

Danylo Halytsky Lviv National Medical University

Department of Pharmaceutical, Organic and Bioorganic chemistry

**SYLLABUS FOR ELECTIVE COURSE
IDENTIFICATION OF ORGANIC COMPOUNDS**

**2nd Master's degree of higher education
Branch of knowledge: 22 " Healthcare "
Specialty 226 «Pharmacy, industrial pharmacy»**

1. General information

Faculty	Pharmaceutical
Pprogram	22 Healthcare, 226 Pharmacy, industrial pharmacy the second (master's) level, full-time
Academic year	2022/2023
Subject	Identification of organic compounds, BB 1.19. Kaf_pharmchemistry@meduniv.lviv.ua
Department	Department Pharmaceutical, Organic and Bioorganic chemistry Pekarska 69, Lviv, Tel. +38(032)275-59-66, 275-59-77, 278-64-34 Kaf_pharmchemistry@meduniv.lviv.ua
Head of Department	Lesyk Roman, Doctor of Science, Professor roman.lesyk@gmail.com
Year of study	Second
Semester	Third or fourth
Type of course / module	Selective
Professors	Nataliya Zelisko, PhD, Associate Professor, NataljaZelisko@gmail.com Danylo Kaminsky, PhD, Associate Professor, dankaminsky@gmail.com Ivanna Subtelna, PhD, Associate Professor, subtelna@gmail.com
Erasmus yes/no	No
The person responsible for the syllabus	Nataliya Zelisko, PhD, Associate Professor, NataljaZelisko@gmail.com
Number of credits ECTS	3
Number of hours	90 (10/ 20/ 60)
Language of study	English
Information about consultations	On schedule
Address, telephone and regulations of the clinical base, office ... (if necessary)	
2. Short annotation to the course	
<p>The elective course "Identification of organic compounds" is devoted to the systematic study of methods and approaches to establish the structure and purity of organic compounds and the formation on this basis of creative chemical thinking necessary for successful mastering of disciplines and practical activities.</p> <p>The main task of the elective course is to provide a scientific approach to solving problems such as pharmaceutical, phytochemical and chemical-toxicological analysis, quality assessment and technology of drug production and storage conditions, as well as laboratory diagnosis of diseases.</p> <p>The training of specialists who need knowledge on the identification of organic compounds requires not only theoretical training, but also versatile practical skills and abilities in the implementation of a chemical experiment.</p> <p>The objectives of the elective course are to determine the structure of organic molecules, both natural and synthetic, including drugs, their metabolites and endogenous compounds; study of the nature of functional groups; identifying the relationship between their molecular, electronic structure and methods of analysis; studying aspects of isolation, purification and analysis of organic compounds.</p>	
3. The purpose and objectives of the course	
<p>The purpose of the elective course "Identification of organic compounds" is:</p> <ul style="list-style-type: none"> -assigning by students the laws of the relationship between the structure and properties of organic compounds; -acquaintance with the basic physical methods of analysis of organic compounds as the main prerequisite for understanding the principles of their identification in medical-biological and clinical-diagnostic research; -study of basic approaches for identification of organic compounds based on the analysis of analytical-functional groups; 	

-acquisition of practical skills that will help the student in the future to master the methods of standardization and quality control of drugs and the principles of laboratory diagnosis.

The objectives of the elective course "Identification of organic compounds" are:

- to teach students the methods of isolation and purification of organic compounds;
- to teach students the general principles of evaluating the chemical properties of organic compounds, which are the basis for the analysis of organic substances;
- disclose practical aspects of the use of physico-chemical methods of analysis in pharmaceutical and medical practice.

Competences and learning outcomes, the formation of which provides the study of the discipline.

General competencies:

- 3K 2. The ability to apply knowledge in practical situations.
- 3K 3. The striving to save the environment.
- 3K 4. The ability to abstract thinking, analysis and synthesis; the ability to study and to be trained up-to date
- 3K 6. Knowledge and understanding of the subject area and comprehension of the profession.
- 3K.7 Ability to adapt and act in a new situation.
- 3K 10. Ability to choose communication strategies, ability to work in a team and with experts from other fields of knowledge / types of economic activity.
- 3K 11. Ability to assess and ensure the quality of performed work.
- 3K 12. Ability to perform research at the appropriate level.
- 3K 14. Ability to preserve and increase moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, techniques and technologies. active recreation and a healthy lifestyle.

