

MINISTRY OF HEALTH OF UKRAINE

ODESSA NATIONAL MEDICAL UNIVERSITY

Department of Pharmaceutical Chemistry and Drug Technology



Vice-rector for scientific and pedagogical work

Eduard BURYACHKIVSKY

September 1st, 2025

**WORKING PROGRAM IN THE DISCIPLINE
«PHARMACEUTICAL CHEMISTRY»**

Level of higher education: second (master's degree)

Area of Knowledge: 22 «Health care»

Specialty: 226 «Pharmacy, industrial pharmacy»

Specialization: 226.01 «Pharmacy»

Educational and professional program: Pharmacy, industrial pharmacy

The work program is based on the educational and professional program "Pharmacy, Industrial Pharmacy" for the training of specialists of the second (master's) level of higher education in the specialty 226 "Pharmacy, Industrial Pharmacy" of the field of knowledge 22 "Health Care", approved by the Academic Council of ONMedU (protocol No. 10 dated June 27, 2024).

Developers:

Head of the Department of Pharmaceutical Chemistry and Drug Technology, Doctor of Chemical Sciences, Professor Volodymyr GELMBOLDT, senior lecturer at the higher education institution, Department of Pharmaceutical Chemistry and Drug Technology Oleksii NIKITIN, Senior lecturer at the higher education institution, Department of Pharmaceutical Chemistry and Drug Technology, PhD in Pharmacy Ivan SHYSHKIN

The work program was approved at the meeting of the Department of Pharmaceutical Chemistry and Drug Technology
Protocol No. 1 dated 08/29/2025.

Head of Department



Volodymyr GELMBOLDT

Agreed with the EPP guarantor



Liana UNHURIAN

Approved by the subject cycle methodical commission for pharmaceutical disciplines of ONMedU
Protocol No. 1 dated 08/29/2025

Head of the subject cycle methodical commission for pharmaceutical disciplines of ONMedU



Natalia FIZOR

Reviewed and approved at the department meeting _____

Protocol No. ___ from "___" _____ 20__.

Head of the department

_____ Volodymyr GELMBOLDT

Reviewed and approved at the department meeting _____

Protocol no. ___ from "___" _____ 20__.

Head of the department

_____ Volodymyr GELMBOLDT

1. DESCRIPTION OF THE ACADEMIC DISCIPLINE

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the academic discipline
Total number: Credits: 13 Hours: 390	Area of Knowledge 22 "Healthcare"	Full-time education Mandatory discipline
	Specialty 226 "Pharmacy, Industrial Pharmacy"	Year of preparation: 3, 4, 5
		Semesters V – IX
	Specialization 226.01 "Pharmacy"	Lectures (80 h.)
		Practical (180 h.)
		Independent work (130 h.)
	Level of higher education second (master's)	Final control form – differential credit 3, 4 courses exam 5 course

2. GOALS AND OBJECTIVES OF THE ACADEMIC DISCIPLINE, COMPETENCES, PROGRAM LEARNING OUTCOMES

Goal: provide systematic knowledge about the structure of drugs, methods of their extraction, identification and quantification, physical, physicochemical and chemical properties, chemical factors of pharmacological action, regularities of the relationship between structure - biological/pharmacological activity and metabolic transformations, studies of purity, use and storage, as well as approaches to the creation of new synthetic drugs and biologically active substances.

Task: acquiring skills in the field of providing high-quality pharmaceutical care to patients, taking into account knowledge of the physical, physicochemical and chemical properties of drugs, the basic laws of the "structure-activity" relationship, avoiding possible interactions of drugs during their manufacture and use, establishing the good quality of individual drugs, their multicomponent mixtures and ensuring their proper storage, acquiring knowledge of the basic methods of drug synthesis or extraction from natural raw materials; in the field of pharmaceutical analysis.

The process of studying the discipline is aimed at forming elements of the following competencies:

General (GC):

GC 1 – The ability to think abstractly, analyze and synthesize, learn and be up-to-date.

GC 2 – Knowledge and understanding of the subject area and understanding of professional activity.

GC 5 – Ability to evaluate and ensure the quality of work performed.

GC 6 – Ability to work in a team.

GC 9 – Ability to use information and communication technologies.

Specialists (SC)

SC 8 – Ability to provide advice on prescription and non-prescription medicines and other pharmacy products; pharmaceutical care during the selection and sale of medicines of natural and synthetic origin by assessing the risk/benefit ratio, compatibility, taking into account biopharmaceutical, pharmacokinetic, pharmacodynamic and physicochemical and chemical features, indications/contraindications for use, guided by data on the health status of a particular patient.

SC 12 – Ability to ensure proper storage of medicinal products of natural and synthetic origin and

other pharmacy products in accordance with their physicochemical properties and the rules of Good Storage Practice (GSP) in healthcare facilities.

SC 19 – Ability to organize and carry out quality control of medicinal products of natural and synthetic origin in accordance with the requirements of the current edition of the State Pharmacopoeia of Ukraine, quality control methods (QC), technological instructions, etc.; prevent the distribution of low-quality, falsified and unregistered medicinal products.

