions. The value of solutions in the vital activity of organisms.	Concentration of solutions and methods of their expression. Preparation of solutions of a given concentration. The importance of solutions in medicine, biology and practical human activity.	LO4 LO5 LO6	1	Work in small groups, lab. work	Solving tasks, protecting the result of lab experiments .works

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<p>Microbiology Practical lesson. General microbiology and virology. Morphology of bacteria. Microscopic examination method.</p>	<p>Morphological features of bacteria. Classification of taxonomy of microorganisms. Microscopic research method in microbiology. Smear preparation technique. Simple painting methods.</p>	<p>LO7 LO8</p>	<p>1</p>	<p>Test conversation, performing laboratory work.</p>	<p>Check list.</p>
<p>Molecular biology of the cell IWLT.№2 Molecular structure and function of cell membrane organelles.</p>	<p>Membrane organelles of the cell. Structure and functions: mitochondria, Golgi complex. Three-dimensional model of Golgi complex dictyosome. ER.</p>	<p>LO2</p>	<p>1</p>	<p>Small group work, presentation defense, glossary compilation.</p>	<p>Presentation, glossary, abstract</p>
<p>Histology IWLT. Consultation on the implementation of the IWL 1. The task of IWLT №2 Nucleus</p>	<p>Identify the core structures at the micro and ultramicroscopic level. The structure of the nucleus in the interphase. The role of the nucleus in protein synthesis.</p>	<p>LO1 1</p>	<p>1/2</p>	<p>Work in small groups, presentation protection, glossary compilation.</p>	<p>Checklist for the evaluation of IWS</p>
<p>Chemistry IWLT/IWL Consultation on the implementation of IWL 4. Task IWL Water. Chemical reactions in an aqueous solution. The biological role of water in a living organism.</p>	<p>Water, the structure of the molecule. Properties of water. Distilled, non-pyrogenic water. The importance of water for the vital activity of organisms.</p>	<p>LO4 LO5 LO6</p>	<p>1/2</p>	<p>Presentation</p>	<p>Oral interview</p>
<p>Microbiology IWLT. Medical microbiology and its role in medicine. Organization and rules of operation of microbiological and virological laboratories.</p>	<p>The role of medical microbiology in the progress of medicine. 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 of work in a microbiological laboratory. Methods for microbiological diagnosis of bacterial and viral infections. The concept of the bacterioscopic research</p>	<p>LO8</p>	<p>1</p>	<p>Presentation, essay.</p>	<p>Criterion assessment.</p>

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		method and its use for laboratory diagnostics. The importance of the bacteriological research method.				
5	Molecular biology of the cell Lecture №2 Topic. Molecular biology of the cell. Adhesive function of membranes. External signal transduction in the cell.	Families of adhesive membrane proteins. Adhesive function of membranes. Basic stages of signal transduction. Types of signaling pathways and signaling systems.	LO1	1	Overview	Feedback
	Molecular biology of the cell Practical lesson №5. Topic. Structure and work of ion channels and pumps.	Ion channels and ion pumps. Uniport, symporti antiport. Na ⁺ , K ⁺ pump. Apoptosis.	LO3	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.
	Histology Practical lesson. №4 Topic: Cell division. Cell cycle.	Characteristics of the cell life cycle. Mitosis. Endomitosis. Endoreproduction. Polyploidy.	LO1 0 LO1 2	1	Характеристики жизненного цикла клетки. Митоз. Эндомитоз. Производство Андреа. Полиплоидия.	A checklist for evaluating a practical lesson.
	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 of solutions for injection (hypotonic, hypertonic and isotonic solutions). Preparation of physiological solutions.	LO4 LO5 LO6	1	Work in small groups, lab. work	Oral interview / test control, protection of the result of lab experiments .works'
	Molecular biology of the cell IWLT.№3 Molecular structure and function of cell membrane organelles.	Membrane organelles of the cell. Structure and functions: mitochondria, Golgi complex. Three-dimensional model of Golgi complex dictyosome. ER.	LO4	1	Small group work, presentation defense, glossary compilation.	Presentation , glossary, abstract
	Histology IWLT. Consultation on the implementation of	A set of signs of vital activity of cells. The reaction of cells to damage. Morphological signs of apoptosis and	LO1 1	1/2	Work in small groups, presentation protection,	Checklist for the evaluation of IWS

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	<p>the IWL 1. The task of the IWL №3 Cytology. The reaction of cells to damaging effects. Aging and cell death.</p>	necrosis.			glossary compilation.	
	<p>Chemistry IWL/IWL Consultation on the implementation of IWL 5. The task of IWL is the value of solutions in the vital activity of organisms. Electrolytes in a living organism.</p>	<p>Types of solutions. Solubility. Dependence of solubility on temperature. Electrolytes. Strong and weak electrolytes. The degree of dissociation and concentration of ions in solutions of weak electrolytes. Biological body fluids in the form of solutions of electrolytes and non-electrolytes.</p>	LO4 LO5	1/2	Presentation	Oral interview
6	<p>Histology Lecture. №2 Topic: Fundamentals of the doctrine of tissues.</p>	Laws of origin and evolution of tissues. Classification of tissues. Mechanisms of tissue homeostasis. Limits of tissue variability. Epithelial tissue. Connective tissue.	LO1 2	1	Overview	Answers to control questions.
	<p>Molecular biology of the cell Practical lesson №5. Topic. Structure and function of cellular non-membrane organelles and the cell cytoskeleton.</p>	Molecular structure and functions of cellular non-membrane organelles. Cell center, ribosome, cilia and flagella. Cytoskeleton and motor organelles of the cell.	LO3	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.
	<p>Histology Practical lesson. №5 Topic: Epithelial tissue. Glands.</p>	Morphofunctional and histogenetic epithelial features. Classification. The structure of various types of epithelium. Glands. Histophysiology of the secretory process. Types of secretion.	LO1 0 LO1 2	1	Work in small groups, checklist of histological preparations and microphotographs	A checklist for evaluating a practical lesson.
	<p>Chemistry Practical lesson №6. Topic: The acid-base</p>	Acid-base theories by Arrhenius and Brensted-Lowry. The degree and constant of	LO4 LO5 LO6	1	Work in small groups of labs. work.	Oral interview / test control, protection

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	equilibrium in the processes of vital activity is the ionic product of water. The hydrogen pH index.	dissociation.Ostwald's law of breeding. The ionic product of water. The hydrogen index.				of the result of lab experiments works
	Microbiology Practical lesson. Bacterial cell structure.	Morphology and structure of bacteria. Complex painting methods. Gram stain. Immersion microscopy method.	LO8 LO9	1	Test conversation, performing laboratory work.	Check list assessment of the practical session
	Chemistry IWL/IWL Consultation on the implementation of IWL 6. The task of IWL Violation of acid-base balance. Homeostasis.	Types of violations of acid-base balance. Types of acidosis and alkalosis. Homeostasis. Violations of the acid balance of the blood.	LO4 LO5 LO6	1/2	Presentation	Oral interview
	Microbiology IWL/IWL. Morphology and physiology of fungi and protozoa.	Classification of mushrooms. Morphology and physiology of fungi and protozoa. Types of protozoa that cause human diseases. Methods for diagnosing protozoal infections. Resistance of fungi to environmental factors. Pathogenic fungi. Mycoses.	LO9	2/1	Abstract, presentation.	Criterion assessment.
7	Chemistry Lecture №2. Topic: The doctrine of solutions. Osmosis in biological systems. Buffer systems.	The solution as the basis of the vital activity of the cells of the body. Changes in boiling and freezing temperatures of solutions. Ebulliometry. Cryometry. Osmosis. Osmosis in blood cells. Van't-Hoff's law. Plasmolysis, hemolysis, turgor and isotonicity. Hypertonic and hypotonic solutions.Buffer systems. Biological functions of buffer systems in living organisms.	LO5 LO6	1	overview/ computer technology	Feedback
	Molecular biology of the cell Practical lesson №6. Topic. Molecular	Membrane organelles of the cell. Structure and functions of mitochondria, Golgi complex. Three-dimensional	LO3	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.