Special responsibility:

- ΦK 2. Ability to provide advice on prescription and over-the-counter drugs and other pharmaceutical products; pharmaceutical care during the selection and sale of over-the-counter drugs by assessing the risk / benefit, compatibility, indications and contraindications based on data on the health of a particular patient, taking into account biopharmaceutical, pharmacokinetic, pharmacodynamic and physicochemical characteristics of the drug and other pharmaceutical products.
- ΦK 4. Ability to ensure rational use, obtain the necessary information from identified sources to ensure conditions for quality and safe pharmaceutical care of prescription and over-the-counter drugs and other pharmaceutical products in accordance with physicochemical, pharmacological characteristics, biochemical, pathophysiological features of a particular disease and its pharmacotherapeutic regimen.
- ΦK 5 Ability to monitor the effectiveness and safety of the use of drugs by the population according to the data on their clinical and pharmaceutical characteristics, as well as taking into account subjective signs and objective clinical, laboratory and instrumental criteria for examination of the patient.
- ΦK 6. Ability to identify drugs, xenobiotics, toxins and their metabolites in body fluids and tissues, to conduct chemical and toxicological studies to diagnose acute poisoning, drug and alcohol intoxication.
- ΦK 7. Ability to ensure proper storage of medicines and other products of the pharmacy range in accordance with their physicochemical properties and the rules of Good Storage Practice (GSP) in health care facilities.
- ΦK 15. Ability to organize and participate in the production of medicines in the context of pharmaceutical companies, including the selection and justification of the technological process, equipment in accordance with the requirements of Good Manufacturing Practice (GMP) with the appropriate development and design of the necessary documentation. Determine the stability of drugs.
- ΦK 19. Ability to organize and control the quality of medicines in accordance with the requirements of the current State Pharmacopoeia of Ukraine and good practices in pharmacy, determine methods of sampling for control of medicines and standardize them in accordance with current requirements, prevent the spread of counterfeit medicines.
- ΦK 20. Ability to develop methods for quality control of medicines, including active pharmaceutical ingredients, medicinal plant raw materials and excipients using physical, chemical, physicochemical, biological, microbiological, pharmacotechnological and pharmacoeconomic control methods.

Program learning outcomes:

- PPH 1 carry out professional activities in social interaction based on humanistic and ethical principles; identify future professional activities as socially significant for human health.
- PPH 2 to apply knowledge of general and professional disciplines in professional activities;
- PPH 4 to use the results of independent search, analysis and synthesis of information from various sources for solving typical tasks of professional activity;
- PPH 10 Adhere to the norms of communication in professional interaction with colleagues, management,

consumers, work effectively in a team.

PIPH 12 to use methods of performance indicators evaluation; to reveal reserves for improving of labor productivity.

PIPH 14 to determine the advantages and disadvantages of drugs of different pharmacological groups, taking into account their chemical, physicochemical, biopharmaceutical, pharmacokinetic and pharmacodynamic features. To recommend to consumers over-the-counter medicines and other products of the pharmacy range with the provision of counseling and pharmaceutical care.

PIPH 16. to determine factors influencing the processes of absorption, distribution, deposition, metabolism and excretion of the drug and due to the condition, features of the human body and physicochemical properties of drugs.

PIPH 17 to use data from clinical, laboratory and instrumental studies to monitor the effectiveness and safety of drugs.

PIPH 30 to ensure quality control of medicines and document its results. Manage quality risks at all stages of the life cycle of medicines.

PIPH 32 to determine the main organoleptic, physical, chemical, physicochemical and pharmacotechnological indicators of medicines, to substantiate and choose methods of their standardization, to carry out statistical processing of results in accordance with the requirements of the current State Pharmacopoeia of Ukraine.

4. Pre-details of the course

1. Biological physics with physical methods of analysis (4.5 credits).
2. General and inorganic chemistry (9 credits).
3. Higher mathematics and statistics (4 credits).
4. Analytical chemistry (8 credits).