SC 20 – Ability to develop and evaluate quality control methods for medicinal products of natural and synthetic origin, including active pharmaceutical ingredients, medicinal plant raw materials and excipients using physical, chemical, physicochemical, biological, microbiological, pharmaco-technological methods; standardize medicinal products in accordance with current requirements.

Program learning outcomes (PLO):

PLO 3 – Have specialized knowledge and skills to solve professional problems and tasks, including for the purpose of further developing knowledge and procedures in the field of pharmacy.

PLO 11 – To determine the advantages and disadvantages of medicines of natural and synthetic origin of various pharmacological groups, taking into account their chemical, physicochemical, biopharmaceutical, pharmacokinetic, pharmacodynamic characteristics and the type of dosage form. To recommend medicines and other pharmacy products to consumers, providing advisory assistance and pharmaceutical care.

PLO 15 – Predict and determine the impact of environmental factors on the quality and consumer characteristics of medicines of natural and synthetic origin and other pharmacy products, organize their storage in accordance with their physicochemical properties and the rules of Good Storage Practice (GSP).

PLO 20 – To carry out pharmaceutical development of medicinal products of natural and synthetic origin in industrial production conditions.

PLO 22 – To ensure and carry out quality control of medicinal products of natural and synthetic origin and document its results; to issue quality certificates and certificates of analysis taking into account the requirements of the current edition of the State Pharmacopoeia of Ukraine, quality control methods (QCM), technological instructions, etc.; to take measures to prevent the distribution of low-quality, falsified and unregistered medicinal products.

PLO 23 – Determine the main chemical and pharmaceutical characteristics of medicinal products of natural and synthetic origin; select and/or develop quality control methods for their standardization using physical, chemical, physicochemical, biological, microbiological and pharmaco-technological methods in accordance with current requirements.

As a result of studying the academic discipline, a higher education applicant must:

Know:

- chemical and pharmacological classification of medicines;
- international non-proprietary names of medicinal substances and preparations of which they are a part;
- basic patterns of the structure-activity relationship, approaches to adequate replacement of drugs;
- the main pathways of drug metabolism, optimal conditions for the action of prodrugs;
- the most common dangers of chemical interactions of drugs with each other and with food, which can impair bioavailability, safety and efficacy;
- chemical foundations of the rational use of medicines;
- state regulation of the quality of medicines;
- qualitative analysis of cations and anions, methods of qualitative and quantitative analysis of medicinal products;
- elemental analysis and analysis by functional groups;
- chemical titrimetric analysis methods;
- gravimetric analysis method, chromatographic identification methods, spectral analysis methods, etc.;

- purity research methods;
- methods of prevention and rapid detection of possible falsification of medicines.

Be able to:

- determine the belonging of a medicinal product to a pharmacological group taking into account the chemical structure, make recommendations regarding the possible replacement of a medicinal product within the pharmacological group;
- provide qualified pharmaceutical care to patients, taking into account the physical, physicochemical and chemical properties of medicines;
- determine possible drug interactions when used together and provide recommendations to prevent them;
- provide information to the patient regarding the possible adverse effects of food on the action of the medicinal product;
- determine optimal conditions for storing medicines;
- provide recommendations to the pharmacist during the manufacture of medicines regarding possible chemical incompatibility and ways to avoid it;
- use analytical documentation that regulates the quality of medicines (State Pharmacopoeia, International Pharmacopoeia, national and regional pharmacopoeias, QCM, relevant orders and instructions);
- use industry standards and methodological guidelines when implementing quality control methods for substances and medicinal products;
- use chemical, physical, physico-chemical methods in quality control of medicines;
- select and perform express methods for qualitative and quantitative analysis of in-pharmacy manufactured dosage forms;
- provide a qualified assessment of the quality of medicines according to the results of the analysis.

3. CONTENT OF THE COURSE

Topic 1. Subject and tasks of pharmaceutical chemistry, history of development. System of assessment of quality of medicines. State Pharmacopoeia of Ukraine, its structure.

- composition constancy as a necessary condition for all stages of the existence of a medicinal product;
- features of pharmaceutical analysis related to the intended purpose of medicinal products and the professional responsibility of a pharmacist;
- state principles and regulations regulating the quality of medicinal products. organization of quality control of medicinal products in Ukraine;
- modern strategies for creating innovative medicinal products;
- pharmacopoeial analysis.

Topic 2. Identification of medicinal substances of inorganic nature.

- cation identification reactions;
- anion identification reactions;
- determination of the purity of medicinal substances;
- determination of turbidity and color;
- determination of acidity, alkalinity and pH of the medium.

Topic 3. Identification of organic medicinal substances by functional groups (functional analysis).

- identification of unsaturated hydrocarbons;
- identification of halogen-containing compounds;
- identification of alcohol, enol and phenol hydroxyl;
- identification of carboxyl, aldehyde and ketone groups;
- identification of ether and ester groups;
- identification of amino, imino, nitro, imido, hydrazo groups;
- identification of thiol, thione, sulfo and sulfamide groups.

Topic 4. Reasons for changing the structure of a medicinal substance. Nature and character of impurities.