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	structure and function of cell membrane organelles and the nucleus.	model of Golgi complex, ER. Nuclear apparatus of the cell, structural organization of chromatin, karyoplasm.				
	Histology Practical lesson. №6 Topic: The blood and lymph.	Morphofunctional characteristics of blood as tissue. Morphology and function of shaped blood elements. The composition of the lymph.	LO1 0 LO1 1		Work in small groups, checklist of histological preparations and microphotographs	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson №7. Subject: Buffer systems. The importance of buffer systems in the human body	Buffer systems. Buffer zone, its calculation. Determination of the pH of acidic and basic buffer systems. The importance of buffer systems in the human body	LO5 LO6	1	Work in small groups	Oral interview/solving tasks
	Molecular biology of the cell IWLT/IWL №4 Consultation on the implementation of the MC. Midterm control №1.	Control over the assimilation of theoretical knowledge and practical skills on the topics covered in lectures and practical classes	LO2	1		Testing, solving situational problems, oral questioning. Evaluation of test results, situational tasks.
	Histology IWLT. Consultation on the implementation of the IWL 1. The task of the IWL №4 Embryonic hematopoiesis.	Features of embryonic hematopoiesis and its main stages.	LO1 2	1/2	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of IWS
8	Microbiology Lecture. Physiology and biochemistry of bacteria and viruses.	Metabolism of bacteria and viruses. Respiration and nutrition of bacteria. Bacterial cultivation. Isolation and indication of viruses.		1	Overview.	Feedback .
	Molecular biology of the cell Practical lesson №7. Topic. Intercellular	Intercellular contacts: simple connection, interdigitation, adhesive belt. Tight junctions: nexus or slit-like	LO3	1	Discussions of the main issues, video training, presentation	Testing, oral and written questioning.

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interactions. Contacts.	junctions.				
Histology Practical lesson №7. Topic: Loose unformed fibrous connective tissue. Dense connective tissue. Connective tissues with special properties.	Principles of classification of connective tissues. Cellular elements of RAST and their function. Varieties of connective tissue fibers. Chemical composition, function and origin of the basic amorphous substance.	LO1 0 LO1 1	1	Work in small groups, presentation protection, glossary compilation.	A checklist for the evaluation of the practical exercise.
Chemistry Practical lesson №8. Topic: Hydrolysis. Hydrolysis of salts. 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. The biological role of hydrolysis in the processes of vital activity of the body	LO5	1	working in small groups	Oral interview/ test control
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 the bacteriological diagnosis of infectious diseases. Preparation of nutrient media for cultivation, inoculation of microorganisms.	LO8 LO9	1	Small group work, performing laboratory work.	A checklist for the evaluation of the practical exercise.
Molecular biology of the cell IWLT. №5 Molecular mechanisms of cell cycle regulation.	The concept of cell cycle regulatory molecules. Cyclin-dependent protein kinases and their function. Cyclins and their function.	LO2	1	Small group work, laboratory work.	Presentation , glossary, abstract
Histology IWLT/IWL5. Midterm control- 1	To summarize the results of the development of theoretical and practical material.	LO1 0 LO1 2	1/ 2	1. The ability to determine histological preparations. 2. The ability to fill out a checklist of histopreparations and	Diagnostics of microphotographs and micropreparations (checklist for evaluation

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					microphotographs	of MC).
	Chemistry IWLT/IWL Consultation on the implementation of MC 1. Midterm control No. 1	Control of the assimilation of theoretical knowledge and practical skills on the topics of lectures, practical classes and SIW (1-7 topics).	LO5	1/2	Oral and written survey on tickets or comp.testing	Oral and written survey
	Microbiology IWLT/IWL. Midterm control No. 1		LO7 LO8	1/3	Colloquium	Oral questioning (tickets)
9	Molecular biology of the cell Lecture №3 Topic. Molecular structure of cells and diseases arising from disruption of their function.	Definition of the concept of organoids and their classification. Diseases of lysosomes, peroxisomes, protein-sorting disorders in ER, mitochondrial diseases. Definition and mechanism of development.	LO1	1	Overview	Answers to control questions.
	Molecular biology of the cell Practical lesson №8 Topic. Adhesive function of membranes. Transmission of external signal into the cell.	General idea of the mechanism of intercellular interaction. Families of adhesive membrane proteins. Adhesive function of membranes. Types of signaling pathways Basic stages of signal transduction. Signal transmission in the cell. Characteristics of signaling molecules. Secondary messengers	LO3	1	Discussions of key issues, video training, presentation	Testing oral and written questioning.
	Histology Practical lesson №8. Connective tissues with special properties.	Reticular connective tissue. Pigmented, white and brown adipose tissue, mucous tissue. Location, functional value.	LO1 0 LO1 2	1	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of practical exercises
	Chemistry Practical lesson №9. Topic: Biogenic s-, p-, d-elements and their significance for living organisms.	Classification of chemical elements. The location of s-, p-, d-elements in the periodic table. The content of chemical elements in the body. The biological role of chemical elements in the vital activity of a living organism.	LO5 LO6	1	Work in small groups	Oral interview/ test control

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	<p>Chemistry IWL/IWL Consultation on the implementation of IWL 8. IWL task Biogenic elements in the human body.</p>	<p>Biogenic elements are non-metals that are part of the human body. Biogenic elements are metals that are part of the human body. The elementary composition of the human body. The content and biological role of chemical elements in the human body.</p>	<p>LO4 LO5</p>	<p>1/2</p>	<p>Presentation</p>	<p>Oral interview</p>
10	<p>Chemistry Lecture №3. Topic: The importance of surface phenomena in medicine. Adsorption.</p>	<p>Surface energy and surface tension. Adsorption. Surfactant The role of adsorption in biology and medicine.</p>	<p>LO4 LO6</p>	<p>1</p>	<p>overview/ computer technology</p>	<p>Feedback</p>
	<p>Histology Practical lesson. №9. Topic: Cartilaginous tissue</p>	<p>To determine the varieties of cartilaginous tissues by the structural features of the intercellular substance and to know the histofunctional features.</p>	<p>LO1 1 LO1 2</p>	<p>1</p>	<p>Work in small groups, presentation protection, glossary compilation.</p>	<p>Checklist for the evaluation of practical exercises.</p>
	<p>Chemistry Practical lesson №10. Topic: Complex compounds and their properties. The medico - biological role of complex compounds.</p>	<p>The structure of complex compounds. Nomenclature and types of complex compounds. Chemical bonding in complex compounds. Equilibrium in solutions and dissociation of complex compounds.</p>	<p>LO4 LO5 LO6</p>	<p>1</p>	<p>work in small groups, laboratory work</p>	<p>Oral interview / test control, protection of the result of lab experiments ,works</p>
	<p>Microbiology Practical lesson. Physiology of viruses. Virological research methods.</p>	<p>Virus cultivation methods. Virus identification indication. Phages and phage typing. Stages of preparing a single-layer cell culture. Techniques for infection with viruses and dissection of a chicken embryo, methods for isolating phages from an environmental object and their identification.</p>	<p>LO1 0</p>	<p>1</p>	<p>Extended conversation.</p>	<p>Check list for the evaluation of practical exercises.</p>
	<p>Molecular biology of the cell Practical lesson №9 Topic. The cell cycle.</p>	<p>Cell cycle. Periods of the cell cycle. Direct and indirect cell division. Mitosis. Typical and atypical mitosis. Phases of mitosis. Similarity and</p>	<p>LO3</p>	<p>1</p>	<p>Discussions of key issues, video training, presentation</p>	<p>Testing oral and written questioning.</p>

