MINISTRY OF HEALTH OF UKRAINE

ODESA NATIONAL MEDICAL UNIVERSITY

Faculty of dentistry, international

Department of Medical Biology and Chemistry

Syllabus of the academic discipline
"Medical chemistry"

Scope of the academic discipline	Total hours: 90 hours, 3.0 credits. 1st semester of the 1st course.
Days, time, place of educational discipline	According to the schedule of classes. Department of clinical chemistry and laboratory diagnostics. Odesa, str. Olgiivska, 4a, Department of Clinical Chemistry and Laboratory Diagnostics, 2d floor.
Teachers	Associate professors: Ph.D. Burdina Y.F., Ph.D. Grekova A.V., Ph.D. Shirykalova A.O. Assistant: Gridina I.R.
Contact Information	**phone consultations**: Burdina Yanina Fedorivna, head teacher of the department 066-293-57-57 Grekova Alla Vasylivna, responsible for organizational and educational work of the department 097-938-30-52 Tatyana Petrivna Troyan, senior laboratory technician of the department (048) 728-54-78 E-mail: medchem@ukr.net **Offline consultations**: from 2:00 p.m. to 5:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday. **Online consultations**: from 4:00 p.m. to 6:00 p.m. every Thursday, from 9:00 a.m. to 2:00 p.m. every Saturday. The link to the online consultation is provided to each group during classes separately.

COMMUNICATION

During presential learning communications with applicants will be conducted in the departement.

During distance learning, communication is carried out through the Microsoft Teams platform, as well as e-mail and other social media by creating chat groups for every single study group managed by the head of the study group and teachers.

ABSTRACT OF THE EDUCATIONAL DISCIPLINE

The subject of studying the discipline is to provide the medical student with the necessary knowledge to understand the functions of individual body systems, the interaction of the body with the environment, as well as the ability to use various quantitative calculations to analyze certain processes.

Prerequisites and post-requisites of the discipline (place of the discipline in the educational program):

Prerequisites: Ukrainian language (by professional direction), foreign language (by professional direction), chemistry (general course)

Postrequisites: bioorganic chemistry, biophysics, medical biology, physiology, pathophysiology, biological chemistry, pharmacology, hygiene and ecology, forensic pathology, toxicology, narcology and immunochemistry.

The goal of the discipline: systematize knowledge of the fundamental theoretical chemistry, learn to actively apply this knowledge to reveal the physico-chemical cause of phenomena that occur in a living organism under normal conditions and during pathological changes, as well as when the body is affected by environmental factors: chemo - and physiotherapeutic means.

Tasks of the discipline:

The task of the discipline: creation of a fundamental scientific base for future doctors in their understanding of the general physico-chemical laws that underlie the processes of human life.

Expected results:

As a result of studying the academic discipline, the applicant must:

To know: the scientific pilars of the general physico-chemical interactions that are primary for the human life.

Be able to:

- Demonstrate knowledge in practical situations;
- Use the aquired knowledge and the understanding of the subject domain and profession;
- Understand self-regulation and lead a healthy lifestyle, the ability to adapt and act in a new situation;
- Be aware of the choice of communication strategy; the ability to work in a team; interpersonal skills;
- Communicate effectively, formulate and solve tasks both orally and written;
- Use some information and communication technologies;
- Apply methods of analysis of design and research, as well as their limitations in accordance with specialization;
- Analyze and evaluate chemical processes, choose and apply a suitable method: analytical, calculation or experimental, interpret research results;
- Use practical skills to solve complex tasks of implementing chemical and biological projects and conducting research in accordance with specialization;
- Collect, interpret relevant data and analyze complexities within specialization to make judgments that highlight social and ethical issues;
- Efforts to preserve the environment;
- Demonstrate the current level of knowledge of specialized issues in medical chemistry in relation to solving medical problems;
- Analyze and interpret the physical and chemical processes taking place in the human body.

DESCRIPTION OF THE EDUCATIONAL DISCIPLINE

Forms and methods of education

The discipline will be taught in the form of lectures (4 hours), practical (32 hours), organization of independent work of the applicant (54 hours).

Teaching methods: When studying the discipline, lectures are held with the use of multimedia materials.

Practical classes are held in classrooms and include explanations, discussions, surveys on

the subject of the class, as well as laboratory work.

Content of the academic discipline

Topic 1. Chemistry of Biogenic Elements. Chemical Elements in Living Organisms.

