

National Pirogov Memorial Medical University, Vinnytsya

"APPROVE"

Vice -Rector of higher education institution
for Research, Education and Academic Affairs

 professor of HEI

Oksana SEREBRENNIKOVA

«02» September 2022 year

“ AGREED ”

Head of the Department
of Pharmaceutical Chemistry

 Assoc. prof. of HEI

Tetyana YUSHCHENKO

«02» September 2022 year

SYLLABUS
of academic discipline
Organic chemistry

Specialty	226 Pharmacy, Industrial Pharmacy
Educational level	the second (master`s) level
Educational programme	EPP Pharmacy, Industrial Pharmacy, 2022
Academic year	2022-2023
Department	Pharmaceutical Chemistry
Lecturer	Assistant Olga Mazur
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Syllabus compiler	PhD, Associate Professor of HEI Natalia Didenko, Assistant Olga Mazur

1. Status and Structure of the Discipline

Discipline status	Obligatory
Discipline OPIII code	OK 17/ discipline of general training
Year/Semester	2 year/III, IV semesters
Scope of the discipline (total number of hours / number of credits ECTS)	225 hours /7,5 credits ECTS
Number of content modules	6 modules
The structure of the discipline	Full-time study: Lectures – 28 hours Practical classes – 114 hoursSelf study - 83 hours
Language of study	English
Form of study	Full-time (or remote by order)

1. Description of the Discipline

Short annotation of the course, relevance. Organic chemistry in higher pharmaceutical education is a general theoretical basic discipline in the system of pharmacist training. Systematic study of the laws of chemical behavior of organic compounds in relation to their structure and the formation on this basis of creative chemical thinking is necessary for the successful mastering of specialized disciplines in senior courses, as well as for practical activities. Without knowledge of modern organic chemistry it is impossible to deeply understand and qualitatively master the knowledge and skills in drug pharmacokinetics (metabolism, absorption, distribution, excretion), biopharmacy, toxicology and toxicokinetics of drugs, biochemistry and medical chemistry, including target-oriented drug search, ligand-prescription ligand . At the present stage, without theoretical knowledge and practical skills in organic chemistry, it is impossible to select and search for new drugs, understanding aspects of their molecular pharmacology.

The main objectives of the discipline "Organic Chemistry" are to teach students to use the basic concepts of organic chemistry: the nature of chemical bonds, the interaction of atoms in organic molecules, isomerism, acid-base properties of organic compounds, understand the reactivity of important classes of organic matter, energy, mechanisms reactions, the importance of organic in the field of pharmacy.

According to the curriculum, "Organic Chemistry" is studied in the second year of study, and includes the following types of classes: lectures, practical classes, laboratory work and independent work of students.

Lectures on "Organic Chemistry" highlight the basic theoretical principles of organic chemistry, physical and chemical properties of organic compounds, reaction mechanisms, special attention is paid to heterocyclic compounds, which are widely used in pharmacy and medicine.

The organization of the educational process is carried out according to the European accumulative credit-transfer system of the organization of the educational process.

The program of the discipline is structured in two modules, the first module (studied in the third semester) includes 3 semantic modules, the second module (studied in the fourth semester) includes 3 semantic modules.

Assimilation of the topic is controlled in practical classes in accordance with specific objectives, assimilation of content modules - in practical final classes. The following means of diagnosing the level of preparation of students are used: tests, solving situational problems, implementation of chemical transformation chains, filling in workbooks, design of experimental laboratory tests and interpretation and evaluation of their results; control of practical skills in performing chemical experiments.

The final control of mastering the first module is carried out after its completion at the end of the third semester of study in the form of a test. The final control of mastering the discipline is the exam

that students take after completing the second module at the end of the fourth semester. Assessment of student achievement in the discipline is set on a multi-point scale and is determined by the ECTS system and scale.

Prerequisite

The practical skills acquired by higher education students while studying the course of organic chemistry are an important prerequisite for mastering other practical aspects of applied pharmaceutical disciplines, including pharmaceutical, phytochemical and chemical-toxicological analysis.