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Mitosis. Meiosis.	difference of mitosis and meiosis. Stages I prophase of meiotic division.				
Molecular biology of the cell IWLT. №6 Transport of substances through membranes: transmembrane transport of low molecular weight substances of low molecular weight substances.	Transmembrane transport of low-molecular substances and ions. Membrane transport of substances in the direction of their movement. Passive transport of substances and ions. Types of ion channels and ion pumps.	LO3	1	Small group work, laboratory work.	Presentation ,glossary, abstract
Histology IWLT/IWL №6 Bone tissue.	Distinguish lamellar bone tissue from Coarse fiber and know their histofunctional features.	LO1 0	1/2	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of IWS.
Chemistry IWLT/IWL Consultation on the implementation of IWL 9. IWL task The biological role of complex compounds. Biocomplexes. Understanding of the structure of metalloenzymes (hemoglobin, chlorophyll) and their biological role.	The biological role of complex compounds in the human body. Representations and biocomplexes. The structure of hemoglobin, chlorophyll, vitamin B12 (cyanocobalamin) and their biological role.	LO4 LO5	1/2	Presentation	Oral questioning
Microbiology IWLT/IWL. Concept of biotechnology. Microorganisms involved in biotechnological processes. Biological preparations obtained by genetic engineering.Features	Biotechnology. A brief history of the development of biotechnology. Processes used in biotechnology. Genetic engineering. Genetics of bacteria and viruses. Microorganisms, cells and processes used in genetic engineering.	LO8	1/2	Abstract, presentation, assay of topic.	Criterion assessment.

	of chemotherapy for viral infections.					
11	Histology Lecture. №3 Topic: Muscle tissue. Nervous tissue.	The structure of muscle tissue. Nerve cells and neuroglia. Nerve fibers, nerve endings, synapses.	LO1 0	1	Overview	Answers to security questions.
	Molecular biology of the cell Practical lesson №10 Topic. Molecular mechanisms of apoptosis and oncogenesis. Carcinogenesis.	General idea of the mechanism of apoptosis and necrosis. Definition of the concept of carcinogenesis.	LO2	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.
	Histology Practical lesson. №10 Topic: Muscle tissue.	Morphofunctional characteristics of muscle tissues. Smooth and striated muscle tissue. Structural differences in the organization of slow and fast muscle fibers.	LO1 1 LO1 2	1	Work in small groups, checklist of histological preparations and microphotographs	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson №11. Topic: Redox processes and their biological role. Electrode potentials.	Redox reactions. Electrode potentials. Galvanic cells. Electromotive force (EMF) of a galvanic cell. The Nernst equation. The direction of redox processes. Membrane potential. The importance of redox reactions in human life.	LO5 LO6	1	Work in small groups	Oral interview/ test control
	Microbiology Practical lesson. Genetics of bacteria and viruses. Genotypic and phenotypic variability of microorganisms.	Genotypic and phenotypic variability of microorganisms. Plasmids. Practical meaning of variability. Essence, goals and objectives of biotechnology. Microorganisms and processes used in biotechnology. Genetic engineering and its application in biotechnology. Genetic recombinations in bacteria in experiments of	LO7 LO8	1	Extended conversation.	A checklist for the evaluation of the practical exercise.

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	transformation, transduction and conjugation. Genotyping.				
Molecular biology of the cell IWLТ. №7 The cell cycle. Mitosis. Atypical mitosis and its causes.	Cell cycle periods G1, S, G2, M, G0, characterization and content of the periods.	LO3	1	Work in small groups, defence of the presentation, compilation of a glossary.	Presentation, glossary, abstract
Histology IWLТ/IWL №7 Regeneration of skeletal muscle tissue	Mechanisms of regeneration of skeletal muscle tissue, its structural features depending on the age of a person.	LO1 2	1/2	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of IWS
Chemistry IWLТ/IWL Consultation on the implementation of IWL 10. IWL task Potentiometry in medical practice.	Potentiometry. The 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	LO4 LO6	1/2	Presentation	Oral questioning
Microbiology IWLТ/IWL. Characteristics of the infectious process.	Biological research methods widely used in the diagnosis of infectious diseases and scientific experiments. Pathogenicity of microorganisms as a polydeterminate trait. Virulence, units of its measurement. Pathogenicity properties. Chemical nature, basic properties of exotoxins. Basic properties and chemical nature of endotoxins. Forms of infection and their characteristics. Periods of infectious disease. Main sources of infection. Routes and methods of infection. List and characterize the infectious properties of viruses, features of viral infections.	LO9	1	Abstract, presentation, essay on the topic .	Criterion assessment.

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12	Chemistry Lecture №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. The structure of the micelle. Methods of preparation and purification of colloidal solutions. Optical and electrokinetic properties of colloidal solutions. The Tyndall effect. Coagulation, its medical and biological significance. The Schulze- Hardy rule. Dialysis, electroosmosis and electrophoresis in medical practice.	LO5 LO6	1	overview/ computer technology	Feedback
	Molecular biology of the cell Practical lesson №11 Topic. The cell cycle and molecular mechanisms of its regulation. https://www.youtube.com/watch?v=U053VjkuFaY&feature=youtu.be	The cell cycle. Cyclins and cyclin Cyclins and cyclin-dependent kinases (CDK), mitosis stimulating factor (MSF). Cell cycle control points. Regulatory role of p-53 proteins.	LO3	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.
	Histology Practical lesson. №11 Topic: Nervous tissue. Neurocytes. Neuroglia.	Identify different types of neurocytes. To explain the cytological features of nerve cells, neuroglia at the microscopic and ultramicroscopic levels.	LO1 0 LO1 1	1	Определите различные типы нейроцитов. Объяснить цитологические особенности нервных клеток, нейроглии на микроскопическ ом и ультрамикроско пическом уровнях.	A checklist for evaluating a practical lesson.
	Chemistry Practical lesson №12. Topic: Surface phenomena at the interface of phases. Biological	Surface energy and surface tension. The concept of sorption, adsorption, absorption. Adsorption at the interface of phases, factors affecting	LO5 LO6	1	Work in small groups	Oral interview/ test control