- exposure to light, moisture, temperature and other factors;
- methods for detecting impurities.

Topic 5. Methods of quantitative analysis of drug content. Gravimetry.

- classification of methods;
- standardization of titrant solutions;
- methods for determining the end point of titration;
- classification of indicators;
- classification of gravimetric analysis methods.

Topic 6. Methods of quantitative analysis of medicinal products. Acid-base titration.

- classification of titrants in aqueous and non-aqueous media;
- methods for determining the end point of titration depending on the nature of the solvent;
- acidimetry in aqueous and non-aqueous media;
- alkalimetry in aqueous and non-aqueous media.

Topic 7. Methods of quantitative analysis of medicinal products. Redox titration methods.

- permanganometry;
- iodometry;
- iodometry;
- bromatometry;
- nitritometry;
- cerimetry;
- dochromatometry.

Topic 8. Methods of quantitative analysis of medicinal products. Complexometry. Precipitation titration.

- conditions for quantitative analysis by precipitation methods;
- argentometry, Mohr's method;
- argentometry, Fayance-Khodakov method;
- thiocyanatometry;
- conditions for quantitative analysis by complexation methods;
- complexometry;
- metallochrome indicators.

Topic 9. Optical methods in the quantitative analysis of medicinal products.

- determination of the refractive index (refractive index);
- determination of optical rotation (polarimetry).

Topic 10. The use of spectroscopic methods in pharmaceutical analysis of drugs.

- basic laws of light absorption;
- classification of spectroscopic methods;
- features of the use of standard samples of medicinal substances and standard spectra.

Topic 11. Chromatographic methods.

- paper chromatography;
- liquid chromatography;
- gas-liquid chromatography;
- ion-exchange chromatography;
- high-performance liquid chromatography.

Topic 12. Express analysis of medicines. Current trends in the development of pharmaceutical analysis.

- express analysis of monocomponent drugs.
- express analysis of multicomponent drugs.
- express analysis of drugs. Analysis of an unknown drug.

Topic 13. Principles of classification of drugs, their nomenclature. Structure-activity relationship in the creation and analysis of drugs. Stages of drug creation.

- classification according to ATC;
- general principles of drug naming;
- establishing a relationship between effect and structure taking into account physicochemical properties;
- the influence of chemical and spatial structure on biological activity;
- the concept of pharmacophore groups;
- QSAR and QSPR modeling methods in the creation of medicinal substances;
- the method of simple chemical modification.

Topic 14. The main pathways of drug metabolism. Prodrugs.

- localization of metabolism in the body;
- phases of metabolism;
- main types of reactions that occur during phases I and II of metabolism;
- factors that affect metabolic processes;
- strategy of prodrugs and antimetabolites.

Topic 15. Nonsteroidal anti-inflammatory drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 16. Narcotic analgesics and their analogues.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 17. Sleep aids.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 18. Anesthesia products.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 19. Psychotropic drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 20. Anticonvulsants and antiepileptic drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 21. Drugs for the treatment of Parkinsonism.

- characteristics, classification;

- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 22. Emetics and antiemetics.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 23. Antitussives.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 24. Nootropic drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 25. Antihistamines.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 26. Agents that affect the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 27. Agents that reduce the sensitivity of afferent nerve fibers. Agents for local anesthesia.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 28. Agents that affect the efferent nervous system. Agents that act on cholinergic processes.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 29. Agents that act primarily on adrenergic processes.

- characteristics, classification;
- relationship between structure and pharmacological action;

- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 30. Cardiotonics.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 31. Antiarrhythmic drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 32. Means that improve blood supply to organs and tissues.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 33. Peripheral vasodilators.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 34. Calcium ion antagonists. Potassium channel activators.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 35. Agents that affect the renin-angiotensin system.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 36. Hypotensive and hypertensive drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 37. Angioprotectors.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 38. Antioxidants.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 39. Hypolipidemic agents.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 40. Diuretics.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 41. Agents that affect platelet aggregation and blood clotting.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 42. Antiseptics and disinfectants.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 43. Antibiotics of heterocyclic structure. Inhibitors of β -lactamases.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 44. Antibiotics tetracyclines and macrolides.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 45. Aminoglycoside antibiotics, amphenicols, other groups of antibiotics.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 46. 8-Hyxoquinoline, quinoxaline and nitrofurane derivatives.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;

- application in medicine.

Topic 47. Sulfonamides.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 48. Derivatives of naphthyridine and quinolone carboxylic acids.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 49. Anti-tuberculosis drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 50. Drugs used to treat cancer (alkylating agents, antimetabolites, alkaloids, antibiotics, hormonal agents and their antagonists, other groups).

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 51. Examples of “targeted” anticancer drugs (drugs of different chemical groups).

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 52. Antivirals.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 53. Antimalarials.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 54. Antifungal drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 55. Drugs for the treatment of protozoal infections.

