

Odessa National Medical University
Faculty of Medicine
Department of Clinical Chemistry and Laboratory Diagnostics

Syllabus of the course
“MEDICAL CHEMISTRY”

Scope	120 hours /4,0 ECTS
Semester, year of study	1 year of study, 1 semester.
Days, time, place	Place of classes: Odessa, Olgievskaya street, 4a (The main building of ONMedU), department of clinical chemistry and laboratory diagnostics. Days and times of classes: According to the schedule of the educational department
Teachers	<ol style="list-style-type: none">1. Burdina Ianina, Associate Professor2. Sidelnikova Tetiana, Associate Professor3. Shcherbakov Serhii, Associate Professor4. Menchuk Kateryna, Associate Professor5. Shyrykalova Anzhela, Associate Professor6. Mraian Nataliia, assistant7. Gridina Inna, assistant8. Kosinskaya Anna, assistant
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Workplace	Odessa, Olgievskaya street, 4a (The main building of ONMedU), department of clinical chemistry and laboratory diagnostics.
Consultations	According to the schedule placed on the information stand of the department

COMMUNICATION

Communication with students will be carried out. During distance learning communication is carried out through the platform Microsoft Teams, as well as through e-mail correspondence, through messengers Viber, Telegram, WhatsApp.

COURSE ABSTRACT

The Subject of study of the discipline is to equip the medical student with the knowledge necessary to understand the functions of individual body systems, interaction

of an organism with environment, as well as the ability to use a variety of quantitative calculations to analyze certain processes.

Prerequisites and post requisites of the course based on the study of bioorganic chemistry, biophysics, medical biology, integrates with these disciplines; lays the foundations for students to study such medical and biological disciplines as physiology, pathophysiology, biological chemistry, pharmacology as well as some clinical, hygienic disciplines and ecology.

The purpose of the course: Formation of students` knowledge of the main types of chemical equilibrium for the formation of a holistic physico-chemical approach to the study of life processes of the organism, as well as be able to apply chemical methods of quantitative and qualitative analysis, be able to classify the chemical properties and transformation of bioinorganic substances in the process of life of the organism.

Tasks of discipline: creation of a fundamental scientific base of future doctors in their understanding of the general physicochemical laws that underlie the processes of human life.

Expected results:

1. Ability to show knowledge in practical situation;
2. Ability to use knowledge and understanding of the subject area and understanding of the profession;
3. Understanding of self-regulation and leading a healthy lifestyle, the ability to adapt and act in a new situation;
4. Ability to be aware of the choice of communication strategy, ability to work in a team; interpersonal skills;
5. Ability to effectively communicate, formulate and solve problems in the native language both orally and in writing;
6. Ability to use some information and communication technologies ;
7. Understanding of applied techniques and methods of design and research analysis, as well as their limitations in accordance with specialization;
8. Ability to analyze and evaluate chemical processes, select and apply suitable standard analytical, calculation and experimental methods, interpret understanding results;
9. Practical skills for solving complex problems of chemical and biological projects and research in accordance with specialization ;
10. Ability to collect, interpret answers and analyze complexities within a specialization to make judgments, highlight social and ethical problems;
11. Understanding the desire to preserve the environment;
12. Ability to demonstrate the current level of knowledge of relevant issues in medical chemistry in relation to solving medical problems;

13. Ability to demonstrate, understand and evaluate physicochemical (laboratory and instrumental) studies of biological systems of the human body and external environment;
14. Ability to analyze and interpret physicochemical processes that take place in the human body;
15. Ability to compare the fundamental phenomena of chemistry with the principles of medicine and to develop components and processes of clinical research based on these principles.

Course description

Forms and methods of teaching

The course will be presented in the form of lectures (20hours), seminars (20 hours), practical (30hours), organization of independent work of students (50hours).

In accordance with the provisions of the higher school, curricula, the standard of the university for quality management of training, the main form of teaching the discipline are: lectures, practical classes, laboratory work, independent work of students.

When studying the discipline “Medical chemistry” lectures are held with the use of multimedia materials.

Practical classes are held in classrooms and include explanations, conversations, surveys on the topic of the lesson, as well as laboratory work.

Independent work of students consists in processing of a material of lectures, and also in preparation for performance and protection of practical works, preparation for current and final controls, perform training tests, search for information from literature source and the Internet and conduct elements of scientific work.

Scientific work of students is carried out in the work of circles, preparation and speeches at scientific student conferences, writing articles.

Curriculum content

Topic 1. Subject and tasks of medical chemistry. Classification of nutrients.

Topic 2. Typical chemical properties, biological role and application in medicine of biogenic s - elements.

Topic 3. Chemical properties and biological role of biogenic p - elements. Qualitative reactions for determining s and p - elements.

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

Topic 5. Structure and classification of complex compounds. Complexation in biological systems.

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

Topic 7. Elements of quantitative analysis.