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	significance of adsorption processes. Adsorption therapy.	adsorption. Surfactants and surfactants. The Duclos-Traube rule. Types of adsorbents. Selective adsorption. The Paneta Faience rule. Adsorption therapy. The role of surfactants in medicine.				
	Microbiology Practical lesson. Drug resistance of bacteria. determination of bacterial sensitivity to antibiotics.	Primary and acquired resistance of microorganisms to chemotherapeutic drugs. Ways to overcome drug resistance in bacteria. Quantitative and qualitative determination of bacterial sensitivity to antibiotics.	LO8 LO9	1	Test conversation, performing laboratory work. Testing.	Practical exercise evaluation checklist
	Molecular biology of the cell IWLT №8 The cell cytoskeleton and motor organelles of the cell.	Define the concept of cytoskeleton and motor organelles of the cell.	LO1	1	Small group work, laboratory work.	Presentation, glossary, abstract
	Histology IWLT/IWL № 8 Nerve endings.	The concept of nerve endings and their classification. The structure of sensory and motor nerve endings.	LO1 0	1/2	Work in small groups, presentation protection, glossary compilation.	Checklist for the evaluation of IWS
	Microbiology IWLT/IWL. Midterm control №2	Control of mastering of theoretical knowledge and practical skills on the passed topics of lectures, practical classes	LO8 LO9	1/3	Colloquium.	Oral Questioning (tickets).
13	Molecular biology of the cell Practical lesson №12 Topic. The cell cycle and molecular mechanisms of its regulation. https://www.youtube.com/watch?v=U053VjkuFaY&feature=youtu.be	The cell cycle. Cyclins and cyclin Cyclins and cyclin-dependent kinases (CDK), mitosis stimulating factor (MSF). Cell cycle control points. Regulatory role of p-53 proteins	LO3	1	Discussions of key issues, video training, presentation	Testing, oral and written questioning.

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<p>Histology Practical lesson №12. Topic: Nervous tissue. Nerve fiber. Nerve ending. Synapses.</p>	<p>To explain the differences in the microscopic structure of myelin and myelin-free nerve fibers. Interneuronal synapses.</p>	<p>LO1 0 LO1 2</p>	<p>1</p>	<p>Work in small groups, checklist of histological preparations and microphotographs</p>	<p>A checklist for evaluating a practical lesson.</p>
<p>Chemistry Practical lesson №13. Topic: Colloidal-dispersed system. Nature, classification of colloidal systems. Properties of dispersed systems.</p>	<p>Concepts: dispersed system, dispersed phase, dispersion medium. Classification of dispersed systems. The structure of the micelle. Methods of preparation and purification of colloidal solutions. Dialysis in medical practice. Optical and electrokinetic properties of colloidal solutions. The Tyndall effect. Electroosmosis and electrophoresis, their application in medicine.</p>	<p>LO5 LO6</p>	<p>1</p>	<p>Work in small groups</p>	<p>Oral interview/ test control</p>
<p>Microbiology Practical lesson. Ecology of microorganisms. Microflora of various organs and systems of the human body.</p>	<p>Distribution of microbes in the environment. Concepts normal to the human microflora. Microflora of various organs and systems of the human body. Reasons for the development of dysbiosis. Bacteriological diagnosis, treatment and prevention of dysbiosis.</p>	<p>LO7 LO8</p>	<p>1</p>	<p>Discussion, essay.</p>	<p>checklist practical session evaluation</p>
<p>Molecular biology of the cell IWLT/IWL №9 Consultation on the implementation of the MC. Midterm control №2.</p>	<p>Control over the assimilation of theoretical knowledge and practical skills on the topics covered in lectures and practical classes</p>	<p>LO2</p>	<p>1</p>	<p>Oral and written questioning, testing</p>	<p>Testing, solving situational problems, oral questioning. Evaluation of test results, situational tasks.</p>
<p>Histology IWLT / IWL №9</p>	<p>To summarize the results of the development of</p>	<p>LO1 1</p>	<p>1/0 ,5</p>	<p>1. The ability to determine</p>	<p>Diagnostics of</p>

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	Midterm control – II	theoretical and practical material.	LO1 2		histological preparations. 2. The ability to fill out a checklist of histopreparations and microphotographs	microphotographs and micropreparations (checklist for evaluation of MC).
	Chemistry IWL/IWL Consultation on the implementation of IWL 11. IWL task Chromatography and its application in medical practice.	Chromatography. The use of chromatography for the preparation and analysis of medicinal substances.	LO4 LO5	1/1	Presentation	Oral interview
14	Chemistry Practical lesson №14. Topic: Stability and coagulation of colloidal systems. Coagulation and peptization of sols. Sedimentation analysis.	Coagulation of colloidal systems, its medical and biological significance. The Schulze-Hardy rule. Aerosols, suspensions, powders, emulsions and their properties.	LO4	2	Work in small groups	Oral interview/ test control
	Microbiology Practical lesson. Infection, infectious process. Biological research method.	Infection, infectious process, infectious disease. Forms of infection and their characteristics. Periods of infectious disease. The nature of the relationship between micro- and macroorganisms. Forms and stages of the infectious process. Characteristic features of infectious diseases. Pathogenicity, virulence, toxigenicity of bacteria. Methods of experimental 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	LO7 LO9	1	Discussion.	Practical exercise evaluation checklist

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		bacterial toxins.				
15	Chemistry Practical lesson №15. Topic: Highly Molecular Compounds. Viscosity of HMC solutions. Swelling.	Features of HMC solutions. Properties of high-molecular compounds. Swelling. Factors affecting swelling, biological significance of swelling. Salting, hardening. Syneresis.	LO4	1	Work in small groups	Oral interview/ test control
	Microbiology Practical exercise.			1		
	Chemistry IWL/IWLT Consultation on the implementation of MC 2. Midterm control-2	Control of the assimilation of theoretical knowledge and practical skills on the topics of lectures, practical classes and SIW (9-14 topics).	LO7	1/2	Oral and written ticket survey or comp. testing	Oral and written survey
9. Teaching and learning methods						
9.1	Lectures	Overview, video training, presentation With distance learning, on-line lectures are held in the form of demonstration presentations on the Zoom and Webex platform. For feedback, students are provided to ask questions on the topic.				
9.2	Practical lesson	- work in small groups, discussion of the main issues, presentation - work in small groups, performance of laboratory works. - work in small groups, check list of histological preparations and microphotographs				
9.3	IWL\IWLT	- presentation, glossary, abstract. Discussion and evaluation of SIW. - presentation - abstract, presentation, essay on the topic - work in small groups, presentation defense, -composition of a glossary.				
9.4	Midterm examination	testing, solving situational tasks, oral questioning. Evaluation of test results, situational tasks. - Oral and written questioning on tickets or computerized testing - diagnostics of microphotographs and microdrugs (check-list for evaluation of the midterm examination).				
10. Evaluation criteria						
10.1 Criteria for assessing the learning outcomes of the discipline						

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№ LO	Name learning outcomes	Unsatisfactory	Satisfactory	Good	Excellent
LO 1	Demonstrates knowledge and understanding of cell structure and cell components	1) Does not describe the structure of the cell and the components of the cell 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 regularities of cellular theory	1) Evaluates the possibility of using pathological changes in the hereditary apparatus to diagnose diseases by cytological method and molecular genetic analysis. 2) Compares changes in the karyotype of patients with clinical manifestations of hereditary diseases. 3) Analyzes patterns of morphological changes in various hereditary diseases.
LO 2	Demonstrates knowledge and understanding of destructive changes in cellular components leading to disease	1) Cannot unravel the etiology, pathogenesis and morphogenesis of various cellular diseases	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 etiology, pathogenesis, and morphogenesis of various cellular diseases to diagnose hereditary diseases.
LO 3	Demonstrates knowledge of the origins and classifications of	1) Cannot define mitochondrial, lysosomal, peroxisomal diseases	1) Makes inaccuracies in the description of mitochondrial,	1) Describes classifications of mitochondrial, lysosomal,	1) Independently describes the classifications