- characteristics, classification;

- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 56. Anthelmintic agents.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 57. Anti-pediculosis and acaricidal agents.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 58. Thyroid hormone medications, antithyroid drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 59. Pancreatic hormone medications.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 60. Antidiabetic drugs.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 61. Steroid hormones. Corticosteroids.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 62. Androgens, anabolic steroids and their analogues.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 63. Progestogens, estrogens. Contraceptives. Estrogens of non-steroidal structure.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 64. Water-soluble vitamins.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 65. Fat-soluble vitamins.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 66. Drugs that affect immune processes (immunotropic agents).

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 67. Anorexigenic agents. Sorbents, antidotes and complexing agents. Antiulcer drugs. Drugs for the treatment of alcoholism.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

Topic 68. Radiocontrast and other diagnostic agents.

- characteristics, classification;
- relationship between structure and pharmacological action;
- mechanism of action, methods of obtaining;
- methods of analysis;
- application in medicine.

4. STRUCTURE OF THE ACADEMIC DISCIPLINE

Topic names	Number of hours of full-time study			
	Total	including		
		lectures	practical	IWS
Topic 1. Subject and tasks of pharmaceutical chemistry, history of development. System of assessment of quality of medicines. State Pharmacopoeia of Ukraine, its structure.	5	2	2	1
Topic 2. Identification of medicinal substances of inorganic nature.	7	2	4	1
Topic 3. Identification of organic medicinal substances by functional groups (functional analysis).	9	2	6	1
Topic 4. Reasons for changing the structure of a medicinal substance. Nature and character of impurities, methods for their detection.	5	0	4	1
Topic 5. Methods of quantitative analysis of drug content. Gravimetry.	8	2	4	2
Topic 6. Methods of quantitative analysis of medicinal products. Acid-base titration.	10	2	6	2
Topic 7. Methods of quantitative analysis of medicinal products. Redox titration methods.	10	2	6	2
Topic 8. Methods of quantitative analysis of medicinal products. Complexometry. Precipitation titration.	10	2	6	2
Topic 9. Optical methods in the quantitative analysis of medicinal products.	8	2	2	4
Topic 10. The use of spectroscopic methods in pharmaceutical analysis of drugs.	8	1	2	5
Topic 11. Chromatographic methods.	9	1	4	4
Тема 12. Express analysis of medicines. Current trends in the development of pharmaceutical analysis.	7	2	0	5
Topic 13. Principles of classification of drugs, their nomenclature. Structure-activity relationship in the creation and analysis of drugs. Stages of drug creation.	8	4	0	4
Topic 14. The main pathways of drug metabolism. Prodrugs.	5	2	0	3
Topic 15. Nonsteroidal anti-inflammatory drugs.	8	2	4	2
Topic 16. Narcotic analgesics and their analogues.	6	2	2	2
Topic 17. Sleep aids.	6	2	2	2
Topic 18. Anesthesia products.	8	2	4	2
Topic 19. Psychotropic drugs.	11	2	6	3
Topic 20. Anticonvulsants and antiepileptic drugs.	7	2	4	1
Topic 21. Drugs for the treatment of Parkinsonism.	3	0	0	3
Topic 22. Emetics and antiemetics.	6,5	0,5	4	2
Topic 23. Antitussives.	4,5	0,5	2	2
Topic 24. Nootropic drugs.	3,5	0,5	1	2
Topic 25. Antihistamines.	7,5	0,5	3	2
Differential credit.	2	0	2	0
Topic 26. Agents that affect the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers.	4	1	2	1
Topic 27. Agents that reduce the sensitivity of afferent nerve fibers. Agents for local anesthesia.	6	1	4	1
Topic 28. Agents that affect the efferent nervous system. Agents that act on cholinergic processes.	6	1	4	1
Topic 29. Agents that act primarily on adrenergic processes.	6	1	4	1
Topic 30. Cardiotonics.	3,5	0,5	2	1
Topic 31. Antiarrhythmic drugs.	3,5	0,5	2	1
Topic 32. Means that improve blood supply to organs and tissues.	3,5	0,5	2	1
Topic 33. Peripheral vasodilators.	1,5	0,5	0	1
Topic 34. Calcium ion antagonists. Potassium channel activators.	3,5	0,5	2	1
Topic 35. Agents that affect the renin-angiotensin system.	3,5	0,5	2	1
Topic 36. Hypotensive and hypertensive drugs.	3,5	0,5	2	1
Topic 37. Angioprotectors.	2	0	1	1
Topic 38. Antioxidants.	3,5	0,5	2	1
Topic 39. Hypolipidemic agents.	0,5	0	0	0,5
Topic 40. Diuretics.	7	2	4	1
Topic 41. Agents that affect platelet aggregation and blood clotting.	6,5	0	6	0,5
Topic 42. Antiseptics and disinfectants.	11	2	8	1
Topic 43. Antibiotics of heterocyclic structure. Inhibitors of β -lactamases.	3,5	0,5	2	1
Topic 44. Antibiotics tetracyclines and macrolides.	2,5	0,5	1	1
Topic 45. Aminoglycoside antibiotics, amphenicols, other groups of antibiotics.	3	1	1	1
Topic 46. 8-Hyxoquinoline, quinoxaline and nitrofurans derivatives.	2,5	0,5	1	1
Topic 47. Sulfonamides.	4	1	2	1
Topic 48. Derivatives of naphthyridine and quinolone carboxylic acids.	3,5	0,5	2	1
Topic 49. Anti-tuberculosis drugs.	3	0,5	2	0,5