General information about biogenic elements Qualitative and quantitative content of biogenic elements in the human body. Macronutrients, trace elements and impurity elements. Organogens. The concept of Vernadsky's doctrine of the biosphere and the role of living matter (living organisms). The relationship between the content of biogenic elements in the human body and their content in the environment. Endemic diseases, their connection with the peculiarities of biogeochemical provinces (areas with a natural deficit or excess of certain chemical elements in the lithosphere). Problems of pollution and purification of the biosphere from toxic compounds of man-made origin.

The contribution of the works of domestic scientists Vernadsky V.I., Vinogradov A.P., Kovalsky V.V., Venchikov A.I., Babenko G.A., as well as foreign scientists E.Underwood, Schutte and others in solving the issues of connection between the biogenic role and physiological properties of chemical elements with the structure of atoms and their location in the periodic table.

Topic 2. Typical chemical properties, biological role and application in medicine of biogenic s-elements. Qualitative reactions for the determination of s-elements.

The structure of atoms of s elements based on their position in the periodic table of elements (PTE). Forms of compounds of s elements. Topography of s - elements in the human body and biological role. Application of s-elements derivatives in medicine. Analytical reactions for the determination of s-elements ions: (K^+, Mg^{2+}, Ba^{2+}, Ca^{2+}). The relationship between the location of s - elements in the periodic table and their content in the body.

Topic 3: Chemical properties and biological role of biogenic p - elements. Qualitative reactions for the determination of p - elements.

Electronic configuration of p - elements atoms. Forms of compounds of p - elements. Acid-base properties of p - element compounds. Amphotericity. Redox reactions involving p - elements. Topography of p - elements in the human body, participation in vital processes. Chemical properties of p - elements. Application in medicine. Toxic effect of compounds. Qualitative reactions to ions CO_3^{2-}, SO_4^{2-}, NO_2^-, $S_2O_3^{2-}$.

Topic 4. General characteristics of biogenic d - elements. Redox properties of compounds of d - elements.

Metals of life. Electronic structure and electronegativity of d - elements. Typical chemical properties of d - elements and their compounds (reactions with a change in the degree of oxidation). Types of redox reactions (intermolecular, intramolecular, disproportionation reactions). Methods for determining the coefficients of redox reactions. Effect of pH on the properties of oxidizing agents and reducing agents.

Topic 5. ***Werner's Coordination Theory and the Structure of Complex Compounds. Applications of Complex Compounds in Medicine.***

Complexation reactions. Coordination theory of A. Werner and modern ideas about the structure of complex compounds. The concept of a complexing agent (central ion). Nature, coordination number, hybridization of complexing orbitals. The concept of ligands. Coordination capacity (dentativity) of ligands. Internal and external spheres of complexes. Geometry of the complex ion. The nature of chemical bonding in complex compounds. Classification of complex compounds according to the charge of the inner sphere and the nature of the ligands. Intrinsically complex compounds. Polyunit complexes. Chelating effect and strength of complexes of biometal cations with polydentate ligands. Metal-ligand homeostasis and metabolism. Causes of disorders of metal-ligand homeostasis. Toxicity of d-element cations and stability of complex compounds. Ferro-, cobalt-, copper- and zinc-containing biocomplex compounds. Complexes and their use in medicine as antidotes for heavy metal poisoning (chelation therapy) and as antioxidants for the storage of drugs.

Topic 6. Biological role and application in medicine of d - elements. Qualitative reactions for the determination of d - elements.

Biological role of d - elements. Topography of d - elements in the human body. Application in medicine. Toxic effect of d - elements and their compounds. Qualitative reactions to ions MnO_4^-, Fe^{3+}, Fe^{2+}, Cu^+, Cu^{2+}, Ag^+, Cr^{3+}.

Topic 7: Basic concepts of chemical thermodynamics. Theoretical foundations of bioenergy. The first law of thermodynamics. Thermochemistry. Hess's law.

The subject of chemical thermodynamics. Basic concepts of chemical thermodynamics: thermodynamic system (isolated, closed, open, homogeneous, heterogeneous), state parameters (extensive, intensive), thermodynamic process (reversible, irreversible). Living organisms are open thermodynamic systems. Irreversibility of vital processes.

The first law of thermodynamics. Enthalpy. Thermochemical equations. Standard heats of formation and combustion. Hess's law. The method of calorimetry. Energy characterization of biochemical processes. Thermochemical calculations for assessing the caloric content of food and the preparation of rational and therapeutic diets.

Topic 8. The second law of thermodynamics. Thermodynamic potentials.