The purpose of the course: acquisition of theoretical knowledge and practical skills on the general principles of evaluation of chemical properties of organic compounds, which are the basis for the synthesis and analysis of organic substances; disclosure of practical aspects of organic chemistry, ways and methods of using its achievements in pharmaceutical practice; systematic study of the laws of chemical behavior of organic compounds in relation to their structure in the study of the discipline "Organic Chemistry".

Mastering the discipline will allow students to acquire, in addition to integral, the following competencies: General (GC): GC 2, GC 3, GC 4, GC 6, GC 9, GC 10, GC 11, GC 12.

Special (professional, subject): SC 19, SC 20.

Postrequisites

Knowledge of the patterns of reactions of organic compounds and their reactivity, skills and practical skills acquired by higher education students while studying the discipline "Organic Chemistry" is an important prerequisite for mastering knowledge and other practical aspects of specialized disciplines studied in senior courses, and namely: biological chemistry, pharmaceutical chemistry, toxicological and forensic chemistry, pharmacology, pharmacognosy, pharmaceutical and industrial technologies of drugs, as well as elective disciplines: identification of organic compounds, theoretical foundations of synthesis.

2. Learning Outcomes

to know:

- methods of image of organic molecules, structure of organic compounds, classification by structure of carbon chain and by nature of functional group, nomenclature: international (IUPAC), trivial, rational;
- The main types of chemical bonds in organic molecules: covalent, ionic, semipolar, coordination, hydrogen; quantum-mechanical bases of the theory of chemical bonding: atomic orbitals, hybridization of atomic orbitals; electronic structure of covalent σ - and π -bonds, main characteristics of covalent bond;
- mutual influence of atoms in molecules of organic compounds: inductive and mesomeric effects, conjugation and spatial obstacles, hyperconjugation; methods of depicting the distribution of electron density in molecules; the concept of resonance;
- types of isomerism of organic compounds: structural isomerism, spatial structure of molecules, optical, geometric and conformational isomerism;
- classification of organic reactions and reagents: energy conditions of reactions, types of organic reactions, types of reaction mechanisms, intermediate active particles (carbocations, carbanions, free radicals);
- acidity and basicity of organic compounds; Brønsted-Lowry theory, Lewis theory; types of organic acids and bases;
- methods of establishing the structure of organic compounds: chemical, instrumental (IR spectroscopy, UV spectroscopy, nuclear magnetic resonance spectroscopy, mass spectrometry);
- methods of extraction, features of reactivity of hydrocarbons depending on hybridization of Carbon atom (alkanes, cycloalkanes, alkenes, alkadienes, alkynes, aromatic hydrocarbons), reaction mechanisms S_R , A_E , S_E , A_N ;
- halogenated derivatives (haloalkanes, dihaloalkanes, haloalkenes, arylhalides): extraction methods, reactivity features, S_N , E reaction mechanisms;