Topic 8. Colligative properties of solutions. Osmometry, cryometry, ebulliometry. The role of osmosis in biological fluids.

Topic 9. The method of neutralization. Determination of the concentration and titer of an alkali solution using an acid solution.

Topic 10. Hydrogen index of biological fluids. Determination of K and a weak acid.

Topic 11. Buffer solutions, classification and mechanism of action.

Topic 12. Buffer capacity. The role of buffer systems in maintaining the acid-base balance of the body. Determination of buffer capacity.

Topic 13. Basic concepts of chemical thermodynamics. Theoretical foundations of bioenergy.

Topic 14. The second law of thermodynamics. Thermodynamic potentials.

Topic 15. Physico-chemical bases of kinetics of biochemical reactions. Kinetics of complex reactions. Catalysis. Features of enzymes.

Topic 16. Chemical equilibrium. Equilibrium constant. The product of solubility. Heterogeneous equilibrium with the participation of salts in the general homeostasis of the organism.

Topic 17. The mechanism of electrode potentials and their classification.

Topic 18. Redox potentials. Potentiometry. Determination of pH of biological fluids.

Topic 19. Sorption of biologically active substances. Fundamentals of occupational therapy.

Topic 20. Adsorption of electrolytes. Chromatographic methods of analysis of mixtures of biologically active substances.

Topic 21. Colloidal solutions. Molecular kinetic, optical and electrokinetic properties.

Topic 22. Kinetic and aggregative stability of dispersed systems. Obtaining sols by condensation method.

Topic 23. Properties of solutions of biopolymers. Isoelectric point of protein.

List of recommended reading

Basic:

1. Medical chemistry: a textbook for universities / V.O . Kalibabchuk, I.S . Chekman, V.I. Galynska and others; for ed .. prof .. V.O. Kalibabchuk - 4th ed.- K. VSV "Medicine", 2019 - 336p.

2. Medical chemistry / V.O. Kalibabchuk, L.I. Grishchenko, V.I . Galynska, S.M. Gozhdinsky, T.O . Ovsyanikova, V.A. Samara. - K. "Intermed", 2006, - 460p.

Auxiliary: 1. Medical chemistry: a textbook / V.P. Musichenko, D.D. Lutsevich, L.P. Yavorska; for order. B.S. Zimenkovsky. - 3rd ed., Ed. - K.: BCB «Medicine», 2018. - 496 p.

2. Mironovich LM Medical Chemistry: A Textbook. - Kiev: Caravel, 2008. - 159 p.

3. General chemistry. Biophysical chemistry. Chemistry of nutrients. Textbook for honey. special universities / A. Berland, Y. Ershov, A. Knizhnik. - M.: High school, 2007. - 560 p.

4. Moroz AS Medical Chemistry: Textbook /, D.D. Lutzkevitch, L.P. Yavorska. - Vinnytsia: New book, 2006. - 776 p.

5. Gotsulyak LO, Mardashko O.O., Erigova SG, Kuzmenko G.I., Kuzmina A.V., Zhilinskaya K.I. Bioinorganic, physicochemical and bioorganic chemistry. Teaching manual. Odessa. Odessa State Medical University 1999.-248p.

Evaluation

Assessment of the discipline consists of two components:

- 50% -current performance (arithmetic mean of all student grades);
- 50%-exam mark.

The current educational activity of the student is estimated at a practical and seminar lesson on a 4-point (traditional) scale.

Criteria for assessing students' knowledge for current educational activities:

- "excellent" (5) points are awarded to a student who is fluent in the material of the ticket program, supports the discussion on the issues set out in the ticket, is able to write basic kinetic equations, structure of colloidal particles, thermochemical equations, mechanism of action and pH values for buffer solutions, make complex compounds and give them a name.

- «good» (4) points are awarded to a student who is fluent in the material of the ticket program, is able to write the basic equations, but admits some insignificant errors (inaccuracies) in answering the questions.

- «satisfactory» (3) points are awarded to a student who is proficient in all questions of the ticket program and has mastered the question of the minimum qualification.

- «unsatisfactorily» (2) points is awarded to a student who has significant gaps in knowledge of the program material, makes fundamental mistakes in explaining the laws of metabolism in humans, does not have the necessary practical skills. Grade „unsatisfactorily” is given to students who are not suitable to continue their studies at a medical university and perform their professional duties without additional mastering of the course of medical chemistry.

Thus, the department puts two grades in the statement:

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

2) traditional grade for the exam.

Average score for the discipline (traditional grade) is calculated as the arithmetic mean of current performance and examination mark.

The received estimation for discipline is regarded as percent of mastering of necessary volume of knowledge on the given subject.

Average score for the discipline	The ratio of the student`s average score for the discipline to the maximum possible value of this index	Assessment of the discipline on a 4-point scale (traditional grade)
4,5 – 5,0	90-100%	5
4,0 – 4,45	80-89%	4
3,75 – 3,95	75-79%	4
3,25 – 3,7	65-74%	3
3,0 – 3,2	60-64%	3

Individual calculation of the percentage of mastering the discipline is carried out using the proportion .