Spontaneous and non-self-induced processes. The second law of thermodynamics. Entropy. Thermodynamic potentials: Gibbs energy, Helmholtz energy. Thermodynamic conditions of equilibrium. Criteria for the direction of spontaneous processes.

Application of the basic principles of thermodynamics to living organisms. ATP as a source of energy for biochemical reactions. Macroergic compounds. Energy conjugation in living systems: exergonic and endergonic processes in the body.Topic 10. Physico-chemical foundations of kinetics of biochemical reactions. Kinetics of complex reactions. Catalysis. Features of enzymes.

Chemical kinetics as a basis for studying the rates and mechanism of biochemical reactions. Insights into the kinetics of enzymatic reactions. Enzymes as biological catalysts.

Topic 9: Physical and chemical bases of biochemical reaction kinetics. Kinetics of complex reactions. Catalysis. Features of enzyme action.

Chemical kinetics as a basis for studying the rates and mechanisms of biochemical reactions. The rate of reaction. Dependence of the reaction rate on concentration. The law of

active masses for the reaction rate. The rate constant. The order of the reaction. Kinetic equations of reactions of the first, second and zero order. Half-life - quantitative characterization of changes in the concentration of radionuclides, pesticides, etc. in the environment. The concept of the reaction mechanism. Molecularity of the reaction.

Dependence of the reaction rate on temperature. The Van't Hoff rule. Features of the temperature coefficient of reaction rate for biochemical processes.

Activation energy. The theory of active collisions. Arrhenius equation. The concept of the theory of the transition state (activated complex).

Topic 10: Kinetics of complex reactions. Catalysis. Features of the action of enzymes.

The concept of the kinetics of complex reactions: parallel, sequential, conjugated, reversible, competing, chain. The concept of antioxidants.

Free radical reactions in a living organism. Photochemical reactions, photosynthesis.

Catalysis and catalysts. Features of the action of catalysts. Homogeneous, heterogeneous and microheterogeneous catalysis. Acid-base catalysis. Autocatalysis. Mechanism of action of catalysts. Promoters and catalytic poisons.

Concept of the kinetics of enzymatic reactions. Enzymes as biological catalysts.

Topic 11. Chemical equilibrium. Equilibrium constant. The product of solubility. Heterogeneous equilibrium with the participation of salts in the general homeostasis of the body.

Chemical equilibrium. Chemical equilibrium constant and methods of its expression. Shift of chemical equilibrium with changes in temperature, pressure, concentration of substances. Le Chatelier's principle.

Precipitation and dissolution reactions. Solubility product. Conditions of precipitation and dissolution of precipitates. The role of heterogeneous equilibrium with the participation of salts in the overall homeostasis of the body.

Study of the effect of concentration and temperature on the shift of chemical equilibrium.

Topic 12. Electrochemistry and Electrochemical Research Methods.

The role of electrochemical phenomena in biological processes. Electrode potentials and the mechanism of their occurrence. Nernst's equation. Normal (standard) electrode potential. Normal hydrogen electrode. Measurement of electrode potentials. Determination and comparison electrodes. Chlorosilver electrode. Ion selective electrodes. Glass electrode. Galvanic elements.

Diffusion potential. Membrane potential. Biological role of diffusion and membrane potentials. Damage potential. Resting potential. Action potential.

The role of redox reactions in vital processes. Redox potential as a measure of oxidation and reduction capacity of systems. Peters' equation. Normal redox potential. Prediction of the direction of redox reactions by the values of redox potentials. The equivalent of an oxidizing agent and a reducing agent. The value of redox potentials in the mechanism of biological oxidation processes. Potentiometry. Potentiometric determination of pH, ionic activity.

Topic 13. Modern Concepts of Solutions. Quantities Characterizing the Qualitative Composition of Solutions.

Methods of quantitative analysis. Classification of methods of quantitative analysis. Fixing the point of equivalence. Indicators. The law of equivalents. Basic calculation formulas.

The role of solutions in the life of organisms. Classification of solutions. Mechanism of dissolution processes. Thermodynamic approach to the dissolution process. Solubility of substances.

Solubility of gases in liquids. Dependence of gas solubility on pressure (Henry-Dalton law), nature of gas and solvent, temperature. Effect of electrolytes on the solubility of gases (Sechenov's law). Solubility of gases in blood. Caisson disease.

Solubility of liquids and solids in liquids. Solubility depends on temperature, nature of the solute and solvent..