5. Program learning outcomes

List of learning outcomes

Learning outcome code	The content of the learning outcome	Reference to the code of the competence matrix
ЗН – Knowledges УМ – skills АВ – independence and responsibility К – competence		PIPH – program learning outcomes
3Н-1	basic principles of classification and structural organization of organic compounds	PIPH 2, PIPH 14
3Н-2	features of the relationship structure - properties of organic compounds	PIPH 2, PIPH 14, PIPH 16
3Н-3	methods of isolation and purification of organic compounds	PIPH 30, PIPH 32
3Н-4	theoretical principles of physicochemical methods of analysis	PIPH 14, PIPH 17, PIPH 30, PIPH 32
3Н-5	main reactions of identification of analytical-functional groups	PIPH 30, PIPH 32
УМ-1	use chemical and reference literature, work with tabular and graphic material	PIPH 4, PIPH 12
УМ-2	use data from physicochemical analysis	PIPH 4, PIPH 12, PIPH 14, PIPH 17, PIPH 30, PIPH 32
УМ-3	determine the physical constants of organic compounds to identify organic compounds	PIPH 4, PIPH 12, PIPH 14, PIPH 17, PIPH 30, PIPH 32
УМ-4	purify liquid and crystalline organic compounds, establish their purity	PIPH 30, PIPH 32
УМ-5	to carry out qualitative reactions to the main functional groups	PIPH 30, PIPH 32

УМ-6	independently analyze an unknown organic compound	ПРН 4, ПРН 12, ПРН 14, ПРН 17, ПРН 30, ПРН 32		
К-1	have a scientific worldview and creative thinking	ПРН 2, ПРН 4, ПРН 12		
К-2	have information management skills	ПРН 2, ПРН 4, ПРН 12		
АВ-1	have the ability to critically evaluate the results of their own research	ПРН 1, ПРН 4, ПРН 10, ПРН 12		
АВ-2	be able to improve their own learning	ПРН 1, ПРН 4, ПРН 10, ПРН 12		
АВ-3	be able to learn new areas through self-study, using the acquired knowledge of organic chemistry	ПРН 1, ПРН 4, ПРН 10, ПРН 12		
6. Format and scope of the course				
Format of the course	Full-time course			
Вид занятий	Number of hours	Number of groups		
lectures	10			
practical	-	-		
seminars	20			
out of class work	60			
7. Topics and content of the course				
Class type code	Topic	Content of training	Code of result of training	Professor
Л – lecture, П – practical class, CPC – out of class work				
Л-1 (lecture -1)	Structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property). Methods of isolation and purification of organic compounds. Sensitivity and selectivity of chemical reactions. Approaches to the characteristics	Structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property). Methods of isolation and purification of organic compounds. Sensitivity and selectivity of chemical reactions. Approaches to the characteristics of organic compounds: the most important physicochemical constants, elemental analysis.	ЗН-1 ЗН-2 ЗН-3 ЗН-4 ЗН-5 УМ-1 УМ-2 УМ-3 УМ-4 УМ-5 К-1 К-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor

	of organic compounds: the most important physicochemical constants, elemental analysis.			
ЛІ-2	Physical methods of analysis: spectroscopic methods of research (NMR, EMR, IR, UV), mass spectrometry, diffractometry, chromatographic methods. Chemical methods of identification of organic compounds: general requirements, approaches to selection.	Physical methods of analysis: spectroscopic methods of research (NMR, EMR, IR, UV), mass spectrometry, diffractometry, chromatographic methods. Chemical methods of identification of organic compounds: general requirements, approaches to selection.	ЗН-3 ЗН-4 ЗН-5 УМ-2 УМ-3 УМ-5	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor
ЛІ-3	Identification by analytical-functional groups: saturated, unsaturated hydrocarbons, arenes, alcohols, phenols, amines, carbonyl compounds, carboxylic acids and their functional derivatives.	Identification by analytical-functional groups: saturated, unsaturated hydrocarbons, arenes, alcohols, phenols, amines, carbonyl compounds, carboxylic acids and their functional derivatives.	ЗН-5 УМ-5 УМ-6	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor
ЛІ-4	Identification by analytical-functional groups: heterofunctional compounds (amino acids, hydroxy acids, monosaccharides). Identification of heterocyclic compounds (N- and S-containing heterocycles). Identification of	Identification by analytical-functional groups: heterofunctional compounds (amino acids, hydroxy acids, monosaccharides). Identification of heterocyclic compounds (N- and S-containing heterocycles). Identification of the main classes of biologically active compounds (proteins, proteins).	ЗН-5 УМ-5 УМ-6	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor

	the main classes of biologically active compounds (proteins, proteins).			
JI-5	Identification of the main classes of biologically active compounds (di- and polysaccharides), lipids. Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	Identification of the main classes of biologically active compounds (di- and polysaccharides), lipids. Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	3H-5 YM-5 YM-6	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-1 (practical class 1)	Structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property). Methods of isolation and purification of organic compounds. Sensitivity and selectivity of chemical reactions. Approaches to the characteristics of organic compounds: the most important physicochemical constants, elemental analysis.	Structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property). Methods of isolation and purification of organic compounds. Sensitivity and selectivity of chemical reactions. Approaches to the characteristics of organic compounds: the most important physicochemical constants, elemental analysis.	3H-1 3H-2 3H-3 3H-4 3H-5 YM-1 YM-2 YM-3 YM-4 YM-5 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-2	Physical methods of analysis: spectroscopic methods of	Physical methods of analysis: spectroscopic methods of research (NMR, EMR, IR, UV), mass spectrometry, diffractometry, chromatographic methods. Chemical methods of identification of organic compounds:	3H-3 3H-4 3H-5 YM-2 YM-3	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate

	research (NMR, EMR, IR, UV), mass spectrometry, diffractometry, chromatographic methods. Chemical methods of identification of organic compounds: general requirements, approaches to selection.	general requirements, approaches to selection.	YM-5	Professor, Subtelna, PhD, Associate Professor
C-3	Identification by analytical-functional groups: saturated, unsaturated hydrocarbons, arenes.	Identification of alkanes and cycloalkanes. Identification of alkenes, alkynes, alkadienes. Identification of arenes.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-4	Identification by analytical-functional groups: alcohols, phenols, amines.	Identification of mono- and polyhydric alcohols. Identification of mono- and polyatomic phenols. Identification of aliphatic and aromatic amines.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-5	Identification by analytical-functional groups: carbonyl compounds, carboxylic acids and their functional derivatives.	Identification of aldehydes and ketones. Identification of carboxylic acids. Identification of amides, esters, halides, nitriles, anhydrides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-6	Identification by analytical-functional groups: heterofunctional compounds (amino acids, hydroxy acids, monosaccharides).	Identification of amino alcohols and aminophenols. Identification of oxoacids. Identification of α -, β - and γ -hydroxy acids. Identification of aromatic hydroxy acids. Identification of α -, β - and γ -amino acids. Identification of aromatic amino acids. Identification of monosaccharides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminsky, PhD, Associate Professor, Subtelna, PhD, Associate Professor
C-7	Identification of heterocyclic	Identification of five-membered heterocyclic compounds (pyrrole, furan, thiophene).	3H-5 YM-1	Zelisko N., PhD, Associate

	compounds (N- and S-containing heterocycles).	Identification of six-membered heterocyclic compounds.	YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
C-8	Identification of the main classes of biologically active compounds (proteins, proteins).	Identification of proteins and proteins.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
C-9	Identification of the main classes of biologically active compounds (di- and polysaccharides)	Identification of disaccharides. Identification of polysaccharides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
C-10	Identification of the main classes of biologically active compounds (lipids). Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	Identification of saponification and non-saponification lipids. Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-1 (out of class work 1)	Structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property).	structure of organic compounds. The most important classes of organic compounds are the basis for the identification of organic compounds. Relationship structure - activity (property).	3H-1 3H-2 YM-1 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-2	Methods of isolation and purification of organic	Methods of isolation and purification of organic compounds. Sensitivity and selectivity of chemical reactions.	3H-3 3H-4 YM-1 YM-4	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD,