Topic 50. Drugs used to treat cancer (alkylating agents, antimetabolites, alkaloids, antibiotics, hormonal agents and their antagonists, other groups).	3	0,5	0	2,5
Topic 51. Examples of "targeted" anticancer drugs (drugs of different chemical groups).	3	0	0	3
Topic 52. Antivirals.	2,5	0,5	0	2
Topic 53. Antimalarials.	2,5	0,5	0	2
Topic 54. Antifungal drugs.	2,5	0,5	0	2
Topic 55. Drugs for the treatment of protozoal infections.	2,5	0,5	0	2
Topic 56. Anthelmintic agents.	2,5	0,5	0	2
Topic 57. Anti-pediculosis and acaricidal agents.	2,5	0,5	0	2
Differential credit.	2	0	2	0
Topic 58. Thyroid hormone medications, antithyroid drugs.	9	1	4	4
Topic 59. Pancreatic hormone medications.	5	1	0	4
Topic 60. Antidiabetic drugs.	11	0	6	5
Topic 61. Steroid hormones. Corticosteroids.	11	2	8	1
Topic 62. Androgens, anabolic steroids and their analogues.	7	2	2	3
Topic 63. Progestogens, estrogens. Contraceptives. Estrogens of non-steroidal structure.	11	2	6	3
Topic 64. Water-soluble vitamins.	15	4	10	1
Topic 65. Fat-soluble vitamins.	8	4	4	0
Topic 66. Drugs that affect immune processes (immunotropic agents).	3	0	0	3
Topic 67. Anorexigenic agents. Sorbents, antidotes and complexing agents. Antiulcer drugs. Drugs for the treatment of alcoholism.	6	4	0	2
Topic 68. Radiocontrast and other diagnostic agents.	4	0	0	4
Total hours	390	80	180	130

5. TOPICS OF LECTURES / SEMINARS / PRACTICAL / LABORATORY CLASSES

5.1. Lecture topics

№ i/o	Topic name	Number of hours
1.	Lecture 1. Subject and tasks of pharmaceutical chemistry, history of development. System of quality assessment of medicinal products. State Pharmacopoeia of Ukraine, its structure.	2
2.	Lecture 2. Methods for identifying inorganic medicinal products.	2
3.	Lecture 3. Methods for identifying organic medicinal products by functional groups.	2
4.	Lecture 4. Methods of quantitative analysis of medicinal products. Classification of methods. Gravimetric analysis.	2
5.	Lecture 5. Methods of quantitative analysis of medicinal products. Acid-base titration.	2
6.	Lecture 6. Methods of quantitative analysis of medicinal products. Methods of redox titration.	2
7.	Lecture 7. Methods of quantitative analysis of medicinal products. Complexometry. Precipitation titration.	2
8.	Lecture 8. Physical methods of analysis in the identification of medicinal products.	2
9.	Lecture 9. Physico-chemical methods of analysis in the identification of medicinal products.	2
10.	Lecture 10. Express analysis of medicines. Modern trends in the development of pharmaceutical analysis.	2
11.	Lecture 11. Principles of classification of drugs, their nomenclature. Structure-activity relationship.	2
12.	Lecture 12. Main pathways of drug metabolism. Prodrugs.	2
13.	Lecture 13. Fundamentals of the strategy for creating new synthetic medicinal compounds.	2
14.	Lecture 14. Nonsteroidal anti-inflammatory drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2

15.	Lecture 15. Narcotic analgesics and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
16.	Lecture 16. Anesthetics. Psychotropic drugs. Neuroleptics. Antidepressants. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
17.	Lecture 17. Psychotropic drugs. Tranquilizers. Sedatives. Psychostimulants. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
18.	Lecture 18. Psychotropic and hypnotic drugs. Drugs derived from barbituric acid. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
19.	Lecture 19. Anticonvulsants and antiepileptic drugs. Drugs for the treatment of Parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
20.	Lecture 20. Emetics and antiemetics. Antitussives. Nootropic drugs. Antihistamines. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
21.	Lecture 21. Agents that affect the afferent nervous system. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
22.	Lecture 22. Agents that affect the efferent nervous system. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
23.	Lecture 23. Cardiotonic, Antiarrhythmic agents. Agents that improve blood supply to organs and tissues. Peripheral vasodilators. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
24.	Lecture 24. Calcium ion antagonists. Antioxidants. Agents affecting the renin-angiotensin system. Hypo- and hypertensive agents. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine	2
25.	Lecture 25. Drugs that affect the excretory system (diuretics). Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
26.	Lecture 26. Antiseptics and disinfectants. Anti-pediculosis and acaricidal agents. Characteristics, classification, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
27.	Lecture 27. Antibiotics. Characteristics, classification, structure-action relationship, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
28.	Lecture 28. Antimicrobial drugs. Sulfonamides. Derivatives of naphthyridine and quinolonecarboxylic acids. Derivatives of 8-oxyquinoline, quinoxaline and nitrofuril. Characteristics, classification, structure-action relationship, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2

