

SYLLABUS

INTERNATIONAL EUROPEAN
UNIVERSITY



SCHOOL OF
MEDICINE

MEDICAL CHEMISTRY

2023



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Course Name				
		MEDICAL CHEMISTRY		
Lecturer (s)				
		PhD in Chemistry, Associate Professor Olena Golodayeva		
Lecturer's profile				
		https://medicine.ieu.edu.ua/pro-yemsh/kafedry/kafedra-fundamentalnykh-dystsyplin		
Consultations				
online consulting		Third Tuesday of the month from 15:00 to 16:00		
offline consulting		Second Friday of the month from 15:00 to 16:00		
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Discipline page				
		https://medicine.ieu.edu.ua/pro-yemsh/kafedry/kafedra-fundamentalnykh-dystsyplin		
Form of final control	test	def. test	exam	
	☐	☒	☐	



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1 Brief discipline annotation

"Medical Chemistry" is a comprehensive discipline that examines the basic concepts, concepts and laws of inorganic, analytical, physical and colloidal chemistry and their application in theoretical and practical medicine. The systematic study of the most important theoretical issues of chemistry will allow students to apply them to reveal the essence of physical and chemical processes occurring in a living organism. This will contribute to better mastery of other theoretical and clinical disciplines by students, and to the formation of their scientific thinking.

2 Background for studying discipline

According to the curriculum, the discipline "Medical Chemistry" is studied by 1st year students during 1 semester. The discipline "Medical Chemistry" is based on the previously acquired knowledge of physics, mathematics, chemistry and biology in accordance with the secondary school curriculum. International disciplinary integration: biological and bioinorganic chemistry, medical biochemistry, microbiology, general and molecular pharmacology, toxicology, general hygiene and ecology.

3 Goal and objectives of the discipline

The purpose of teaching the discipline "Medical Chemistry" is to form students' knowledge of the main types of chemical equilibrium to form a holistic approach to the study of life processes.

The main goals of the discipline "Medical Chemistry" are to create a fundamental scientific basis for future doctors in their understanding of the general physical and chemical laws underlying the processes of human life.

4 Learning outcomes

PLR 1

Have a thorough knowledge of the structure of professional activity. Be able to carry out professional activities that require updating and integrating knowledge. To be responsible for professional development, the ability to further professional training with a high level of autonomy.

PLR 2

Understanding and knowledge of basic and clinical biomedical sciences, at a level sufficient to sufficient to solve professional problems in the field of health care.

PLR 21

Search for relevant information in professional literature and databases and other sources, analyze, evaluate and apply this information.

PLR 24

To organize the necessary level of individual safety (own and of the persons under his/her care) in the event of typical dangerous situations in the individual field of activity.

5 ECTS credits

3 ECTS credits / 90 academic hours, of which 16 are lectures, 32 are practical classes, 42 are individual work.



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Course Content

Name of the topic	Type of classes/hour		
	Lectures	Seminars / practical classes	Individual work
1. Structure of atoms, periodic law and periodic table of elements. Chemical bonding. Complex compounds.	2	2	4
2. Biogenic s-, p-, and d-elements: chemical properties, biological role, and application in medicine	2	4	4
3. Basic laws of chemical thermodynamics and their application. Bioenergy.	2	2	4
4. Chemical kinetics as a basis for studying the rate and mechanism of biochemical reactions. Catalysis. Chemical equilibrium.	2	4	4
5. Solutions, their composition and types. The importance of aqueous solutions in biology and medicine	2	2	4
6. Colligative properties of dilute solutions		2	2
7. Equilibria in electrolyte solutions. pH of biological fluids. Buffer systems, their biological role	2	4	4
8. Basics of titrimetric analysis		2	2
9. Electrode processes and their importance for physiology and medicine	2	2	2
10. Physicochemistry of surface phenomena and their practical significance in biology and medicine		2	4
11. Colloidal solutions: preparation, purification and properties. Coagulation of colloidal solutions	2	2	2
12. Properties of biopolymer solutions	2	4	2
Final control of studying the course "Medical chemistry"		2	
Total hours	16	32	42