Topic 14. Equilibrium in Electrolyte Solutions. Electrolytic Dissociation in Solutions of Strong and Weak Electrolytes. Hydrogen Ion Concentration of Biological Fluids.

Solutions of electrolytes. Electrolytes in the human body. Degree and constant of dissociation of weak electrolytes. Ostwald's dilution law.

Properties of solutions of strong electrolytes. Activity and activity coefficient. Ionic strength of a solution. Water-electrolyte balance - a necessary condition for homeostasis. Intervals of pH for body fluids in normal and pathological conditions. Acidosis. Alkalosis. The role of electrolytes in vital processes. Acid-base equilibrium in electrolyte solutions. Determination of the constant and degree of dissociation of a weak electrolyte.

Dissociation of water. Ionic product of water. Hydrogen pH. Arenius' theory of acids and bases, Bransted and Lowry's proteolytic theory, Lewis' electronic theory. Types of proteolytic reactions: neutralization, hydrolysis, ionization.

Topic 15. Colligative properties of solutions. Osmometry, cryometry, ebuliometry. The role of osmosis in biological fluids.

Colligative properties of dilute solutions of nonelectrolytes. Relative decrease in the pressure of saturated vapor of the solvent above the solution. Raoul's law. Ideal solutions. Lowering of the freezing point and increasing of the boiling point of solutions in comparison with solvents. Osmosis and osmotic pressure. Van't Hoff's law. Colligative properties of dilute electrolyte solutions. Isotonic coefficient. Hypo-, hyper- and isotonic solutions. Cryometry, ebulliometry, osmometry, their application in biomedical research. The role of osmosis in biological systems. Osmotic pressure of blood plasma. The Haller equation. Oncotic pressure. Plasmolysis and hemolysis.

Topic 16. Buffer solutions, classification and mechanism of action.

Classification of buffer solutions. Buffer capacity and its dependence on various factors. Protein buffer systems. The concept of the acid-base state of blood.

Topic 17. Buffer capacity. The role of buffer systems in maintaining the body's acid-base balance. Determination of buffer capacity.

Buffer capacity and its dependence on various factors. Protein buffer systems. The concept of the acid-base state of blood. Acidosis. Alkalosis. Determination of buffer capacity by the titrimetric method.

Topic 18. Sorption of biologically active substances. Fundamentals of adsorption therapy.

Surface phenomena and their importance in biology and medicine. Surface tension of liquids and solutions. Surface tension isotherm. Surface active and surface inactive substances. Surface activity. The Duclo-Traube rule.

Adsorption at the liquid-gas and liquid-liquid interfaces. Gibbs' equation.

Orientation of surfactant molecules in the surface layer. The structure of biological membranes. Adsorption at the solid-gas interface. Langmuir's equation. Adsorption from a solution on the surface of a solid. Physical and chemical adsorption. Laws of adsorption of dissolved substances, vapors and gases. The Freundlich equation.

Physicochemical basis of adsorption theory (hemosorption, plasma adsorption, lymphatic adsorption, enterosorption, application therapy). Immunosorbents.

Topic 19: Electrolyte adsorption. Chromatographic methods for the analysis of mixtures of biologically active substances.

Electrolyte adsorption - specific (selective) and ion exchange. Paneth-Fayans rule. Natural and synthetic ion exchangers. The role of adsorption and ion exchange in the life processes of plants and organisms.

Chromatography. Classification of chromatographic methods of analysis on the basis of the aggregate state of phases, technique and distribution mechanism. Adsorption, ion-exchange and distribution chromatography. Application of chromatography in biology and medicine.

Topic 20: Colloidal solutions. Molecular kinetic, optical and electrokinetic properties.

The body as a complex set of dispersed systems. Classification of dispersed systems by degree of dispersion. Colloidal state. Lyophilic and lyophobic colloidal systems. Structure of colloidal particles. Double electric layer. Electrokinetic potential of a colloidal particle.

Methods of preparation and purification of colloidal solutions. Dialysis, electrodialysis, ultrafiltration, compensatory dialysis, vividialysis. Hemodialysis and artificial kidney.

Molecular kinetic properties of colloidal systems. Brownian motion, diffusion, osmotic pressure. Optical properties of colloidal systems.

Electrokinetic phenomena. Electrophoresis. Application of electrophoresis in research and clinical laboratory practice. Electrophoregrams.

Topic 21. Kinetic and aggregate stability of dispersed systems. Production of ash by condensation method.

