MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY
Department of Pharmaceutical Chemistry and Drug Technology

Syllabus of the educational discipline
"Organic chemistry"

Scope of the educational discipline	Total hours per discipline: 240 hours, 8 credits. Semesters: III-IV. 2nd year.
Days, time, place of the academic discipline	According to the schedule of classes. Department of Pharmaceutical Chemistry. Odesa, st. Marshal Malinovskyi, 37.
Teacher (-s)	Gelmboldt Volodymyr. doctor of chemical science, professor, head of the department. Docent, PhD. Lozhichevska Tatyana. Assistants: Shyshkin Ivan, Ulizko Igor.
Contact Information	Help by phones: Nikitin Oleksii, head teacher of the department 067-485-11-06 Klyvniak Iryna, senior laboratory assistant 0487779828 E-mail: pharmchemistry@onmedu.edu.ua Face-to-face 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 given to each group during the classes separately.

COMMUNICATION

Communication with applicants will be conducted in the classroom (face-to-face).

During distance learning, communication is carried out through the Microsoft Teams platform, as well as through e-mail correspondence, Viber messengers (through groups created in Viber for each group, separately through the head of the group), Telegram.

ABSTRACT OF THE EDUCATIONAL DISCIPLINE

Subject of discipline study – general theoretical provisions of organic chemistry followed by a description of the reactivity of the most important classes of organic substances.

Prerequisites: is based on students' study of inorganic chemistry, biophysics,

medical biology and integrates with these disciplines.

Postrequisites: lays the foundations for students to study pharmaceutical chemistry, biological chemistry, general and molecular pharmacology and toxicology.

Goal - are in-depth assimilation of fundamental knowledge in the field of chemistry, which is the basis of studying a cycle of chemical disciplines that will be widely used in practical work. The organic chemistry course is also an introduction to some aspects of the physical and colloid chemistry, chemical technology, and biochemistry courses and includes a description of classes of organic compounds, including polymers and biologically active organic compounds.

Tasks of the discipline: acquiring skills in using chemical and reference literature, working with tabular and graphic material, studying the theoretical foundations of organic chemistry, studying classical methods of synthesis and properties of various organic compounds, establishing the relationship between the structure, reactivity and properties of organic compounds in that volume, which is necessary for further study and understanding of the main chemical and biological processes that occur at the molecular level, to know the qualitative reactions to the multiple bond and the main functional groups (halogen, amino group, alcohol and phenolic hydroxyls, aldehyde, ketone and carboxyl groups), mastering separate physico-chemical methods of identification of organic compounds.

Expected results:

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

- *Know:* to know the basic principles of classification, nomenclature and structural isomerism of organic compounds; to know the qualitative reactions to the multiple bond and the main functional groups (halogen, amino group, alcohol and phenolic hydroxyls, aldehyde, ketone and carboxyl groups); to know the types of chemical bonds, conjugated systems, electronic effects, acidity and basicity of organic compounds as the basic basis of their reactivity; to know the principles of classification of organic reactions according to the direction, the method of breaking the bond and the mechanism of their course; to know the structure, nomenclature, isomerism, extraction methods and chemical properties of hydrocarbons, halogen-, oxygen-, sulfur- and nitrogen-containing derivatives of hydrocarbons, heterofunctional compounds, heterocyclic compounds, biopolymers and bioregulators.
- *Be able:* be able to use chemical and reference literature, work with tabular and graphic material; to be able to independently carry out an elemental analysis of organic compounds (discovery of carbon, hydrogen, sulfur, nitrogen, halogens); to be able to assemble separate laboratory installations; be able to determine the physical constants of organic compounds (melting point, boiling point, specific rotation).
- *to master skills:* the ability to abstract thinking, analysis and synthesis, the ability to learn and be modernly educated; knowledge and understanding of the subject area and understanding of professional activity; ability to apply knowledge in practical situations; the ability to communicate in the state language; ability to

adapt and act in a new situation; with determination and persistence in relation to assigned tasks and assumed responsibilities.

DESCRIPTION OF THE EDUCATIONAL DISCIPLINE

Forms and methods of education. The course will be taught in the form of lectures (30 hours) and practical classes (120 hours), organization of students' independent work (90 hours).

Teaching methods are used during practical classes: multimedia presentation is used in lectures; in practical classes - educational methodical materials, situational tasks, individual tasks, laboratory equipment, to test acquired knowledge and skills - test and calculation tasks, for independent work a list of necessary literary sources is provided.

Content of the education discipline

Topic 1. Subject of organic chemistry. Classification and nomenclature of organic compounds.
Topic 2. Types of chemical bonds.
Topic 3. Mutual influence of atoms in organic molecules.
Topic 4. Isomerism of organic compounds. Acidic and basic properties of organic compounds.
Topic 5. Classification of organic reactions and reagents. Methods of determining the structure of organic compounds.
Topic 6. Alkanes.
Topic 7. Cycloalkanes.
Topic 8. Alkenes. Alkadienes.
Topic 9. Alkynes.
Topic 10. Mononuclear arenas.
Topic 11. Polynuclear arenas. Non-benzoic aromatic compounds.
Topic 12. Halogen derivatives of hydrocarbons. Haloalkanes. Haloalkenes.
Topic 13. Haloarenes and arylalkyl halides.
Topic 14. Nitro compounds.
Topic 15. Aliphatic amines.
Topic 16. Aromatic amines. Diamines. Identification of amines.
Topic 17. Diazo- and azo compounds.
Topic 18. Alcohols. Phenols.
Topic 19. Ethers. Thioalcohols and thioethers.
Topic 20. Halogen- and nitrogen-containing hydrocarbon derivatives. Hydroxy derivatives of hydrocarbons.
Topic 21. Aldehydes and ketones.
Topic 22. Monocarboxylic acids.
Topic 23. Dicarboxylic acids.
Topic 24. Functional derivatives of carboxylic acids.
Topic 25. Halocarboxylic, hydroxy- and phenolic acids.