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	mitochondrial, lysosomal, peroxisomal diseases	2) Cannot distinguish between changes in the hereditary apparatus in various mitochondrial, lysosomal, peroxisomal diseases	lysosomal, peroxisomal diseases. 2) Poorly distinguishes between classifications of mitochondrial, lysosomal, peroxisomal diseases	peroxisomal diseases 2) Distinguishes well between different mitochondrial, lysosomal, peroxisomal diseases	of mitochondrial, lysosomal, peroxisomal disease 2) Provides differential diagnosis for mitochondrial, lysosomal, peroxisomal disease
LO 4	-demonstrates knowledge of chemical processes (basic types of reactions) in the body, obeying the general laws and laws of chemistry, as well as general energy and kinetic laws of chemical processes;	-is not oriented to theories, concepts, and directions on the topic, does not demonstrate knowledge, and does not answer questions.	- is not clearly oriented in theories, concepts and directions on the topic, weakly demonstrates his/her knowledge, answers questions with fundamental errors.	- competently, oriented in theories, concepts and trends on the topic, demonstrates his/her knowledge, answers questions with non-principled errors.	-logically, clearly, competently, oriented in theories, concepts and directions on the topic, demonstrates his knowledge, answers all questions. Also logically and competently answers additional questions.
LO 5	-applies knowledge of calculation formulas (mass fraction, molar concentration, molar concentration, molar concentration of equivalent, molar concentration, molar fraction, titer) in preparation of solutions of given concentrations and understands the methods of	- doesn't know the calculation formulas for ways 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 liquids under study.	doesn't clearly know the calculation formulas for ways to express the concentration of solutions. Poor reasoning in the choice of formulas for preparing solutions. And does not know how to draw conclusions about the quantitative content of substances in the	does not clearly know the calculation formulas of the ways to express the concentration of solutions. Poor reasoning in the choice of formulas when preparing solutions. And does not know how to draw conclusions about the quantitative content of	clearly knows the calculation formulas for expressing concentration of solutions. Logical correctly reasoning in the choice of formulas in the preparation of solutions. And is able to draw conclusions about the quantitative content of

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	determining the quantitative content of substances in the systems under study, including biological fluids.		liquids under study.	substances in the liquids under study.	substances in the liquids under study.
LO 6	Formulates general theoretical foundations of chemistry for knowledge, skills and abilities in their subsequent professional activity.	is not orientated in the general theoretical foundations of chemistry on the topic, does not answer the teacher's questions Does not know how to draw a conclusion and cannot relate the topic to his/her future profession.	is not competent, orientated in the general theoretical basis of chemistry on the topic answers the teacher's questions. He/she gives a vague conclusion and cannot relate the topic to his/her future profession.	answers the teacher's questions vaguely, but competently, orientated in the general theoretical basis of chemistry on the topic. He/she gives a vague conclusion and is able to relate the topic to his/her future profession.	logically, clearly, competently, orientated in the general theoretical basis of chemistry on the topic answers additional questions of the teacher. Gives a clear independent conclusion and is able to relate the topic to the future profession. future profession.
LO 7	Demonstrates knowledge of classification and biological properties of microorganisms (morphological, physiological, antigenic) and their ecology; methods of isolation of pure cultures and identification; principles of determining sensitivity/resistance of microorganisms to antimicrobial	1) does not describe morphological, physiological and antigenic properties of microorganisms; 2) does not understand the results of studies conducted to determine morphological, physiological and antigenic properties of microorganisms; 3) does not know the methods of determining the sensitivity of microorganisms to	1) describes morphological, physiological and antigenic properties of microorganisms; 2) understands the results of research conducted to determine morphological, physiological and antigenic properties of microorganisms; 3) possesses methods of determining the sensitivity of	1) uses knowledge of morphological, physiological and antigenic properties of microorganisms; 2) explains the results of studies conducted to determine morphological, physiological and antigenic properties of microorganisms; 3) describes methods of determining the	1) can classify microorganisms according to their morphological, physiological and antigenic properties; 2) interprets the results of studies conducted to determine morphological, physiological and antigenic properties of microorganisms; 3) describes methods of determining the

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	agents;	antimicrobial agents.	microorganisms to antimicrobial agents.	sensitivity of microorganisms to antimicrobial agents.	3) uses quantitative and qualitative methods to determine the sensitivity of microorganisms to antimicrobial agents.
LO 8	Demonstrates knowledge of/about the basics of genetics of microorganisms; essence of biotechnology; influence of environmental factors on microorganisms, purposes and methods of asepsis, antisepsis, sterilization, disinfection; chemotherapy and antibiotics; basics of epidemiology of infectious diseases, ways of infection, localization in the human body;	1) cannot tell about the 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) knows 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) justifies the effectiveness of CTP and antibiotics used in the treatment of infectious diseases.
LO 9	Possesses the skills of preparing a native smear, staining smears with simple and complex methods and interpreting the results of microscopy; culturing viruses; determining the sensitivity and/or resistance of microorganisms to	does not describe the technique of preparation of native preparations, staining with simple and complex staining methods, microscopy, and microbial culturing techniques.	1) describes the technique of preparation of native preparations, staining with simple and complex staining methods, microscopy, microbial culturing techniques.	1) knowledge of preparation of native preparations, staining with simple and complex staining methods, microscopy, microbial culturing techniques	1) apply in practice the technique of preparation of native preparations, staining with simple and complex staining methods, microscopy, microbial culturing

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	antimicrobial agents.				techniques
LO 10	-Demonstrates knowledge of the subject matter and objectives of anatomy, histology and physiology, their importance for medicine; -knows the structure and general regularities of functioning of cells, tissues, regulation mechanisms considered from the perspective of general physiology and integrative human behavioral activity;	-does not demonstrate knowledge of the subject matter and objectives of anatomy, histology and physiology; -does not know the structure and general regularities of functioning of cells, tissues, regulation mechanisms	- demonstrates partial knowledge of the subject and tasks of anatomy, histology and physiology, makes gross errors; - does not fully know the structure and general regularities of functioning of cells, tissues, mechanisms of regulation, makes gross errors.	- demonstrates knowledge of the subject and tasks of anatomy, histology and physiology, their importance for medicine; -knows the structure and general regularities of functioning of cells, tissues, mechanisms of regulation.	-Demonstrates excellent knowledge of the subject and tasks of anatomy, histology and physiology, their importance for medicine; -excellent knowledge of the structure and general regularities of functioning of cells, tissues, regulation mechanisms
LO 11	-distinguishes, describes, compares features of the structure of different cells, tissues, organs of the organism and explains their functions; - possesses the skills of conducting laboratory studies of cells and methods of processing the results;	-does not distinguish, describe, compare features of the structure of different cells, tissues, organs of the organism and does not explain their functions; - does not know how to carry out laboratory studies of cells and methods of processing the results	-partially describes, compares features of the structure of different cells, tissues, organs of the organism and explains their functions, makes gross errors; - partially possesses the skills of laboratory research of cells;	-distinguishes, describes, compares features of the structure of different cells, tissues, organs of the organism and explains their functions, makes non-principled errors; - possesses the skills of conducting laboratory studies of cells and methods of processing the results results;	-perfectly distinguishes, describes, compares features of the structure of different cells, tissues, organs of the organism and explains their functions; - has excellent skills in conducting laboratory studies of cells and methods of processing the results;
LO 12	-Ability to present information visually and logically in the	Unable to visually and logically present information in the form of a	Able to present information in a clear and logical manner in the	Able to present information clearly and logically in the	Able to present information in a clear and logical manner