	compounds. Sensitivity and selectivity of chemical reactions.		K-1 K-2	Associate Professor, Subtelna , PhD, Associate Professor
CPC-3	Approaches to the characteristics of organic compounds: the most important physicochemical constants, elemental analysis.	Approaches to the characteristics of organic compounds: the most important physicochemical constants, elemental analysis.	3H-4 YM-1 YM-2 YM-3 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-4	Physical methods of analysis: spectroscopic methods of research (NMR, EMR, IR, UV).	Physical methods of analysis: spectroscopic methods of research (NMR, EMR, IR, UV).	3H-4 YM-1 YM-2 YM-3 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-5	Physical methods of analysis: mass spectrometry, diffractometry, chromatographic methods.	Physical methods of analysis: mass spectrometry, diffractometry, chromatographic methods.	3H-4 YM-1 YM-2 YM-3 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-6	Chemical methods of identification of organic compounds: general requirements, approaches to selection.	Chemical methods of identification of organic compounds: general requirements, approaches to selection.	3H-4 YM-1 YM-2 YM-5 YM-6 K-1 K-2	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-7	Identification by analytical-functional groups: saturated, unsaturated hydrocarbons, arenes.	Identification of alkanes and cycloalkanes. Identification of alkenes, alkynes, alkadienes. Identification of arenes.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-8	Identification by analytical-functional	Identification of mono- and polyhydric alcohols. Identification of mono- and polyatomic	3H-5 YM-1 YM-5	Zelisko N., PhD, Associate Professor, Professor,

	groups: alcohols, phenols, amines.	phenols. Identification of aliphatic and aromatic amines.	YM-6 K-1 K-2 AB-1 AB-2 AB-3	Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-9	Identification by analytical-functional groups: carbonyl compounds, carboxylic acids and their functional derivatives.	Identification of aldehydes and ketones. Identification of carboxylic acids. Identification of amides, esters, halides, nitriles, anhydrides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-10	Identification by analytical-functional groups: heterofunctional compounds (amino acids, hydroxy acids, monosaccharides).	Identification of amino alcohols and aminophenols. Identification of oxoacids. Identification of α -, β - and γ -hydroxy acids. Identification of aromatic hydroxy acids. Identification of α -, β - and γ -amino acids. Identification of aromatic amino acids. Identification of monosaccharides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-11	Identification of heterocyclic compounds (N- and S-containing heterocycles).	Identification of five-membered heterocyclic compounds (pyrrole, furan, thiophene). Identification of six-membered heterocyclic compounds.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-12	Identification of the main classes of biologically active compounds (proteins, proteins).	Identification of proteins and proteins.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-13	Identification of the main classes of biologically active compounds (di- and polysaccharides).	Identification of disaccharides. Identification of polysaccharides.	3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna , PhD, Associate Professor
CPC-14	Identification of the main classes	Identification of saponification and non-saponification lipids.	3H-5 YM-1	Zelisko N., PhD, Associate

	of biologically active compounds (lipids).		YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor
CPC-15	Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	Quantitative analysis - the basis for clinical laboratory diagnosis: basic methods.	YM-1 YM-6 K-1 K-2 AB-1 AB-2 AB-3	Zelisko N., PhD, Associate Professor, Kaminskyy, PhD, Associate Professor, Subtelna, PhD, Associate Professor

Teaching methods are explanatory-illustrative, problem-solving, partial-search. When studying the elective course "Identification of organic compounds", students use textbooks, lecture notes, guidelines, chemical computer programs, models of molecules.

According to the curriculum, the methods of organization and implementation of educational activities are:

- a) lectures
- b) seminars
- c) out of class work of students.

The topics of the lecture course reveal the problematic issues of the relevant sections of this discipline. Lecture material is presented using multimedia equipment, computer, video clips, graph projector, models of organic molecules and demonstration experiments.

Classes according to the methods of their organizations are seminar and laboratory, involve discussion and implementation of laboratory studies to study certain classes of organic compounds on the properties of their functional groups, conducting qualitative reactions, isolation and purification of organic compounds, establishment of physicochemical constants.

Students also use exercises and solve situational problems. The practical classes use computer programs ISIS DRAW, HyperChem, Chemistry in motion, video clips developed by the department, models of molecules.

The structure of the organization of classes includes:

1. Discussion and explanation of the most difficult issues of the topic.
2. Writing a test.
3. Execution / Discussion of practical (laboratory) works, aspects of use and interpretation of results.
4. Registration of the protocol.
5. The result of the lesson

Out of class work of students includes:

1. Elaboration of literature on this topic.
2. Solving training exercises and tests.

8. Verification of learning outcomes

Current control

Carried out in each lesson according to specific goals, as well as during the individual work of the teacher with the student for those topics that the student is working on independently and they are not part of the structure of the seminar. A standardized form of control of theoretical and practical training of students is used.

The standardized form of control of the theoretical part includes 10 tasks. Five of them of the first level are test (1 point each), and five tasks of the second level, to which in addition to the test answer you need to give a written answer (2 points each).