- nitro compounds: the structure of the nitro group, extraction methods, chemical properties, aci-nitrotautomerism;
- amines: basicity and nucleophilicity, excellent reactions;
- diazo and azo compounds, extraction methods, features of the reactivity of diazonium salts:
 - reactions with and without nitrogen;
- hydroxy derivatives of hydrocarbons: acid-base properties, monohydric, polyhydric alcohols, production methods, features of reactivity; mechanisms of S_N reactions (intermolecular dehydration, OH group substitution with halogen, intramolecular dehydration, specific reactions); monoatomic, polyhydric phenols (acidic properties, S_E reactions, specific reactions);
- oxo derivatives of hydrocarbons: aldehydes and ketones of aliphatic (saturated and unsaturated) and aromatic series, features of reactivity (A_N reaction mechanisms, addition - cleavage, condensation, polymerization, redox reactions, reactions involving α -carbon atom, qualitative determination;
- carboxylic acids: mono- and dicarboxylic acids, saturated, unsaturated, aromatic, features of reactivity (acidic properties, reactions involving a functional group, reactions involving the α -carbon atom, qualitative determination of the carboxyl group); features of reactivity of functional derivatives of carboxylic acids (esters, halides, anhydrides, amides, hydrazides, nitriles); mechanism of esterification reaction, hydrolysis of esters;
- heterofunctional carboxylic acids: halocarboxylic acids, alcohol acids, phenolic acids, oxoacids, amino acids; extraction methods; specific reactions of heterofunctional carboxylic acids;
- carboxylic acid derivatives: acid chlorides, amides, urea, ureides, urethanes, qualitative reaction to urea (biuret reaction);
- organosulfuro compounds: thiols, sulfides, sulfonic acids, extraction methods, chemical properties;
- heterocyclic compounds: structure, methods of extraction, features of reactivity of three-, four- and five- membered heterocycles with one heteroatom (aziridine, oxirane, azetidine, oxetane, furan, pyrrole, thiophene), aromaticity, acidophobicity; indole; the concept of pyrrole and pyridine atoms of nitrogen. Five-membered heterocycles with two heteroatoms (pyrazole, imidazole, thiazole, oxazole, isoxazole), azole tautomerism, acid- base properties, electrophilic substitution reactions, reduction and oxidation, specific reactions; six-membered heterocyclic compounds with one and two heteroatoms (pyran, pyridine, quinoline, isoquinoline, acridine, pyrimidine, pyrazine, pyridazine, purine); reactions involving a heteroatom, basic properties, electrophilic and nucleophilic substitution, reduction and oxidation, barbituric acid, uric acid, lactam-lactim tautomerism;
- carbohydrates: structure, classification and nomenclature, isomerism of monosaccharides, cyclo-oxo- and carbonyl-endiol tautomerism, features of reactivity of open and cyclic forms, glycosidic bond, qualitative reactions of carbohydrates; disaccharides (reducing, non-reducing), extraction, chemical properties, identification; polysaccharides (homopolysaccharides, heteropolysaccharides), π -, σ -glycosidic bonds, hydrolysis, application;
- the concept of lipids, classification (saponified and unsaponified lipids); terpenes: classification, extraction, features and chemical properties of monocyclic (terpenes, menthol) and bicyclic (camphor) terpenes, meaning and application in pharmacy.

be able to:

- use basic laboratory chemical utensils and auxiliary devices;
- to apply separate elements of equipment of laboratory works, assembly of separate installations, heating of substances in a test tube, weighing, measurement of liquids;
- perform practical experiments with an understanding of the processes that take place, explain the essence of specific reactions;

- to conduct experiments on the identification of organic compounds, qualitative determination of functional groups and individual representatives of classes of organic compounds;
- apply methods of separation and purification of substances (filtration, recrystallization, distillation, sublimation, extraction, chromatography);
- determine the most important physical constants (melting point, boiling point, specific rotation, density);
- analyze unknown organic matter;
- use methods to establish the structure of organic compounds (qualitative elemental analysis, chemical and instrumental research methods);
- to carry out syntheses of organic compounds, in particular and medicinal substances, as an example for applicants for higher education, to follow the methods of execution, to perform initial calculations and final calculations;
- draw up reporting documentation based on experimental data;
- follow safety rules;
- work independently with educational and reference literature on organic chemistry able to demonstrate:
 - basic knowledge and understanding of the basics of chemistry and related fields of knowledge;
 - knowledge of standard chemical equipment and devices;
 - ability to prepare the necessary solutions and reagents, plan and conduct experiments;
 - ability to classify the main types of chemical reactions, to describe their main characteristics;
 - the ability to establish a relationship between the structure and properties of substances;
 - knowledge of the main aspects of chemical terminology and nomenclature, the ability to express (or describe) chemical data in symbolic form;
 - knowledge of the basic principles of chemical synthesis, analysis, characteristics of chemical compounds and drugs;
 - understanding the basics of instrumental methods of analysis;
 - ability to describe the properties of aliphatic, aromatic, heterocyclic and natural compounds, to explain the structure and behavior of functional groups in organic molecules;
 - ability to show the genetic connection between classes of organic compounds.

have the skills of:

- search for scientific and professional information using modern computer tools, network technologies and databases; technologies of independent activity and self-control; generalization and systematization of information obtained as a result of scientific research to solve typical problems of professional activity;
- public and scientific language; Ability to create and edit professional texts, participate in professional discussions and debates, logically argue their views;
- conducting research both as a group and independently;
- choosing rational ways and means of using theoretical and practical aspects of organic chemistry in pharmaceutical practice, to know the chemical properties of substances and be able to analyze them; be able to anticipate the possibility of their interaction both with each other and with the products of chemical reactions; have methods for determining the storage conditions of organic substances depending on their nature.

decide self:

- apply methods and tools of learning and self-control to acquire new knowledge and skills;
 - - to organize, to carry out quality control of medicines with use of physical and chemical (instrumental) methods in the conditions of the pharmaceutical enterprise, to be able to interpret the received results according to requirements of SPU

Program Learning Outcomes (PLO):

PLO 2. Apply knowledge of general and professional disciplines in professional activities.

PLO 3. Adhere to the norms of sanitary and hygienic regime and safety requirements in carrying out professional activities.

PLO 4. Demonstrate the ability to independently search, analyze and synthesize information from various sources and use these results to solve typical and complex specialized tasks of professional activity.

PLO 8. Carry out professional communication in the state language, use the skills of oral communication in a foreign language, analyzing texts of professional orientation and translate foreign language information sources.

PLO 9. Carry out professional activities using information technology,

"Information databases", navigation systems, Internet resources, software and other information and communication technologies.

PLO 12. Analyze the information obtained as a result of scientific research, summarize, systematize and use it in professional activities.

PLO 30. Ensure quality control of medicines and document its results. Manage quality risks at all stages of the life cycle of medicines.

Content and Logistics of the Discipline

Module 1. Fundamentals of the structure of organic compounds. Hydrocarbons (alkanes, cycloalkanes, alkenes, alkadienes, alkynes, arenes) and their functional derivatives (halogen, nitrogen-containing compounds, hydroxy derivatives of hydrocarbons, aldehydes and ketones)	III semester – 120 hours Module 1 114 hours/3,8 credits	Lectures № 1-7 (Full time study) Practical classes: Topics №1-17
Module 2. Carboxylic acids, heterocyclic and natural compounds.	IV semester – 10 hours Module 2 111 hours/3,7 credits	Lectures № 8-14 (Full time study) Practical classes: Topics №18-35

The course includes 35 topics, which are divided into two modules (6 content modules).

MODULE 1. Fundamentals of the structure of organic compounds. Hydrocarbons (alkanes, cycloalkanes, alkenes, alkadienes, alkynes, arenes) and their functional derivatives (halogen, nitrogen-containing compounds, hydroxy derivatives of hydrocarbons, aldehydes and ketones)

CONTENT MODULE 1. *Fundamentals of the structure of organic compounds (classification and nomenclature, chemical bonds and mutual influence of atoms in molecules of organic compounds, isomerism of organic compounds, spatial structure of the molecule, acid and basic properties, classification of organic reactions and reagents). Hydrocarbons (alkanes, cycloalkanes, alkenes, alkadienes, alkynes). Reactivity depending on the hybridization of the carbon atom.*

Topic 1. The subject of organic chemistry. The role of organic chemistry in the system of pharmaceutical education. Classification and nomenclature of organic compounds.

Topic 2. Chemical bond and mutual influence of atoms in molecules of organic compounds. Topic

3. Isomerism of organic compounds. Spatial structure of molecules. Topic 4. Acid and basic properties of organic compounds.

Topic 5. Saturated hydrocarbons (alkanes, cycloalkanes). Classification of organic reactions and reagents. Methods for establishing the structure of organic compounds.

Topic 6. Unsaturated hydrocarbons (alkenes, alkadienes). Topic 7. Unsaturated hydrocarbons (alkynes).

CONTENT MODULE 2. *Aromatic hydrocarbons. Halogenated hydrocarbons, nitro compounds, amines, diazo, azo compounds.*

Topic 8. Aromatic hydrocarbons (mononuclear arenes). Topic 9. Aromatic hydrocarbons (multinuclear arenes). Topic 10. Halogenated hydrocarbons.