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<p>form of a presentation. - compares physiological parameters (constants) of healthy and sick organisms; - analyses the information obtained in the course of experimental observations, determines its analyses the information obtained in the course of experimental observations, determines its significance for characterising the state of the organism.</p>	<p>presentation. - is unable to compare physiological parameters (constants) of a healthy and sick organism; -does not analyse the information obtained during experimental observations, does not determine its significance for characterising the state of the organism. analyses the information obtained in the course of experimental observations, does not determine its significance for characterising the state of the organism.</p>	<p>form of a presentation. -partially compares physiological indicators (constants) of healthy and sick organism, making gross errors</p>	<p>form of a presentation. - compares physiological parameters (constants) of a healthy and sick organism, making unprincipled errors; - analyses information obtained in the course of experimental observations, determines its significance for characterizing the state of the organism.</p>	<p>Present information in the form of a presentation. - perfectly Compares physiological indicators (constants) of a healthy and sick organism; - freely analyses information obtained in the course of experimental observations, determines its significance for characterising the state of the organism.</p>
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10.2 Criteria for assessing teaching methods and technology

Checklist for the practical session....

Control form	Evaluation	Evaluation criteria
Work in small groups (practical practical, laboratory practical, laboratory classes)	95-100% (4,0; A)	The student has completed all practical and laboratory works and gives a complete answer to all theoretical questions and test tasks. Actively participates, becomes an absolute leader in the group, is able to conduct a dialogue between subgroups, uses self-assessment and self-assessment.
	90-94% (3,67; A-)	The student has completed all practical and laboratory works and gives a complete answer to all test questions. Actively participates, leads the subgroup, is able to dialogue between subgroups, uses self-assessment and self-assessment.
	80-89% (3,0; B; 3,33; B+)	The student knows the theoretical issues, timely submitted laboratory works and reports on them, and during the response in practical classes made unprincipled mistakes; positive assessment of tests. non-principled errors; positive assessment on tests.

		Actively participates in a subgroup, is able to conduct a dialogue between subgroups, uses self-assessment.
	70-79% (2,33; C+; 2,67; B-)	The student knows the theoretical issues in time handed in laboratory works and reports on them, and during the answer at practical classes made fundamental errors; positive assessment on tests. Not very actively participates in a subgroup, is able to conduct a dialogue between subgroups, uses the self-assessment.
	60-69% (1,67; C-; 2,0; C)	The student has some difficulties when answering in practical classes, made logical and stylistic errors when answering. Failed to complete laboratory work on time, handed in all reports on them; showed little activity in the class and needed the help of the teacher, partially completed the test tasks.
	50-59% (1,0; D+)	The student has made gross errors when answering theoretical questions and does not understand the issues of the topic. Incompletely completed the laboratory work and reports on it, did not complete the test tasks. Did not show activity in the subgroup.
	0-49% (0.24; F; 0.5; FX)	The learner has not prepared, does not know the topic and purpose of the class, as well as did not perform laboratory work, did not hand in reports and did not participate during the class, did not complete test tasks. Has not been active in the subgroup.

Control form	Evaluation	Evaluation criteria
Oral survey	Excellent Corresponds to grades: A (4,0; 95-100%); A- (3,67; 90-94%)	The learner answered all questions logically, clearly, competently, orientated in theories, concepts and directions on the topic. Also logically and competently answers to additional questions teacher.
	Good Corresponds to grades: B+ (3,33; 85-89%); B (3,0; 80-84%); B- (2,67; 75-79%) C+ (2,33; 70-74%)	The student made non-principled inaccuracies in his/her answers, which he/she corrects himself/herself. The learner answers additional questions of the teacher. The student made non-principled inaccuracies in his/her answers, which he/she corrects. The learner answers the teacher's additional questions with non-principled mistakes.
	Satisfactory Corresponds to grades:	The student made fundamental errors in his/her answers, which he/she corrects with the help of the

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	C (2,0; 65-69%); C- (1,67; 60-64%); D+ (1,33; 55-59%) D (1,0; 50-54%)	teacher. The student answers additional questions with fundamental errors. The student made fundamental errors in his/her answers, which he/she can hardly correct with the help of the teacher. He/she makes gross errors in additional questions.
	Unsatisfactory Corresponds to grades: FX (25 - 49%) F (0-24)	The student made gross errors in his/her answers, which he/she cannot correct, even with the teacher's leading questions. The learner cannot answer additional questions of the teacher.
Control form	Evaluation	Evaluation criteria
Solving problems	95-100% (4,0; A)	- the correct algorithm for solving the problem is drawn up, there are no errors in logical reasoning and in the choice of formulae and solution, the correct answer is obtained, the problem is solved in a rational way; gives a full and clear explanation of the solution of the problem, the ability to draw conclusions on the basis of the obtained data.
	90-94% (3,67; A-)	- the correct algorithm for solving the problem has been drawn up, there are grammatical 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; the ability to draw conclusions based on the obtained data.
	80-89% (3,0; B; 3,33; B+)	- the correct algorithm for solving the problem is drawn up, there are no significant errors in the logical reasoning and solution; the choice of formulae for the solution is correct; there is an explanation of the solution, but the problem is solved in an irrational way or no more than two non-significant errors are made, and the correct answer is obtained.
	70-79% (2,33; C+; 2,67; B-)	- the correct algorithm for solving the problem is drawn up, there are no significant errors in the solution; the choice of formulae for the solution is correct; but there is no full and clear explanation of the solution, or the problem is solved in an irrational way or more than two non-significant errors are made, the correct answer is obtained.
	60-69% (1,67; C-; 2,0; C)	- the problem is solved, but there are significant errors in the choice of formulas or in mathematical calculations, the problem is not completely solved
	50-59% (1,0; D+)	- the problem is solved incorrectly, there are

		significant errors in logical reasoning and in the solution.
	0-49% (0.24; F; 0.5; FX)	- the task is not solved, no answer to the task.
Control form	Evaluation	Evaluation criteria
Testing	Excellent Corresponds to grades: A (4,0; 95-100%); A- (3,67; 90-94%)	90-100% correct answers
	Good Corresponds to grades: B+ (3,33; 85-89%); B (3,0; 80-84%); B- (2,67; 75-79%)	70-89 % correct answers
	Satisfactory Corresponds to grades: 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 Corresponds to grades: FX (25 - 49%) F (0-24)	less 50% correct answers

Checklist for IWLT/IWL

Presentation

Control form	Evaluation	Evaluation criteria
Topic presentation	Excellent 95-100 score 90-94 score	The presentation is self-executed, on time, with at least 20 slides. At least 7 literature sources were used. The slides are informative and concise. At the defence the author demonstrates deep knowledge of the topic. Does not make mistakes when answering questions during the discussion.
	Good 85-89 score 80-84 score 75-79 score 70-74 score	The presentation is self-executed, within the assigned deadline, with the volume of at least 17 slides. At least 6 literature sources were used. The slides are informative and concise. At the defence the author demonstrates good knowledge of the topic. Makes non-principled mistakes in answering questions, which corrects himself.
	Satisfactory 65-69 score 60-64 score 50-54 score	The presentation is self-executed, on time, with at least 14 slides. At least 5 literature sources are used. The slides are not informative. At the defence the author makes fundamental errors in answering questions.
	Unsatisfactory 0,5; 25-49 score 0:0-24 score	The presentation is not delivered on the due date, the volume is less than 10 slides. Less than 5 literature sources are used. The slides are not informative. At the

defence the author makes gross errors when answering questions. Does not orientate in his/her own material.