Kinetic (sedimentation) and aggregate stability of dispersed systems. Stability factors. Coagulation. Mechanism of coagulating action of electrolytes. Threshold of coagulation. The Schulze-Hardy rule. Mutual coagulation. Coagulation processes in drinking water and wastewater treatment. Colloidal protection.

Disperse systems with gaseous dispersion medium. Classification of aerosols, methods of preparation and properties. Application of aerosols in clinical and sanitary-hygienic practice. Toxic effects of some aerosols. Powders.

Coarse dispersed systems with liquid dispersion medium. Suspensions, methods of preparation and properties. Pastes, their medical application.

Emulsions, methods of preparation and properties. Types of emulsions. Emulsifiers. Application of emulsions in clinical practice. Biological role of emulsification.

Preparation of ash by condensation method.

Topic 22. Properties of biopolymer solutions. Isoelectric point of protein.

High molecular weight compounds - the basis of living organisms. Globular and fibrillar structure of proteins. Comparative characteristics of solutions of high molecular weight compounds, true and colloidal solutions.

Swelling and dissolution of polymers. The mechanism of swelling. Effect of pH, temperature and electrolytes on swelling. The role of swelling in physiology. Dragging of IV solutions. The mechanism of drag. The effect of pH, temperature and electrolytes on the rate of drag. Thixotropy. Syneresis. Diffusion.

Topic 23. Nanochemistry in the Modern World.

Nanomaterials for Molecular Visualization and Early Disease Diagnosis. Advantages and Limitations of Using Nanomaterials in Diagnostics. Targeted Drug Delivery Using Nanomaterials. Development and Use of Nanomaterials for Treating Cancer and Cardiovascular Diseases.

Class 24. Differentiated credit test.

List of recommended literature:

Basic:

1. Medical chemistry / V.O. Kalibabchuk, V.I. Halynska, L.I. Hryshchenko et al. – Kyiv, AUS Medicine Publishing, 2020. – 224 p.
2. Medical Chemistry: textbook / V.Y. Tsuber, A.A. Kotvytska, K.V. Tykhonovych et al. - – Kyiv, AUS Medicine Publishing, 2022. – 392 p.
3. General and Inorganic Chemistry: textbook / V.O. Kalibabchuk, V.V. Ohurtsov, V.I. Halynska et al. – Kyiv, AUS Medicine Publishing, 2019. – 456 p.

Additional:

1. Textbook of Medicinal Chemistry / V. Alagarsamy // CBS Publishers & Distributors Pvt Ltd, India; 3rd edition, 2018 – 584 p.
2. Richard Post. Chemistry: Concepts and Problems / Richard Post, Chad Snyder, Clifford C. Houk // A Self-Teaching Guide, Jossey-Bass, 2020. – 432 p.
3. Darrell D. Ebbing. General Chemistry / Darrell D. Ebbing, Steven D. Gammon. – Boston: Cengage Learnin, 2017. – 1190 c.

13. Electronic information resources

1. http://moz.gov.ua - Ministry of Health of Ukraine
2. www.who.int - World Health Organization
3. www.dec.gov.ua/mtd/home/ - State Expert Center of the Ministry of Health of Ukraine
4. http://bma.org.uk - British Medical Association
5. www.gmc-uk.org - General Medical Council (GMC)
6. www.bundesaerztekammer.de - German Medical Association

EVALUATION

Current control: oral survey, assessment of performance of practical skills, solution of situational tasks, assessment of activity in class.

Differentiated assessment is carried out with the help of written work (tasks and exercises, the performance of which requires mandatory knowledge, as well as situational tasks): 2 tasks of the II level of difficulty and 2 tasks of the III level of difficulty.

Criteria for ongoing assessment in the practical lesson:

Score	Assessment criterion
Excellent «5»	The student is fluent in the material, takes an active part in the discussion and solution of the situational problem, confidently demonstrates practical skills in the interpretation of laboratory tests, expresses his opinion on the topic of the lesson.
Good «4»	The student is well versed in the material, participates in the discussion and solution of the situational problem, demonstrates practical skills during and interpretation of laboratory tests with some errors, expresses his opinion on the topic of the lesson.
Satisfactory «3»	The student does not have enough material, uncertainly participates in the discussion and solution of a situational problem with significant errors.
Unsatisfactory «2»	The student does not have the material, does not participate in the discussion and solution of the situational problem, does not demonstrate practical skills.

The student is admitted to the differential test provided that the requirements of the curriculum are met and if for the current academic activity he received at least 3.00 points and passed the control of practical skills for a positive assessment.