Assessment of practical training of students - as a result of the practical part - is made in the form of a protocol.

The final grade for the current educational activity is set on a 4-point (national) scale.

Criteria for evaluating current learning activities:

A grade of "5" (excellent) is given to a student who actively participated in the discussion of the most difficult questions on the topic of the lesson, gave at least 90% correct answers to standardized test tasks,

answered written tasks without errors, did practical work and drew up a protocol.

Grade "4" (good) is given to the student who participated in the discussion of the most difficult questions on the topic, gave at least 75% correct answers to standardized test tasks, made some minor mistakes in answering written tasks, did practical work and drew up a protocol.

Grade "3" (satisfactory) is given to a student who did not participate in the discussion of the most difficult questions on the topic, gave at least 60% correct answers to standardized test tasks, made significant mistakes in answering written tasks, did practical work and drew up a protocol.

Grade "2" (unsatisfactory) is given to a student who did not participate in the discussion of the most difficult questions on the topic, gave less than 60% of correct answers to standardized test tasks, made gross mistakes in answering written tasks or did not answer them at all. performed practical work and did not draw up a protocol.

Learning outcome code	Code of the type of classes	Method of verification of learning outcomes	Enrollment criteria
3H-1 3H-2 3H-3 3H-4 3H-5 YM-1 YM-2 YM-3 YM-4 YM-5 K-1 K-2 AB-1 AB-2 AB-3	C-1 JI-1 CPC-1 CPC-2 CPC-3	1. Acquaintance with the organization and procedure of seminars on the subject "Identification of organic compounds". 2. Acquaintance with safety precautions and rules of work in chemical laboratory. 3. Consideration of the main issues of the topic. 4. Acquaintance with the equipment used in the chemical laboratory. 5. Performing training exercises and tests.	evaluation according to the established criteria on a traditional 4-point scale
3H-3 3H-4 3H-5 YM-1 YM-2 YM-3 YM-5 YM-6 K-1 K-2	C-2 JI-2 CPC-4 CPC-5 CPC-6	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.	evaluation according to the established criteria on a traditional 4-point scale
3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	C-3 JI-3 CPC-7	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer.	evaluation according to the established criteria on a traditional 4-point scale

		5. Performance of practical (laboratory) works on the basis of a small workshop.	
3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	C-4 JI-3 CPC-8	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.	evaluation according to the established criteria on a traditional 4-point scale
3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	C-5 JI-3 CPC-9	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.	evaluation according to the established criteria on a traditional 4-point scale
3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3	C-6 JI-4 CPC-10	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.	evaluation according to the established criteria on a traditional 4-point scale
3H-5 YM-1 YM-5 YM-6 K-1	C-7 JI-4 CPC-11	1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational	evaluation according to the established criteria on a traditional 4-point scale

<p>K-2 AB-1 AB-2 AB-3</p>		<p>problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.</p>	
<p>3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3</p>	<p>C-8 JI-4 CPC-12</p>	<p>1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.</p>	<p>evaluation according to the established criteria on a traditional 4-point scale</p>
<p>3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3</p>	<p>C-9 JI-5 CPC-13</p>	<p>1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.</p>	<p>evaluation according to the established criteria on a traditional 4-point scale</p>
<p>3H-5 YM-1 YM-5 YM-6 K-1 K-2 AB-1 AB-2 AB-3</p>	<p>C-10 JI-5 CPC-14 CPC-15</p>	<p>1. Survey of students and explanation of the most difficult questions of topics. 2. Checking homework and tests. 3. Execution of written tasks. Tasks are presented in the form of situational problems and involve writing the equations of chemical reactions, data analysis of physical and chemical analysis. 4. Writing a test. The task includes the first level questions and the second level tasks, to which in addition to the test answer you need to give a written</p>	<p>evaluation according to the established criteria on a traditional 4-point scale</p>