29.	Lecture 29. Anti-tuberculosis drugs. Drugs for the treatment of cancer. Antiviral and antimalarial drugs. Characteristics, classification, structure-action relationship, mechanism of action, methods of preparation, analysis methods, application in medicine	2
30.	Lecture 30. Antifungal drugs. Drugs for the treatment of protozoal infections. Anthelmintic drugs. Characteristics, classification, structure-action relationship, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
31.	Lecture 31. Thyroid hormone drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
32.	Lecture 32. Steroid hormones and their analogues: corticosteroids and their synthetic analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
33.	Lecture 33. Steroid hormones and their analogues: gestagens, androgens and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
34.	Lecture 34. Steroid hormones and their analogues: estrogens and their analogues, synthetic compounds with estrogenic action. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
35.	Lecture 35. Aliphatic vitamins. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
36.	Lecture 36. Vitamins of the alicyclic and aromatic series. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
37.	Lecture 37. Heterocyclic vitamins: chroman derivatives, rutin, pyridine derivatives. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
38.	Lecture 38. Heterocyclic vitamins: pyrimidine and thiazole derivatives, isoalloxazine derivatives, pterin derivatives, corin derivatives. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
39.	Lecture 39. Anorexigenic agents. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
40.	Lecture 40. Antiulcer drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
<i>Number of lecture hours in the discipline</i>		80

5.2. Seminar topics

Seminars are not provided

5.3. Topics of practical classes

№ i/o	Topic name	Number of hours
1.	Subject and tasks of pharmaceutical chemistry. System of assessment of quality of medicines. Constancy of composition as a necessary condition of all stages of existence of a medicine.	2
2.	Identification of medicinal substances of inorganic nature according to the SPhU.	2
3.	Laboratory work: Analysis of cations and anions	2
4.	Analysis of medicinal substances for the limit level of ion impurities.	2
5.	Laboratory work: Analysis for the limit level of ion impurities.	2
6.	Identification of medicinal substances of organic nature by functional groups (functional analysis).	2
7.	Laboratory work: Analysis by functional groups	2
8.	Solving situational and test tasks on the Analysis of medicinal substances of inorganic nature and functional analysis.	2
9.	Methods of analysis of the quantitative content of medicinal products.	2
10.	Gravimetric analysis of medicinal products.	2
11.	Titrimetric methods of analysis. Classification of methods. Acid-base titration in an aqueous medium.	2
12.	Acid-base titration in a non-aqueous medium.	2
13.	Laboratory work: Quantitative determination of hydrochloric acid.	2
14.	Titrimetric precipitation methods. Complexation methods.	2
15.	Laboratory work: Quantitative determination of the substance Sodium chloride by Mohr's method.	2
16.	Laboratory work: Quantitative determination of Magnesium sulfate by complexometry.	2
17.	Redox titration.	2
18.	Laboratory work: Quantitative determination of 3% hydrogen peroxide solution by permanganometry.	2
19.	Solving situational and test problems on Methods of quantitative analysis of the content of medicinal products.	2
20.	Spectral methods of drug analysis. Optical methods of drug analysis.	2
21.	Laboratory work: Quantitative determination of Glucose solution for injection 40% 20 ml by polarimetry.	2
22.	Chromatographic methods for the analysis of medicinal products.	2
23.	Solving situational and test problems on Physico-chemical methods of analysis.	2
24.	Nonsteroidal anti-inflammatory drugs (NSAIDs). Sodium salicylate, acetylsalicylic acid, metamizole sodium, butadione, paracetamol, diclofenac sodium, ibuprofen, mefenamic acid.	2
25.	Laboratory work: Analysis of Analgin tab. 500 mg.	2
26.	Narcotic analgesics and their analogues. Morphine hydrochloride, codeine, codeine phosphate, fentanyl, promedol.	2
27.	Sleep aids. Barbituric acid derivatives, chloral hydrate, bromide.	2
28.	Anesthesia agents. Medical ether, fluorothane, nitrous oxide, thiopental sodium, hexenal.	2
29.	Solving situational and test tasks on the pharmaceutical analysis of Nonsteroidal anti-inflammatory drugs, Narcotic analgesics, Sleeping pills, and Anesthetics.	2