7 List of obligatory tasks

1. Quantum mechanical model of the atom. Location in the periodic system and structure of bioelement atoms. Chemical bonding: types and experimental characteristics.
2. Bioelements, their classification and content in the body. Micro- and macroelements.
3. Biogenic s- and p-elements: chemical properties, biological role, application in medicine.
4. Biogenic d-elements: chemical properties, biological role. Application of complex compounds of d-elements in medicine.
5. The first and second laws of thermodynamics. Thermal effect of chemical reactions. Directionality of processes in closed systems.
6. Reaction rates, molecularity and order. Dependence of the reaction rate on the concentration of reacting substances, temperature, pressure. Catalysis. Features of enzymatic catalysis.
7. Chemical equilibrium. Equilibrium constants: thermodynamic and concentration.
8. General information about solutions, types, composition. Ways to express the quantitative composition of solutions. Solubility of a substance.
9. Colligative properties of dilute solutions.
10. Solutions of electrolytes. Dissociation of water. Equilibria in electrolyte solutions Theory of acids and bases. Hydrolysis of salts
11. pH of biological fluids. Buffer systems, their biological role
12. Fundamentals of titrimetric analysis
13. The product of solubility. Determination of redox potential

8 List of selective tasks

1. Create multimedia presentations on the topics of practical classes
2. Production of tables
3. Participation in the work of the student scientific club
4. Participation in the student olympiad in the discipline
5. Participation in student scientific and practical conferences
6. Organization and visiting of thematic museums
7. Publication of abstracts of scientific conference reports in co-authorship with a teacher

9 Discipline features

Period of teaching	Semester	International disciplinary integration	Year of study	Courses: general training/ professional training/elective
1 semester	1st semester	available	1	General training

10 Assessment system and requirements. General system of discipline assessment

The current performance of students is assessed on a 4-point scale (2; 3; 4; 5) at each practical, taking into account the approved evaluation criteria for the relevant discipline. The student must receive a grade for each topic for further conversion of grades into points on a multi-point (200-point) scale.

Criteria for assessing current academic performance:



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10 Assessment system and requirements. General system of discipline assessment

Excellent ("5") - the student answered 90-100% of the questions correctly. Solves situational problems of increased complexity, is able to summarize the material.

Good ("4") - the student answered 70-89% of the questions correctly. The student has the necessary practical skills and techniques to perform them to an extent that exceeds the required minimum.

Satisfactory ("3") - the student answered 50-69% of the questions correctly. Has only the required minimum of research methods.

Unsatisfactory ("2") - the student answered 50% of the questions correctly. When answering and demonstrating practical skills, he/she makes significant, gross mistakes.

Evaluation of students' independent work in preparation for classroom practical classes is carried out during the current control of the topic at the relevant classroom.

The semester credit is evaluated on a two-point scale (passed/not passed) and a 200-point scale by determining the arithmetic mean of current grades for each practical lesson on a 4-point scale and its subsequent conversion to 200-point scale. The minimum number of points that a student must score is 120.

The final control of knowledge in the discipline "Medical Chemistry" is carried out in the form of a differentiated test. The differentiated test in the discipline is conducted in the form of an oral survey according to the questions compiled in accordance with the material covered.

<https://ieu.edu.ua/docs/rate-of-study.pdf>

11 Assessment system and requirements. General system of discipline assessment

Students who have completed all types of work, tasks provided for in the curriculum for the semester in accordance with the discipline, attended all classes provided for in the curriculum, written and submitted a medical history and have an average score for current academic activities of at least "3" (72 points on a 120-point scale) are allowed to take part in the semester final control

<https://ieu.edu.ua/docs/rate-of-study.pdf>

12 Admission to final control

In order to achieve the learning objectives and successfully complete the course, you must actively engage in the work from the first day, attend lectures regularly, prepare for practical classes in advance, not be late or miss classes, come to class dressed in a medical gown, perform all necessary tasks and work on self-improvement every day, be able to work with a partner or as part of a group, ask for help and receive it when you need it.

In the classroom, students must exclude the possibility of using a mobile phone, tablet or other mobile devices, not resort to cheating and plagiarism, adhere to the cooperation and solidarity of the teacher and students, contact the teacher to help organize and consult on scientific, search and research work, participate in scientific circles; The teacher, in turn, must ensure the full implementation of the curriculum is mandatory, not to be late for lectures, practical (seminar) classes, objective. It is important to prevent any manifestations of corruption. First of all, the teacher should monitor the chemical classrooms, pay special attention to students in practical classes when working with chemical equipment and reagents. And it is important to avoid prejudice and discrimination regardless of race, ethnicity, or religious beliefs.