Glossary

Control form	Evaluation	Evaluation criteria
Preparing the glossary	Excellent Corresponds to the grades: (4,0; 95-100%); (3,67; 90-94%)	<ul style="list-style-type: none"> - If the students have compiled a glossary on their own; - The volume is at least 15 terms; - The terms correspond to the defended topic; - The wording of the term is competent, corresponds to the biological meaning, complete; - The terms are arranged alphabetically, the etymology of the term is given of the term;
	Good Corresponds to the grades: (3,33; 85-89%); (3,0; 80-84%); (2,67; 75-79%); (2,33; 70-74%).	<ul style="list-style-type: none"> - If the students have compiled a glossary on their own; - The volume is at least 10-13 terms; - The terms correspond to the defended topic; - The wording of the term is competent, corresponds to the biological meaning, etymology is absent. - There is no alphabetical order; - There are some inaccuracies;
	Satisfactory Corresponds to the grades: (2,0; 65-69%); (1,67; 60-64%); (1,0; 50-54%)	<ul style="list-style-type: none"> - If the trainees have compiled a glossary on their own; - The volume is at least 10 terms; - The wording of the term corresponds to the biological meaning, but is not complete; - No alphabetical order; - No etymology;
	Unsatisfactory Corresponds to the grades: (0,5; 25-49%) (0:0-24%)	<ul style="list-style-type: none"> - If the trainees have compiled a glossary on their own; - The volume is at least 10 terms; - The terms do not correspond to the topic; - There are serious biological errors. No alphabetical order; - No etymology.

Abstract

Control form	Evaluation	Evaluation criteria
Preparation and defence of the abstract	Excellent 95-100 score 90-94 score	The abstract is neatly completed and submitted by the due date, written independently on at least 15 pages of typewritten text, using at least 7 literature sources. Schemes, tables and figures corresponding to the theme of the abstract are given. When defending the abstract, the text is not read, but narrated. Confidently and unmistakably answers all the questions asked.
	Good 85-89 score 80-84 score 75-79 score 70-74 score	The abstract is neatly completed and submitted by the due date, written independently on at least 13 pages of typewritten text, using at least 6 literature sources. Schemes, tables and figures corresponding to the topic of the abstract are given. the theme of the abstract. When defending the abstract, the text is not read, but narrated.

			When answering questions makes non-principled mistakes.
		Satisfactory 65-69 score 60-64 score 50-54 score	The abstract is neatly completed and submitted by the due date, written independently on at least 10 pages of typewritten text, using at least 5 literature sources. When defending the abstract, the text is read. Does not confidently answer questions, makes fundamental errors.
		Unsatisfactory 0-49 score	The abstract is sloppy and not submitted in due time, written independently on less than 10 pages of typewritten text, using less than 5 literary sources. When defending the abstract, the text is read. When answering questions makes gross errors, is not orientated in the material. material.

Intermediate certification

Control form	Evaluation	Evaluation criteria
Tests/ oral and written questioning	Excellent 95-100 score 90-94 score	The grade is given if the student has not made any mistakes or inaccuracies during the answer. Orientates in the theories, concepts and directions of the discipline under study and gives them a critical assessment, uses scientific achievements of other disciplines.
	Good 85-89 score 80-84 score 75-79 score 70-74 score	It is put in the case if the student during the answer did not make gross errors in the answer, allowed non-principled inaccuracies or fundamental errors corrected by the student himself, managed to systematize the program material with the help of the teacher.
	Satisfactory 65-69 score 60-64 score 50-54 score	It is put in the case if the student during the answer allowed inaccuracies and non-principled errors, limited only to the educational literature specified by the teacher, had great difficulty in systematizing the material.
	Unsatisfactory 24-49 score 0-24 score	It is given in the case if the student during the answer made fundamental errors, did not work through the basic literature on the topic of the class, can not use the scientific terminology of the discipline, answers with gross stylistic and logical errors. gross stylistic and logical errors.

Multi-point system of knowledge evaluation

Letter system evaluation	Numerical equivalent of scores	Percentage content	Evaluation in 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	

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B -	2,67	75-79	Satisfactory
C +	2,33	70-74	
C	2,0	65-69	
C -	1,67	60-64	
D+	1,33	55-59	
D-	1,0	50-54	Unsatisfactory
FX	0,5	25-49	
F	0	0-24	

11. Teaching Resources

Electronic resource:

1. John Wilson and Tim Hunt. Molecular Biology of the cell. 2015. Sixth Edition.
2. Lodich, H. Molecular cell [Электронный ресурс]: научное издание / Н. Lodich. - Электрон.текстовые дан. (10,4 Мб). - Б. м. : Б. и., 2003
3. Primer of Molecular Genetics [Электронный ресурс]: учебник. - Электрон.текстовые дан. (10,5 Мб). - М. : Б. и., 1992
- 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
4. Glossary, Lodish H. Molecular Cell biology [Электронный ресурс] : словарь / Lodish H. Glossary. - Электрон. текстовые дан. (11,1 Мб). - Б. м. : Б. и., 2003
- Watson, J. D. Molecular Biology of the gene [Электронный ресурс]: научное издание / J. D. Watson. - Fifth edition. - Б. м. : Б. и., 2004

References:

In the Kazakh language

Basic:

1. Клетканың молекулалық биологиясы. 2 т. : оқулық / Б. Альбертс [т.б.] ; ағылшын тіл. ауд. Ә. Ережепов. - 6- бас. - Алматы : Дәуір, 2017. - 660 б. с.
2. Batyrova, K. I. Introduction to biology = Введение в биологию : textbook / K. I. Batyrova, D. K. Aydarbaeva. - Almaty : Association of higher educational institutions of Kazakhstan, 2016. - 316 p.
3. Cooper, Geoffrey M. The cell a molecular approach: textbook / Geoffrey M. Cooper, Robert E. Hausman. - 7th ed. - U. S. A. : Boston University, 2016. - 832 p.
4. Jorde, Lynn B. Medical genetics : textbook / Lynn B. Jorde, John C. Carey, Michael J. Bamshad. - 5th ed. - Philadelphia : Elsevier, 2016. - 356 P.
5. Molecular biology of the cell: textbook / B. Alberts [and etc.]. - 6th ed. - New York : Garland Science, 2015. - 1342 p.
6. Нұрғазы, Қ. Ш. Молекулалық биология: оқулық / Қ. Ш. Нұрғазы, У. К. Бисенов. - Алматы : Эверо, 2016. - 428 бет.
7. Есиркепов, М. М. Молекулярная биология клетки: учеб. пособие / М. М. Есиркепов ; М-во здравоохранения РК; Учеб.-методическое об-ние мед. вузов РК. - Караганда : ИП "Изд-во АҚНҰР", 2013. - 146 с.
8. Әбилаев, С. А. Молекулалық биология және генетика: оқулық / С. А. Әбилаев. - 2-бас. түзет., жән толықт. - Шымкент : ЖШС "Кітап", 2010. - 388 бет с.
9. Притчард, Дориан Дж. Наглядная медицинская генетика: учеб. пособие / Дориан Дж. Притчард, Брюс Р. Корф ; пер. с англ. под ред. Н. П. Бочкова. - М. :

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ГЭОТАР - Медиа, 2009. - 200 с.