The obtained percentage of knowledge acquisition in this discipline allows you to convert to a score on a 100- point scale .

Further calculation are made by the information and computer center of the university .

According to the obtained points on a 100- point scale, students are evaluated on a rating scale ECTS. Students enrolled in one course (one specialty) on the basis of the number of points earned in the discipline are ranked on the ECTS scale as follows:

ECTS assessment	Statistical indicator
«A»	The best 10 % of students
«B»	The next 25 % of students
«C»	The next 30 % of students
«D»	The next 25 % of students
«E»	The last10 % of students

Methods of current control include assessment of current learning activities (current control) - is based on daily control of theoretical knowledge, practical skills in accordance with specific objectives for each topic and control of practical skills - are carried out after each section based on control of theoretical knowledge, practical skills and skills.

Ongoing monitoring is done through oral interviews or interviews or written controls.

The final control (differential test in the discipline "Medical Chemistry") is conducted in the form of an oral examination of 4 questions in the ticket. The student is given up to 30 minutes to prepare for the oral answer.

Additional (bonus) points a student can receive for individual tasks:

- participation and report in the student scientific conference;
- participation in the subject Olympiad in biochemistry report on the student scientific circle;

- preparation of multimedia slides and tests;

- translations of scientific articles from foreign languages;

- abstract work on a particular topic.

The number of points accrued for different types of individual tasks depends on their scope and significance, are determined by the standard and working programs of the discipline and are added to the sum of points earned by students for current academic activities for a particular section. Grades for individual tasks are charged to the student only if they are successfully completed and defended. The grade is added to the current performance.

Independent work of students.

Tasks for independent work are the general obligatory tasks allocated in workbooks which the student should prepare for each employment; keeping notes, filling out a workbook, learning vocabulary, studying subtopics that do not require explanation.

Students' independent work, which is provided by the topic of the lesson along with the classroom work, is assessed during the current control of the topic in the relevant lesson. Assimilation of topics that are submitted only for independent work is checked during the exam.

COURSE POLICY

Deadline and recompilation policy:

It is expected that students will attend all lectures and practical classes. If they missed classes, it is necessary to work it out (according to the schedule posted on the information stand of the department and according to the permission of the dean's office, if necessary).

Reassignment of control of mastering of practical skills is carried out during a semester the discipline under the conditions that the average score for the current educational activity is less than 3.00 (conducted according to the schedule posted on the information stand of the department).

Differential credit is carried out at the last lesson of the discipline. The student is admitted to the differential test provided that he / she attends all classes, receives a positive assessment individually with the decision of time of carrying out working off.

Reassignment of unsatisfactory grades is carried out in the last month of study of from the control of practical skills acquisition and has an average score for current educational activities of at least 3.00.

Academic Integrity Policy:

Observance of academic integrity by students of education provides:

- independent performance of educational tasks, tasks of current control and differential credit (for persons with special educational needs this requirement is applied taking into account their individual needs and opportunities);
- links to sources of information in the case of the use of ideas, developments, statements, information;
- compliance with the legislation on copyright and related rights;
- providing reliable information about the results of their own (scientific, creative) activities, used research methods and sources of information.

Unacceptable in educational activities for participants in the educational process are:

- use of family or business ties to obtain a positive or higher assessment in the implementation of any form of control over learning outcomes or advantages in scientific work;
- use of prohibited auxiliary materials or technical means (cheat sheets, abstracts, headphones, telephones, smartphones, tablets, etc.) during control measures;
- passing the procedures of control of learning outcomes by fictitious persons.

For violation of academic integrity, students may be held subject to the following academic liability:

- reduction of results of assessment of control work, examination, credit, etc .;
- re-passing the assessment (test, exam, test, etc.);
- appointment of additional control measures (additional individual tasks, tests, tests, etc.);
- re-passing the relevant educational component of the educational program;
- conducting additional verification of other works by the infringer.

Attendance and lateness policy:

Attendance at lectures and practical classes is mandatory. If you are more than 15 minutes late, the lesson is considered missed and needs to be practiced.

Mobile devices:

During practical classes, the use of a smartphone, tablet or other device for storing and processing information is allowed only with the permission of the teacher.

The use of mobile devices and their accessories is strictly prohibited during any control.

Audience behavior:

During classes it is allowed: to leave the audience for a short time if necessary and with the permission of the teacher; take photos of presentation slides; take an active part in the class.

During classes it is forbidden: to eat (except for persons whose special medical condition requires another - in this case, medical confirmation is required); smoking, drinking alcohol and even low-alcohol beverages or drugs; to use obscene language or use words that offend the honor and dignity of colleagues and faculty; gaff; to damage the material and technical base of the university (damage inventory, equipment; furniture, walls, floors, litter the premises and territories); shouting, shouting or listening to loud music in classrooms and even in corridors during classes.