Topic 26. Oxo- and amino acids.
Topic 27. Sulfonic acids. Carbonic acid and its functional derivatives.
Topic 28. Oxo compounds. Carboxylic acids and their functional and heterofunctional derivatives. Sulfuric acids. Carbonic acid and its functional derivatives.
Topic 29. General characteristics of heterocyclic compounds. Three- and four-membered heterocycles with one heteroatom.
Topic 30. Five-membered heterocyclic compounds with one heteroatom. Five-membered heterocycles with two heteroatoms.
Topic 31. Six-membered heterocycles with one heteroatom.
Topic 32. Azines with condensed rings: quinoline, isoquinoline, acridine. Heterocycles of the pyran group.
Topic 33. Six-membered heterocycles with two heteroatoms.
Topic 34. Seven-membered heterocycles. Condensed systems of heterocycles.
Topic 35. Heterocyclic compounds.
Topic 36. General characteristics of carbohydrates. Monosaccharides.
Topic 37. Di- and polysaccharides.
Topic 38. Proteins.
Topic 39. Lipids. Fats.
Topic 40. Carbohydrates. Proteins Lipids. Fats.

Recommended literature list:

Basic:

1. Chernykh V.P., Shemchuk L.A. Organic Chemistry. – Kharkiv: Original, 2011. – 440 p.
2. Jie Jack Li, Chris Limberakis, Derek A. Pflum Modern Organic Sinthesis. – Oxford.: University Press, 2007.
3. Organic Chemistry I by Xin Liu is licensed under a Creative Commons Attribution-NonCommercial-ShareAlike 4.0 International License, except where otherwise noted. 2021. – 379p.
4. Introduction to Chemistry. General, Organic, and Biological v. 1.0. 2011. – 1236 p.
5. ORGANIC CHEMISTRY LABORATORY TECHNIQUES. Lisa Nichols, 2nd Edition. 2016. – 389 p.

Additional:

1. Загальний практикум з органічної хімії / В.П. Черних, І.С. Гриценко, М.О. Лозинський, З.І. Коваленко; За ред. В.П. Черних. – Х.: Вид-во НфаУ; Золоті сторінки, 2003. – 592 с.
2. Державна Фармакопея України : в 3 т. / ДП «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Х. : Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
3. Державна Фармакопея України : в 3 т. / ДП «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Х. : Державне

підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
4. Державна Фармакопея України : в 3 т. / ДП «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Х. : Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 3. – 732 с.

EVALUATING

Forms and methods of current control: oral survey, testing, evaluation of practical skills, problem solving.

Current evaluation criteria in practical training

Evaluation	Evaluation criteria
"5"	The applicant takes an active part in the discussion of the most difficult questions on the topic of the lesson, gives at least 90% correct answers to standardized test tasks, answers written tasks without errors, performs practical work and issued a protocol.
"4"	The applicant participates in the discussion of the most difficult questions on the topic, gives at least 75% correct answers to standardized test tasks, makes some minor mistakes in the answers to written tasks, performs practical work and draws up a protocol.
"3"	The applicant participates in the discussion of the most difficult questions on the topic, gives at least 60% correct answers to standardized test tasks, makes significant mistakes in answers to written tasks, performs practical work and draws up a protocol.
"2"	The applicant does not participate in the discussion of complex questions on the topic, gives less than 60% correct answers to standardized test tasks, makes gross mistakes in answers to written tasks or does not give answers to them at all, does not perform practical work and does not draw up a protocol.

Forms and methods of final control: the applicant is admitted to the exam on the condition that the requirements of the educational program are met and if he received at least 3.00 points for the current educational activity and passed the test control of the "STEP-1" tests with at least 90% (50 tasks).

The test control is held in the Educational and Production Complex of Innovative

Technologies of Learning, Informatization and Continuous Education of ONMedU in the last session on the eve of the exam.

Possibility and conditions of obtaining additional (bonus) points: not provided.

INDEPENDENT WORK OF HIGHER EDUCATION ACQUIRES

Independent work involves preparation for each practical session.

EDUCATIONAL DISCIPLINE POLICY

The policy on deadlines and rescheduling corresponds to the general rules at ONMedU. Absences of classes for non-respectable reasons will be worked out according to the schedule of the teacher on duty. Absences for valid reasons are worked out according to an individual schedule with the permission of the dean's office.

*Observance of academic integrity by applicants is mandatory, namely: I*ndependent performance of all types of work, tasks, forms of control provided for by the work program of this educational discipline; references to sources of information in the case of using ideas, developments, statements, information; compliance with the legislation on copyright and related rights; provision of reliable information about the results of one's own educational (scientific) activity, used research methods and sources of information.

Attendance and Tardiness Policy:

Uniform: a medical gown that completely covers the outer clothing.

Equipment: notebook, pen.

State of health: applicants suffering from acute infectious diseases, including respiratory diseases, are not allowed to attend classes.

A student who is late for a class can attend it, but if the teacher has put "nb" (absent) in the journal, he must complete it in the general order.

Use of mobile devices:

Mobile devices may be used by students with the permission of the instructor if they are needed for the assignment.

Behavior in the audience:

The behavior of applicants and teachers in the classrooms must be working and calm, strictly comply with the rules established by the Regulations on academic integrity and ethics of academic relations at Odessa National Medical University, in accordance with the Code of Academic Ethics and University Community Relations of Odessa National Medical University, Regulations on Prevention and detection of academic plagiarism in research and educational work of students of higher education,

scientists and teachers of Odessa National Medical University.