Topic 11. Nitro compounds. Topic 12. Amines.

Topic 13. Diazo and azo compounds.

CONTENT MODULE 3. *Hydroxyl derivatives of hydrocarbons (alcohols, phenols) and their thioanalogues. Oxo derivatives of hydrocarbons (aldehydes, ketones).*

Topic 14. Alcohols.

Topic 15. Phenols. Ethers.

Topic 16. Aldehydes and ketones of the aliphatic series. Topic 17. Aldehydes and ketones of the aromatic series

MODULE 2. Carboxylic acids, heterocyclic and natural compounds.

CONTENT MODULE 4. *Carboxylic acids, functional derivatives of carboxylic acids, heterofunctional carboxylic acids. Carboxylic acid derivatives. Sulfonic acids.*

Topic 18. Carboxylic acids.

Topic 19. Functional derivatives of carboxylic acids.

Topic 20. Heterofunctional carboxylic acids (halogen-alcohol, phenol, oxo acids).

Topic 21. Heterofunctional carboxylic acids (amino acids). Proteins. Topic 22. Carboxylic acid and its functional derivatives. Sulfonic acids.

CONTENT MODULE 5. *Heterocyclic compounds.*

Topic 23. Introduction to the topic "Heterocyclic compounds". Three-, four-membered heterocyclic compounds with one heteroatom.

Topic 24. Five-membered heterocyclic compounds with one heteroatom.

Topic 25. Derivatives of five-membered heterocycles with one heteroatom (furfural, indole, indoxyl, isatin).

Topic 26. Five-membered heterocyclic compounds with two heteroatoms.

Topic 27. Nitrogen-containing six-membered heterocyclic compounds with one heteroatom. Pyridine.

Topic 28. Condensed azines (quinoline, isoquinoline, acridine).

Topic 29. Oxygen-containing six-membered heterocyclic compounds with one heteroatom. Topic 30. Six-membered heterocyclic compounds with two heteroatoms.

Topic 31. Condensed systems of heterocycles. Purine.

CONTENT MODULE 6. *Carbohydrates. Nucleic acids. Lipids*

Topic 32. Carbohydrates. Monosaccharides. Classification, structure, stereoisomerism of monosaccharides

Topic 33. Monosaccharides. Chemical properties. Topic 34. Disaccharides. Polysaccharides.

Topic 35. Nucleic acids. The concept of lipids (saponified and unsaponifiable). Isoprenoids (terpenes).

The topics of the lecture course reveal the problematic issues of the relevant sections of the discipline. Practical classes provide a theoretical justification of the main issues of the topic and the acquisition of the following practical skills:

- use basic laboratory chemical utensils and auxiliary devices;
- to apply separate elements of equipment of laboratory works, assembly of separate installations, heating of substances in a test tube, weighing, measurement of liquids;
- perform practical experiments with an understanding of the processes that take place, explain the essence of specific reactions;
- to conduct experiments on the identification of organic compounds, qualitative determination of functional groups and individual representatives of classes of organic compounds;
- apply methods of isolation and purification of substances (filtration, recrystallization, distillation, sublimation, extraction, chromatography);
- determine the most important physical constants (melting point, boiling point, specific rotation, density);
- analyze unknown organic matter;
- use methods to establish the structure of organic compounds (qualitative elemental analysis, chemical and instrumental research methods);
- to carry out syntheses of organic compounds, in particular and medicinal substances, as an example for applicants for higher education, to follow the methods of execution, to perform initial calculations and final calculations;
 - draw up reporting documentation based on experimental data;
 - follow safety rules;
- independently work with educational and reference literature on organic chemistry

The student's independent work involves preparation for practical classes and intermediate tests, study of topics for independent extracurricular work, writing essays, preparation of presentations, tables. The control of mastering the topics of independent extracurricular work is carried out at the intermediate control classes and the final control of the discipline.

Individual work includes the study of scientific literature, preparation of reviews on the topics provided for presentation at meetings of the student scientific group, the implementation of scientific and practical research, participation in specialized competitions, scientific and practical conferences, competitions of student research papers.