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13 Discipline policy

A student who, for valid reasons, confirmed by documentary evidence, was not subject to current control has the right to undergo current control within two weeks after returning to study.

A student who was absent from classes without valid reasons, did not participate in current control activities, did not eliminate academic debt, is not allowed to take the final semester control of knowledge in this discipline, and on the day of the exam, the academic staff member gives a grade of "not admitted" in the examination record.

Retaking the differentiated test in the discipline is assigned subject to the completion of all types of educational, independent (individual) work provided for by the working curriculum of the discipline and is carried out in accordance with the schedule of liquidation of academic debt approved by the directorate.
<https://ieu.edu.ua/docs/050.pdf>

14 Policy of absence and late task performance

Participants in the educational process are guided by the principles of academic integrity
<https://ieu.edu.ua/docs/011.pdf>

15 Recommended sources of information

Primary literature:

1. Medical chemistry: textbook / V.O. Kalibabchuk, I.S. Chekman, V.I. Galynska and others; edited by V.O. Kalibabchuk - 4th ed.
2. Medical chemistry: textbook / V.P. Muzychenko, D.D. Lutsevych, L.P. Yavorska; edited by B.S. Zimenkovsky - 3rd ed.
3. Medical chemistry: textbook / Moroz A.S., Lutsevych D.D., Yavorska L.P.. - Vinnytsia: New book, 2008. -776 c.
4. Medical chemistry: textbook / Homonai V.I., S. Milovich, - Vinnytsia: New book, 2016. - 672 p.
5. Galynska et al. eds. 4th ed. - K.: VSV "Medicine", 2019. - 336 p. Medical chemistry: textbook / V.P. Muzychenko, D.D. Lutsevych, L.P. Yavorska; edited by B.S. Zimenkovsky - 3rd ed.
6. Medical chemistry: a textbook / Moroz AS, Lutsevych D, Yavorska LP. - Vinnytsia: New book, 2008. -776 c

Supporting literature:

1. Myronovych L.M. Medical chemistry: Study guide. - Kyiv: Caravel, 2008. - 159 p.
2. Poretsky AV, Bannikova-Bezrodna OV, Filippova LV Medical chemistry: Textbook. - K.: VSV "Medicine", 2012. - 384 p.
3. Medical Chemistry: Textbook / Homonai V.I., S. Milovich, - Vinnytsia: New Book, 2016. - 672 p.
4. Poretskyi AV, Bannikova-Bezrodna OV, Medicinal chemistry: Under. - K.: VSV "Medicine", 2012. - 384 p.

Additional information sources:

1. State Formulary of Medicinal Products. Issue 1- 11 / Edited by V.T. Chumak, V.I. Maltsev, A.M. Morozov, V.D. Paria, A.V. Stepanenko - K.: Morion.
2. International Statistical Classification of Diseases and Related Health Problems, 10th Revision, Version for 2007 [Electronic resource]: <http://apps.who.int/classifications/apps/icd/icd10online/>.
3. Rational use of medicines: progress in implementing the WHO medicines strategy Report by the Secretariat, EB118/6, May 11, 2006, [Electronic resource]. - Accessed at: www.who.int/gb/ebwha/pdf_files/EB118/B118_6-en.pdf/



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15 Recommended sources of information

4. www.ncbi.nlm.nih.gov/PubMed - free access to the scientific database
5. <https://pubchem.ncbi.nlm.nih.gov/> - free access to the scientific database
6. www.pereplet.ru/cgi/soros/readdb.cgi - Soros Educational Journal - free access to popular science articles on chemistry and biochemistry.
7. <https://pubs.acs.org/journal/jmcmar> - Journal of Medicinal Chemistry

16 Tips on successful study during the course

If you want to be successful in this discipline, you need to:

1. Be active, persistent, inquisitive, consistent
2. Be neat and polite
2. Systematically prepare for practical classes
3. Attend lectures and take notes
4. Perform tasks for independent work and defend them in class.
5. Handle the equipment of the department, including microscopes, with care.
6. To be present in the classroom in a medical coat.
7. To solve tests and tasks independently, to work actively in class.
8. Keep a sketchbook and sketch macro and micro preparations.
9. Visit the Krok Center website and focus on medical biology questions.
10. Prepare presentations and crossword puzzles in the discipline. Participate in student scientific conferences and engage in research work in the department's scientific circles.

I wish you perseverance, dedication and motivation to learn. And then success will come to you! See you in class! Don't forget your medical gowns!