30.	Psychotropic drugs. Part 1. Neuroleptics: phenothiazine derivatives, chlorprothixene, haloperidol. Antidepressants: imizin, amitriptyline, nialamide, transamine.	2
31.	Psychotropic drugs. Part 2. Tranquilizers: benzodiazepine derivatives, meprotran, amisil. Analeptics: racemic camphor, nikethamide (cordyamine).	2
32.	Psychotropic drugs. Part 3. Sedatives: sodium and potassium bromide. Psychostimulants: phenamine, pyridrol, caffeine-sodium benzoate, cocaine hydrochloride.	2
33.	Anticonvulsants and antiepileptics. Phenobarbital, carbamazepine, diphenin, clonazepam, hexamidine, sodium valproate.	2
34.	Solving situational and test tasks on the pharmaceutical analysis of psychotropic drugs, anticonvulsants and antiepileptic drugs, drugs for the treatment of Parkinsonism.	2
35.	Emetics and antiemetics. Emetics: copper sulfate pentahydrate, zinc sulfate heptahydrate. Antiemetics: scopolamine, diprazine, etaperazine, triphthazine.	2
36.	Laboratory work: Analysis of the substance Copper sulfate pentahydrate.	2
37.	Cough remedies. Codeine, Codeine phosphate, ethylmorphine hydrochloride, libexin, ambroxol hydrochloride.	2
38.	Nootropics. Piracetam, GABA, aminalon, picamilon, glycine, glutamic acid. Antihistamines. Diphenhydramine (diphenhydramine hydrochloride), suprastin, diazolin, diprazine, loratadine.	2
39.	Laboratory work: Analysis of Diphenhydramine solution for intravenous use 1% 1 ml.	2
40.	Differential credit.	2
41.	Agents that stimulate afferent nerve fiber receptors. Antacids, enveloping and astringent agents: Aluminum hydroxide, Magnesium oxide, Magnesium carbonate basic, Bismuth nitrate basic. Adsorbents: Activated charcoal	2
42.	Agents that stimulate afferent nerve fiber receptors. Expectorants: Terpin hydrate, Sodium benzoate, Acetylcysteine. Irritants: Racemic menthol, Validol. Laboratory work: Analysis of the substance Sodium benzoate.	2
43.	Agents that reduce the sensitivity of afferent nerve fibers. Agents for local anesthesia. Esters of p-aminobenzoic acid: Benzocaine, Procaine hydrochloride. Derivatives of acetanilide: Lidocaine hydrochloride. Arylamides of piperidinecarboxylic acids: Bupivacaine hydrochloride, Articaine hydrochloride	2
44.	Agents affecting the efferent nervous system. Agents acting on cholinergic processes. Agents acting on cholinergic receptors. Cholinomimetics: Pilocarpine hydrochloride. Reversible anticholinesterase agents: Neostigmine methylsulfate. Irreversible anticholinesterase agents: Armin	2
45.	Agents that affect the efferent nervous system. Agents that act on cholinergic processes. Anticholinergics (anticholinergics). m-Anticholinergics: Atropine sulfate, Scopolamine hydrobromide, Platyphylline hydrotartrate, Loperamide hydrochloride n-Anticholinergics: Pachycarpine hydroiodide, Hexamethonium benzosulfonate	2
46.	Agents that act primarily on adrenergic processes. Adrenomimetics: Epinephrine, Norepinephrine, Phenylephrine hydrochloride, Ephedrine hydrochloride	2
47.	Agents that act primarily on adrenergic processes. Adrenomimetics: Naphazoline nitrate, Clonidine hydrochloride, Salbutamol. Adrenoblockers (adrenolytics): Propranolol hydrochloride, Atenolol	2
48.	Cardiotonic agents. Cardiac glycosides: Digoxin. Non-glycoside cardiotonic agents: dopamine, dobutamine, amrinone. Solving situational and test tasks on	2