		answer. 5. Performance of practical (laboratory) works on the basis of a small workshop.	
Final control			
General evaluation system	Participation in the work during the semester / credit on a 200-point scale		
Rating scales	Traditional 4-point scale, multi-point (200-point) scale, ECTS rating scale		
Conditions of admission to the final control	The student attended all seminars and received at least 120 points for current performance		
Type of final control	Methods of final control	Enrollment criteria	
Залік	This is a form of final control, which consists in assessing the student's mastery of educational material solely on the basis of the results of all types of educational work provided by the working curriculum. The semester credit is set based on the results of the current control.	<p>The maximum number of points that a student can score for the current educational activity in the study of the discipline is 200 points.</p> <p>The minimum number of points that a student must score for the current academic activity to enroll in the discipline is 120 points.</p>	
<p>The calculation of the number of points is based on the grades obtained by the student on a 4-point (national) scale during the study of the discipline, by calculating the arithmetic mean (CA), rounded to two decimal places. The value obtained is converted into points on a multi-point scale as follows:</p>			
9. Course policy			
The student must independently complete homework, training exercises and tests, tasks of current and final control. It is not allowed to spy on the work of another student, write off, use a textbook, notebook or mobile phone while writing a test, use cheat sheets, copy your work by other students. Omissions of practical classes are not allowed. If a student misses classes for good reasons, which are documented, he has the right to practice them.			
10. Literature			
The main literature			
1. Josyf D. Komarytsia. Organic Chemistry. Handbook for pharmaceutical students. L'viv medical university. L'viv, 2000. – 151 P.			
The additional literature			
1. T.W. Graham Solomons. Organic Chemistry. – 6th or 5th ed. John Wiley & Sons, Inc. New York Chichester Brisbane Toronto Singapore. – 1218 P.			
2. Mary Ann Fox, James K. Whitesell. Organic Chemistry. – 2nd ed. Jones and Bartlett Publishers. Boston London Singapore. – 828 P.			
3. Molly M. Bloomfield. Chemistry and the Living Organism. – 5th or 4th ed. John Wiley & Sons, Inc. New York Chichester Brisbane Toronto Singapore. – 746 P.			
4. John D. Roberts, Marjorie C. Caserio. Basic Principles of Organic Chemistry. – 2nd ed. W. A. Benjamin, Inc. Menio Park, California Reading, Massachusetts London Amsterdam Don Molls, Ontario Sydney. – 1596 P.			
5. Robert Thornton Morrison, Robert Neilson Boyd. Organic Chemistry. – 4th ed. Allyn and Bacon, Inc. Boston, London, Sydney, Toronto. – 1370 P.			
6. David C. Eaton. Laboratory Investigation in Organic Chemistry. McGRAW-HILL BOOK COMPANY, – 929 P.			
7. Donald L. Pavia, Gary M. Lampman, George S. Kriz, Randall G. Engel. Introduction to Laboratory Techniques. Saunders College Publishing – 878 P.			
8. Harold Hart, Leslie E. Crain, David J. Hart. Organic Chemistry. A Short Course. Houghton Mifflin Company. – 573 P.			
Information resources			
1. www.ncbi.nlm.nih.gov/PubMed – free access to the database of scientific data in the field of biomedical sciences.			
2. https://pubchem.ncbi.nlm.nih.gov/ free access to a database of scientific data in the field of biomedical sciences.			
3. www.biochemistry.org.ua - the official site of the Institute of Biochemistry. O.B. Palladin of the National Academy of Sciences of Ukraine.			

4. www.bpci.kiev.ua is the official website of the Institute of Bioorganic Chemistry and Petrochemistry of the National Academy of Sciences of Ukraine.

5. www.xumuk.ru – articles on biochemistry in free access. www.pereplet.ru/cgi/soros/readdb.cgi - Soros Educational Journal - free access to popular science articles in biochemistry, biology and chemistry. www.chem.msu.su/rus/ - Russian chemical educational portal. The resource is part of the ChemNet virtual system, which combines a large number of information resources on chemistry.

6. www.bioorganica.org.ua - scientific publication presenting works on bioorganic and medical chemistry

11. Equipment, logistics and software of the discipline

Equipment for laboratory work in the discipline, chemical utensils, reagents, multimedia projector for classes, overhead projector, computers, Internet for individual tasks, platform for distance learning MISA; thematic tables, molecule models, methodical instructions for practical and independent work are posted on the MISA distance learning service and are freely available to students.

12. Additional information

The department has a permanent student research group.

The Syllabus was developed by:
Nataliya Zelisko, PhD, Associate Professor

Head of Department of Pharmaceutical, Organic
and Bioorganic chemistry
Prof. R.B. Lesyk