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INTERNATIONAL EUROPEAN UNIVERSITY

# SYLLABUS

## INTERNATIONAL EUROPEAN UNIVERSITY


## SCHOOL OF MEDICINE

**Medical chemistry**

**2021**

# SYLLABUS

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|---|---|
| **Subject matter** | Medical chemistry |
| **Lecturer(s)** | Kostenko Liudmyla Stepanivna |
| **Lecturer's profile** | https://medicine.ieu.edu.ua/pro-yemsh/kafedry/kafedra-fundamentalnykh-dystsyplin |
| **Consultations** | |
| On-campus consultations | The second Tuesday of the month from 15:00 to 16:00 |
| Online consultations | The third Wednesday of the month from 15:00 to 16:00 |
| **Contact phone number** | +38 0973508481 |
| **E-mail** | kostenkoliudmyla@ieu.edu.ua |
| **Discipline page** | https://medicine.ieu.edu.ua/pro-yemsh/kafedry/kafedra-fundamentalnykh-dystsyplin/mater-ali-dlya-student-v-fundament/medychna-biolohiia |

| Form of final control | Final test | grading test | exam |
|---|---|---|---|
| | ☐ | ☒ | ☐ |

# SYLLABUS

## 1 Subject matter summary

"Medical chemistry" is complex science that considers the basic concepts and laws of inorganic, analytical, physical and colloidal chemistry, and their application in theoretical and practical medicine. Systematic study of the most important theoretical issues of chemistry will allow to use to reveal the essence of physicochemical processes occurring in a living organism.

## 2 Background of studying the subject matter

According to the curriculum, the study of the discipline "Medical Chemistry" is carried out by 1st-year students during the 1st semester. The discipline "Medical Chemistry" is based on previously acquired knowledge of physics, mathematics, chemistry and biology in accordance with the program of secondary school.

## 3 Aim and objectives of the discipline

The purpose of teaching the discipline "Medical Chemistry" is to form students' knowledge of the basic types of chemical equilibrium for the formation of a holistic approach to the study of life processes.
The main task in the study of the discipline "Medical Chemistry" is to create a fundamental scientific base for future doctors in their understanding of the general physicochemical laws that underlie the processes of human life.

## 4 Study results

- the formation of a holistic system of physical and chemical knowledge among students, which will allow them to understand the phenomena/patterns of vital activity of objects of living nature and the human body at all levels of their organization;
- the ability to solve typical and specialized complex tasks of physicochemical and biochemical direction;
- knowledge of the factors and mechanisms of the influence of chemical factors on the human body;
Including: knowledge of the basic and physical and chemical laws underlying the processes of human life; the ability to apply the acquired chemical and physical-chemical knowledge in practice;

## 5 ECTS credits

3 ECTS credits =90 hours over 1 semesters
16 hours of lectures, 32 hours of practical classes
42 hours of independent work

## 6 Subject matter structure

| Topics | Type of classes / hours | | |
|---|---|---|---|
| | Lectures | Seminars / Practical | Individual work |
| 1. Structure of atoms, periodic law and periodic system of elements. Chemical bond. Coordination compounds. | 2 | 2 | 4 |

## 6 Subject matter structure

| Topics | Type of classes / hours | | |
|---|---|---|---|
| | Lectures | Seminars / Practical | Individual work |
| 2. Biogenic s-, p- and d- elements: chemical properties, biological role, 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 value 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. Fundamentals of titrimetric analysis. | | 2 | 2 |
| 9. Electrode processes and their significance for physiology and medicine. | 2 | 2 | 2 |
| 10. Physico-chemistry 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 mastering the course "Medical Chemistry"*** | | 2 | |

## 7 List of obligatory tasks

1. Quantum-mechanical model of the atom. The periodic table and the structure of atoms of bioelements. Chemical bond: types and experimental characteristics.
2. Bioelements, their classification and content in the body. Micro- and macroelements. Biogenic s- and p-elements: chemical properties, biological role, application in medicine.
3. Biogenic d-elements: chemical properties, biological role. The use of complex compounds of d-elements in medicine.
4. The first and second laws of thermodynamics. Thermal effect of chemical reactions.
5. Reaction rate, molecularity and order. Dependence of reaction rate on the concentration of reactants, temperature, pressure. Catalysis. Features of enzymatic catalysis.