Thematic plans of lectures, calendar plans of practical classes, thematic plan of independent extracurricular work, volume and directions of individual work are published on the site of the department.

Route of receiving materials: Department of Pharmaceutical Chemistry / Student / Full-time / part-time form of education / Pharmacy, industrial pharmacy / 2th year / Teaching materials / or by link <https://www.vnmu.edu.ua/> pharmaceutical chemistry department #. Access to materials is carried out from the student's corporate account s000XXX@vnmu.edu.ua.

5. Forms and methods of monitoring learning success

Current control in practical classes	Methods: <i>oral or written survey, testing, electronic survey, solving situational problems, conducting laboratory tests, their interpretation and evaluation of their results (registration of the protocol in the workbook)</i>
Control of mastering the thematic section of the discipline at intermediate control classes	Methods: <i>oral or written questioning, electronic testing, solving situational problems, control of practical skills</i>
Final semester control - credit at the end of the third semester (full-time study)	Methods: <i>pre-examination testing, oral examination (according to the provisions on the organization of the educational process in Pirogov memorial VNMU (link https://www.vnmu.edu.ua/Загальна information / Basic documents)</i>
Final control of the discipline - exam)	Methods: <i>pre-examination testing, oral examination (according to the provisions on the organization of the educational process in Pirogov memorial VNMU (link https://www.vnmu.edu.ua/Загальна information / Basic documents)</i>
Tools for diagnosing learning success	Theoretical questions, tests, clinically-oriented situational tasks, practical tasks, demonstration of practical skills

6. Evaluation criteria

Assessment of knowledge is carried out in accordance with the Regulations on the organization of the educational process in Pirogov memorial VNMU (link <https://www.vnmu.edu.ua/Загальна> information / Basic documents)

Current control	According to the five-point system of traditional assessments: 5 "excellent", 4 "good", 3 "satisfactory", 2 "unsatisfactory"
Intermediate separation controls	According to the five-point system of traditional assessments
Control of practical skills	According to the five-point system of traditional assessments
Final control of the discipline	<i>Sum of points for pre-examination testing (12-20 points) and oral examination (38-60 points)</i> <i>Exam grade:</i> <i>71-80 points - "excellent" 61-70 points - "good"</i> <i>50-60 points - "satisfactory"</i> <i>Less than 50 points - "unsatisfactory" / did not pass</i>
Discipline assessment:	Current performance - from 72 to 120 points (conversion of the average traditional grade for practical classes on a 120-point scale): 60% of the grade for the discipline Final control - from 50 to 80 points: 40% of the grade for the discipline Individual work - from 6 to 12 points Total from 122 to 200 points.

Discipline Assessment Scale: National and ECTS

The sum of points for all types of training activities	Mark ECTS	Score on a national scale	
		for exam, course project (works), practices	for credit
180-200	A	excellent	credited
170-179,99	B	good	
160-169,99	C		
141-159,99	D	satisfactory	
122-140,99	E	satisfactory	
0-121,99	FX	unsatisfactory with the possibility of reassembly	not credited with the possibility of re-assembly
	F	unsatisfactory with mandatory re-study of the discipline	not credited with compulsory re-study of the discipline

7. Discipline / course policy

The student has the right to receive high-quality educational services, access to contemporary scientific and educational information, qualified advisory assistance during the study of discipline and mastering practical skills. The policy of the department during the providing of educational services is a student-centered, based on normative documents of the Ministry of Education and the Ministry of Health of Ukraine, the Statute of the University and the Procedure for the Providing of Educational Services regulated by the main principles of the organization of the educational process in National Pirogov Memorial Medical University, Vinnytsya and the principles of academic integrity (link <https://www.vnmu.edu.ua/en/general-regulations>).

Adherence to the rules of VNMU, safety techniques in practical classes.

Requirements for preparation for practical classes. Student should be present at the practical lesson on time, theoretically prepared according to the topic, adhere to the necessary for work in the laboratory form of clothing (medical gown, if necessary - hat, gloves, etc.). When performing a laboratory work, it is necessary to strictly follow the rules and safety precautions, experiments are possible only in the presence of a teacher or laboratory assistant in the classroom. Show tolerance, courtesy, tact and respect to other participants during the discussion.