Additional:

1. Муминов, Т. А. Молекулалық биология негіздері: лекциялар курсы / Т. А. Муминов, Е. У. Қуандықов, М. Е. Құлманов; қаз. тіл. ауд. Н. М. Малдыбаева, Т. А. Муминов. - Алматы : Литер Принт. Қазақстан, 2017. - 388 б. с.
2. Основы молекулярной биологии: курс лекций / под ред. Т. А. Муминов; Т. А. Муминов [и др.]. - 2-е изд., испр. и доп. - Алматы : Литер Принт. Қазақстан, 2017. - 556 с.
3. Қуандықов, Е. Ө. Негізгі молекулалық-генетикалық терминдердің орысша-қазақша сөздігі - Алматы : Эверо, 2012. - 112 бет
4. Муминов, Т. Основы молекулярной биологии : курс лекций. - Алматы : Эффект, 2007

In Russian:

Basic:

1. Генетика. Учебник для ВУЗов/Под ред. Академика РАМН В. И. Иванова – М.: ИКЦ «Академкнига», 2006-638 с.: ил.
2. Муминов Т. Основы молекулярной биологии: курс лекций. - Алматы: Эффект, 2007.

Additional:

1. Иванюшкин А. Я., Игнатъев В. Н., Коротких Р. В., Силюянова И. В. Изд-во Прогресс, М., 2008 г.
 2. У. Клаг, М. Каммингс. Основы генетики – М.: Техносфера, 2009 г.
 3. Основы молекулярной биологии клетки. Учебник. Зтомах. Б. Альбертс и др., Изд-во OZON.RU, 2018 г.
- На английском языке:
- Основная:
1. Jorde L. B., Carey J. C., Bamshad M. J. Medical Genetics, Elsevier, 2015
 2. Cooper G. M., Hausman R. E. The Cell: a Molecular Approach. - Sinauer Associates, 2015
 3. Genetics [Текст] = Генетика : textbook / D. K. Aydarbaeva [and etc.]. - Almaty : Association of higher educational institutions of Kazakhstan, 2016. - 244 p
 4. Alberts B. [et al.]. Molecular Biology of the CELL - 3th ed., 2014
 5. Batyrova, K. I. Introduction to biology [Текст] = Введение в биологию : textbook / К. I. Batyrova, D. K. Aydarbaeva. - Almaty: Association of higher educational institutions of Kazakhstan, 2016. - 316 p.

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Additional:

1. Schumm, Dorothy E. Core Concepts in clinical Molecular biology [Текст]
: монография / Dorothy E. Schumm. - First Edition. - New York : Lippincott - Raven
Publishers Philadelphia, 1997. - 74 p.

Electronic textbooks

№	Name	Link
1	Electronic library	http://lib.ukma.kz
2	Republican interuniversity electronic library	http://rmebrk.kz/
3	Electronic library of the Medical University "Student Advisor"	http://www.studmedlib.ru
4	"Paragraph" information system "Medicine" section	https://online.zakon.kz/Medicine
5	Scientific electronic library	https://elibrary.ru/
6	Electronic library "BuxMed"	http://www.booksmed.com
7	«Web of science» (Thomson Reuters)	http://apps.webofknowledge.com
8	«Science Direct» (Elsevier)	https://www.sciencedirect.com
9	«Scopus» (Elsevier)	www.scopus.com
10	PubMed	https://www.ncbi.nlm.nih.gov/pubmed

12. Discipline policy

Requirements for students:

1. during the period of being on the territory of the department, fulfill the disciplinary requirements indicated at the entrance to the department;
2. compulsory attendance of lectures, practical and laboratory classes according to the schedule;
3. not be late for classes;
4. in the classroom to be in the special. clothes (robes, caps);
5. not to miss classes, in case of illness, provide a work sheet issued by the dean's office on the basis of a certificate of illness;
6. to work off missed classes according to the schedule of acceptance of workings by the teacher;
7. actively participate in the educational process;
8. comply with the internal regulations of the academy and ethics of conduct;
9. timely and accurately complete homework and IWT according to the IWT delivery schedule;
10. in case of non-fulfillment of tasks and missed lectures, the final grade is reduced;

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11. be tolerant, open and friendly towards fellow students and teachers;
12. take good care of the property of the department;
13. in connection with the absence of lectures for no good reason, 1 point is deducted from the overall rating of the admission for each pass.
14. in connection with the absence of classes on the IWLT for an unjustified reason, for each absence, 2 points from the overall rating of admission.
15. upon receiving an unsatisfactory mark (0-49 points) at the midterm control, the student is not allowed to the final control.
16. If you receive unsatisfactory evaluation of the practical skills test, the student is not allowed to the final control.
17. In the conditions of distance learning: to familiarize in a timely manner with the tasks that are entered in the module "Assignment" AIS Platonus, to perform tasks in the lecture, practical training and SIW according to the schedule; to participate in the discussion of the main issues of the topic of classes, to perform individual or group tasks in the broadcasting platforms in the classes organized by the teacher (Zoom, WebExidr);
18. in case of absence of the student at lectures, practical classes, IWLT in the electronic logbook of AIS Platonus, a note of absence ("a") is made.

13. Academic policies based on the moral and ethical values of the academy

Realization of the principles and culture of academic honesty, which expresses the student's honesty in practical, laboratory work in the IWLT classes. As well as at examinations, expressing their position in their relations with teachers and administration.
The online proctoring system is used for distance learning of the discipline to verify the identity and confirm the results of online exams in compliance with academic integrity.





14. Approval and revision

date of approval by the Department of Biology and Biochemistry	Protocol № ____	Full name of Head department PhD in medicine., professor Esirkeпов M.M.	Signature
date of approval by the Department of Chemical disciplines	Protocol № ____	Full name of Head department PhD in chemistry., acting associate professor Daurenbekov K.N.	Signature
date of approval by the Department of Microbiology, virology and immunology	Protocol № ____	Full name of Head department MD., professor Seithanova B.T.	Signature
date of approval by the Department of Pathological anatomy and histology	Protocol № ____	Full name of Head department acting associate professor Sadykova A.Sh.	Signature

Department of «Biology and Biochemistry», «Chemical disciplines»,
«Microbiology, virology and immunology», «Pathological anatomy and
histology»
Syllabus

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p. 42
from p. 42

Date of approval by the CEP	Protocol № ___	Chairperson of CEP Sadykova A.Sh.	Signature

14. Approval and revision			
date of approval by the Department of Biology and Biochemistry	Protocol № <u>87</u> 16.05.23	Full name of Head department PhD in medicine., professor Esirkeпов M.M.	Signature 
date of approval by the Department of Chemical disciplines	Protocol № <u>10</u> 12.05.23.	Full name of Head department PhD in chemistry., acting associate professor Daurenbekov K.N.	Signature 
date of approval by the Department of Microbiology, virology and immunology	Protocol № <u>108</u> 23.05.23	Full name of Head department MD., professor Seitbanova B.T.	Signature 
date of approval by the Department of Pathological anatomy and histology	Protocol № <u>11</u> 26.05.23	Full name of Head department acting associate professor Sadykova A.Sh.	Signature 
Date of approval by the CEP	Protocol № <u>11</u> 05.06.23	Chairperson of CEP Sadykova A.Sh.	Signature 