## 7 List of obligatory tasks

6. Chemical equilibrium. Equilibrium constants: thermodynamic and concentration.
7. General information about solutions, types, composition. Methods of expressing the quantitative composition of solutions. Solubility of the substance.
8. Colligative properties of dilute solutions.
9. Solutions of electrolytes. Water dissociation. Equilibria in electrolyte solutions Theory of acids and bases. Hydrolysis of salts.
10. pH of biological fluids. Buffer systems, their biological role.
11. Basics of titrimetric analysis.
12. The product of solubility. Determination of redox potential.
13. Sorption of biologically active substances. Ion exchange. Chromatography.
14. Preparation, purification and properties of colloidal solutions. Coagulation of colloidal solutions.
15. Macromolecular compounds - the basis of living organisms.

## 8 List of selective tasks

1. Create multimedia presentations with practical exercises
2. Making tables
3. Participation in the work of the student scientific circle
4. Participation in student discipline Olympiad
5. Participation in student scientific and practical conferences
6. Organization and visits to thematic museums
7. Publication of abstracts of scientific conferences in collaboration with the teacher

## 9 Subject matter features

| Period of training | Semester | International disciplinary integration | Course (year of study) | Cycles of: general training /vocational training /free choice |
|---|---|---|---|---|
| One semester, 16 weeks | 1 | Yes | 1 course | General preparation |

## 10 Assessment system and requirements

Discipline is evaluated in accordance with the European credit transfer system which is designed for a single pan – European approach to assessing and comparing student achievement, which study in various institutions of higher education.
All lectures and practical classes must be recorded in the synopsis that the teacher certifies at each lesson. The conditions of admission to the final control are working out all classes with a grade not less than 3 points on a 4-point system.
**https://ieu.edu.ua/docs/rate-of-study.pdf**

## 11 Subject matter policy

To achieve the goals of training and successfully complete the course, it is necessary from the first day to be actively involved in work, regularly attend lectures, prepare for practical classes, do not be late and do not miss classes, come to class dressed in a medical gown, perform all necessary tasks and work daily over self-improvement, be able to work with a partner or in a group, seek help and receive it when you need it.

## 11 Subject matter policy

**For students:**
- exclude the possibility of using a mobile phone, tablet or other mobile devices during classes, copying and plagiarism;
- not to miss practical classes without a good reason;
- when studying the discipline to adhere to the cooperation and solidarity of teachers and students;
- apply to the teacher for help in organizing and consulting on scientific, exploratory and research work;
- take part in scientific circles;
- topics of the discipline are considered in terms of their practical application and bioethical capacity;
- to be in medical gowns during classes.

**For teachers:**
- implementation of the curriculum is mandatory;
- delays in lectures, practical (seminar) classes are not allowed;
- discipline policy provides for an objective assessment of knowledge and skills;
- any manifestations of corruption are prohibited;
- the teacher must follow the chemical classrooms;
- pay special attention to students in practical classes when working with chemical equipment and reagents;
- prejudice and discrimination regardless of race, ethnicity and religion are not allowed.

## 12 Policy of absence and late task performance

Students who miss current control for valid reasons confirmed by documents have the right to take current control within two weeks after returning to studying.
Students who have missed classes without valid reasons, have not participated in current control activities, have not liquidated academic failure are not admitted to final semester control of this discipline. In this case, an academic staff member puts a mark 'non-admission' in the exam record.
Repeated taking of the grading exam of the discipline is appointed in case of accomplishing all types of educational, individual work stipulated by the working program of the academic discipline and is carried out according to the approved schedule of academic failure liquidation.
**https://ieu.edu.ua/docs/050.pdf**

## 13 Academic honesty policy

Code of academic integrity of scientific and pedagogical, scientific, pedagogical workers and applicants for higher education International European University
**https://ieu.edu.ua/docs/011.pdf**

## 15 Recommended information sources

Medical chemistry: textbook / V.O. Kalibabchuk, V.I. Halynska, L.I. Hryshchenko et al.; edited by V.O. Kalibabchuk. 7th edition. Kyiv: AUS Medicine Publishing, 2020. 224 p.

## 16 Tips for successful learning of the course

Be active, persistent, inquisitive, and consistent;
Prepare yourself at home for practical classes and on the topic of independent work;
Independently solve tests and tasks, actively work in class