The structure of the differential test

The content of the evaluated activity	Number of questions
Theoretical questions	2
Practical task	2

Criteria for assessing the learning outcomes of students in the exam:

Excellent «5»	Exhibited to a student who worked systematically during the semester, showed during the differential test comprehensive and deep knowledge of the program material, is able to successfully perform the tasks provided by the program, mastered the content of basic and additional literature, realized the relationship of individual sections of the discipline, their importance for future profession , showed creative abilities in understanding and using educational material, showed the ability to independently update and replenish knowledge; level of competence - high (creative);
Good «4»	It is presented to a student who has shown full knowledge of the curriculum, successfully performs the tasks provided by the program, mastered the basic literature recommended by the program, showed a sufficient level of knowledge of the discipline and is able to independently update and update during further study and professional activities; level of competence - sufficient (constructive-variable)
Satisfactory «3»	Exhibited to a student who has shown knowledge of the basic curriculum in the amount necessary for further study and further work in the profession, copes with the tasks provided by the program, made some mistakes in answering the differential test and tasks, but has the necessary knowledge to overcoming mistakes; level of competence - average (reproductive)

Unsatisfactory «2»	Exposed to a student who did not show sufficient knowledge of the basic curriculum, made fundamental mistakes in performing the tasks provided by the program, can not without the help of the teacher to use the knowledge in further study, failed to master the skills of independent work; level of competence - low (receptive-productive)

Thus, the department publishes two grades:

1) the arithmetic mean of all current grades (calculated as a number rounded to 2 (two) decimal places);

2) traditional grade for differentiated credit.

The average score for the discipline (traditional grade) is calculated as the arithmetic average of the current performance and the grade obtained on the differentiated test.

Further calculations are made by the information and computing center of the university.

INDEPENDENT WORK OF HIGHER EDUCATION ACQUIRES

Independent work involves preparation for each practical session.

EDUCATIONAL DISCIPLINE POLICY

Policy on Deadlines and Retakes: Students are expected to attend all lectures and practical classes. If a class is missed, it must be made up according to the schedule posted on the department's information board and in accordance with the dean's office's permission if required. Retakes for unsatisfactory grades are allowed in the final month of the course if the average grade for current academic performance is less than 3.00 (conducted according to the schedule posted on the department's information board). The differentiated assessment is conducted during the final class of the course. A student is eligible for the differentiated assessment if they have attended all classes and have an average grade of at least 3.00 for current academic performance.

Policy on Academic Integrity.

Students are expected to maintain academic integrity, which includes:

- Completing assignments, ongoing assessments, and differentiated assessments independently (for students with special educational needs, this requirement is applied considering their individual needs and capabilities).
- Citing sources when using ideas, developments, statements, or information.
- Complying with copyright and related rights laws.
- Providing accurate information about their own (scientific or creative) work, research methods used, and sources of information.

Unacceptable behaviors in academic activities include:

- Using family or professional connections to obtain a positive or higher grade during any form of assessment or to gain advantages in scientific work.
- Using prohibited supplementary materials or technical devices (crib sheets, notes, earpieces, phones, smartphones, tablets, etc.) during assessments.
- Having another person take an assessment on behalf of the student. Students who violate academic integrity may face the following academic consequences.
- Lowering of the evaluation results for an assessment, exam, or test.
- Retaking an assessment (exam, test, etc.).
- Assignment of additional control measures (additional individual tasks, tests, etc.).
- Retaking the relevant educational component of the program.
- Additional checks of other works authored by the violator.

Policy on Attendance and Tardiness: Health: Students with acute infectious diseases, including respiratory illnesses, are not allowed to attend classes. Tardiness to class is not acceptable. A student who is late to class may still attend, but if the instructor marks "absent" in the journal, the student must make up for the missed class according to general procedures.

Use of Mobile Devices: The use of mobile devices is prohibited. If this rule is violated, the student must leave the class, and the instructor will mark "absent," which the student must make up according to the standard procedure. Mobile devices may be used with the instructor's permission if they are required for the task.

Classroom Behavior: The behavior of both students and instructors in the classroom must be professional and calm, strictly following the rules set out in the Regulations on Academic Integrity and Ethics of Academic Relations at Odessa National Medical University, in accordance with the University's Code of Academic Ethics and Relations, and the Regulations on Preventing and Detecting Academic Plagiarism in the Scientific and Educational Work of Students, Researchers, and Instructors at Odessa National Medical University.