Usage of mobile phones and other electronic devices. The use of electronic devices is allowed, but limited to individual cases. It is allowed to use these devices for testing on the Microsoft Teams platform, for mathematical calculations ("Calculator" function), for processing literary sources in electronic form (agreement with teacher is required). It is forbidden to use electronic devices during classes for photo, audio and video recording without the consent of all participants of the educational process, for entertainment purposes, as well as during an oral survey.

Academic integrity. When studying the discipline, the student must be guided by the Code of Academic Integrity and Corporate Ethics of National Pirogov Memorial Medical University, Vinnytsya (link: <https://www.vnmu.edu.ua/en/general-regulations/> Code of Academic Integrity). In case of violation of the norms of academic integrity during the current and final controls student receives a grade of "2" and must work it out to his teacher in the prescribed manner within two weeks after receiving an unsatisfactory assessment).

Missed classes. Missed classes are working out in the manner prescribed by Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>) at the time of work out schedule (published on the website of the department <https://www.vnmu.edu.ua/> department of Pharmaceutical Chemistry #) to the

teacher on duty. To work out missed lesson student must provide permission from the dean's office, pass multiple choice questions (MCQ) on a missed topic and recitation, work out laboratory work (if the latter is in a particular topic), draw up a laboratory report and defend it to the teacher on duty.

Note. To ensure the completion of the laboratory works, it is necessary to apply in advance to the laboratory assistant of pharmaceutical chemistry department and indicate the topic and specific date of rework to prepare the necessary reagents, laboratory utensils, etc.

The reworks of missed lectures are carried out to the lecturer of the subject, with the permission of the dean, the abstract of the lecture, a short recitation on the topic of the lecture is possible.

The procedure for admission to the discipline final control is given in the Regulations of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>). To the final control allowed students who do not have missed practical classes and lectures and received an average traditional grade of at least "3".

Additional points. Individual points in the discipline (from 6 to 12) that student can receive for individual work, the amount of which is published on the website of the department in the educational methodical materials of the discipline, the number of points is determined by the results of IRS according to Regulation of the Academic process in National Pirogov Memorial Medical University, Vinnytsya (link <https://www.vnmu.edu.ua/en/general-regulations>).

Conflict resolution. In case of misunderstandings and complaints to the teacher because of the quality of educational services, knowledge assessment and other conflict situations, student should submit his / her claims to the teacher. If the issue is not resolved, the student has the right to apply to the head of the department according to Complaints Consideration Procedure in VNMU named after M.I. Pirogov (link <https://www.vnmu.edu.ua/en/general-regulations>)

Politics in terms of remote learning. Distance learning regulated by the Regulations of the elements of remote learning in National Pirogov Memorial Medical University, Vinnytsya (<https://www.vnmu.edu.ua/> General information). The main training platforms for studying are Microsoft Team and Google Meets. Practical classes and lectures, exercises and consultations during distance learning is published on the website of the department (<https://www.vnmu.edu.ua/en/Department of Pharmaceutical Chemistry / to Students> or <https://www.vnmu.edu.ua/en/Department of Pharmaceutical Chemistry / News>).

Feedback from teachers is via messengers (Viber, Telegram, WhatsApp) or e-mail (at the teacher's choice) during working hours.

Educational resources.

1. Educational and methodological support of the discipline is published on the website of the department (<https://www.vnmu.edu.ua/en/department of Pharmaceutical Chemistry / for students>). Consultations are held twice a week according to the schedule.
2. **The time-table and distribution of groups** with assigned teachers are published on the web page of the department (<https://www.vnmu.edu.ua/en/department of Pharmaceutical Chemistry / for students>). Questions to the intermediate and final semester control (credit) of the discipline are published on the web page of the department (<https://www.vnmu.edu.ua/en/department of Pharmaceutical Chemistry / for students>).

Responsible for the Course



Teacher Olha MAZUR

Head of the Pharmaceutical
Chemistry Department



Assoc. prof. of HEI
Tetyana YUSHCHENKO