	pharmaceutical analysis of agents that stimulate receptors of afferent nerve fibers, agents that affect the efferent nervous system, agents that act mainly on adrenergic processes, cardiogenic agents.	
49.	Antiarrhythmics. Procainamide hydrochloride, Amiodarone. Means that improve blood supply to organs and tissues. Nitrovasodilators: Glycerol trinitrate solution, Pentaerythryl tetranitrate, Eritit	2
50.	Calcium ion antagonists. Nifedipine, Verapamil hydrochloride, Amlodipine, Diltiazem hydrochloride. Potassium channel activators. Minoxidil, Diazoxide	2
51.	Agents that affect the renin-angiotensin system. Hypotensive (antihypertensive) agents. Angiotensin-converting enzyme (ACE) inhibitors: Captopril, Enalapril maleate. Antispasmodics: Papaverine hydrochloride, Drotaverine hydrochloride, Dibazol. Laboratory work: Analysis of Dibazol hydrochloride.	2
52.	Antihypertensives. Adrenaline tartrate, noradrenaline hydrotartrate, mezaton	2
53.	Angioprotectors. Antioxidants. Ascorbic acid, Rutin, Nicotinic acid, Tocopherol acetate, Retinol acetate, Thiothiazolin. Laboratory work: Analysis of Ascorbic acid.	2
54.	Solving situational and test tasks Antiarrhythmic drugs, Drugs that improve blood supply to organs and tissues, Calcium ion antagonists, Drugs that affect the renin-angiotensin system, Hypotensive drugs, Hypertensive drugs, Angioprotectors, Antioxidants.	2
55.	Diuretics. Saluretics: Chlorthiazide, hydrochlorothiazide, Furosemide, Indapamide, Ethacrynic acid. Aldosterone antagonists (potassium-sparing): Spironolactone	2
56.	Diuretics. Osmotic diuretics: Potassium acetate, Mannitol, Urea, Ammonium chloride. Xanthine derivative diuretics: Euphylline, Theophylline, Theobromine. Laboratory work: Analysis of Euphylline Solution 2.4%.	2
57.	Agents that affect platelet aggregation and blood clotting. Antiplatelet agents: Acetylsalicylic acid. Anticoagulants: Neodicoumarin, Heparin	2
58.	Agents that affect platelet aggregation and blood clotting. Hemostatics: Vikasol. Antifibrinolytics: Aminocaproic acid. Laboratory work: Analysis of acetylsalicylic acid.	2
59.	Solving situational and test tasks on the pharmaceutical analysis of hypolipidemic agents, antiatherosclerotic agents, diuretic agents, agents that affect platelet aggregation and blood clotting.	2
60.	Antiseptics and disinfectants. Halogens and halogen-containing agents: Chloramine, Iodine, Alcoholic iodine solution 5, 10%, Triiodomethane (Iodoform). Oxidizing agents: Hydrogen peroxide solution 3, 30%, Potassium permanganate. Laboratory work: Analysis of Hydrogen peroxide solution 3%	2
61.	Antiseptics and disinfectants. Acids and alkalis: Benzoic acid, Salicylic acid, Boric acid, Sodium tetraborate. Aldehydes: Formaldehyde solution 35%. Alcohols: Ethanol 96%. Laboratory work: Analysis of the substance Benzoic acid	2
62.	Antiseptics and disinfectants. Heavy metal salts: Silver nitrate, Copper sulfate pentahydrate, Zinc oxide, Zinc sulfate heptahydrate. Phenols: Phenol, Resorcinol, Phenyl salicylate. Dyes: Ethacridine lactate. Laboratory work: Analysis of the substance Copper sulfate pentahydrate	2
63.	Solving situational and test tasks on pharmaceutical analysis of antiseptics and disinfectants. Laboratory work: Analysis of the substance Resorcinol.	2
64.	Antibiotics of heterocyclic structure. β -lactamase inhibitors. Penicillins. Cephalosporins.	2

65.	Antibiotics tetracyclines and macrolides, aromatic series. Tetracyclines. Macrolides: Erythromycin. Antibiotics aromatic series: Chloramphenicol, Chloramphenicol stearate, Chloramphenicol succinate soluble.	2
66.	Antibiotics of aminoglycoside structure, amphenicols, other groups of antibiotics. Lincomycins. Antibiotics – aminoglycosides: Streptomycin sulfate, Kanamycin monosulfate, Gentamicin sulfate. Derivatives of 8-oxyquinoline and nitrofurantoin. Derivatives of 8-hydroxyquinoline: Nitroxoline. Derivatives of nitrofurantoin: Nitrofurantoin, Furazolidone. Laboratory work: Analysis of the substance Nitrofurantoin	2
67.	Derivatives of sulfanilic acid amides. General characteristics. Sulfanilamides: Sulfanilamide, Sodium Sulfacetamide (Albucid), Sulfathiazole (Norsulfazol), Phthalylsulfathiazole (Phtalazol)	2
68.	Anti-tuberculosis drugs. Derivatives of isonicotinic acid hydrazide: Isoniazid, Ftivazid. Derivatives of p-aminosalicylic acid: Sodium para-aminosalicylate. Laboratory work: Analysis of Isoniazid.	2
69.	Derivatives of naphthyridine and quinolone carboxylic acids. Ofloxacin, Norfloxacin, Ciprofloxacin hydrochloride, Lomefloxacin hydrochloride. Solving situational and test tasks on pharmaceutical analysis of Antibiotics, 8-hydroxyquinoline derivatives, Nitrofurantoin derivatives, Sulfanilamides, Antituberculosis drugs.	2
70.	Differential credit.	2
71.	Thyroid hormone drugs, antithyroid drugs. Thyroid hormone drugs: Thyroxine, Triiodothyronine, Thyroidin. Drugs used for hypothyroidism: Potassium iodide. Antithyroid drugs: Iodine, Diiodotyrosine, Mercazolil (thiamazole).	2
72.	Laboratory work: Analysis of the substance Potassium iodide.	2
73.	Antidiabetic drugs. Sulfonylurea derivatives: Butamide, Chlorpropamide, Bucarban, Glibenclamide. Biguanides: Metformin hydrochloride, Buformin.	2
74.	Laboratory work on the topic: "Antidiabetic drugs"	2
75.	Solving situational and test tasks on the pharmaceutical analysis of thyroid hormone drugs, antithyroid drugs, pancreatic hormone drugs, and antidiabetic drugs.	2
76.	Steroid hormones and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of preparation, methods of analysis, application in medicine.	2
77.	Adrenal cortex hormones and their synthetic analogues. Corticosteroids. Mineralocorticosteroids: Deoxycorticosterone acetate. Glucocorticosteroids: Cortisone acetate, Hydrocortisone acetate. Synthetic analogues of glucocorticosteroids: Prednisolone, Dexamethasone, Triamcinolone, Flumethasone pivalate	2
78.	Laboratory work: Analysis of Prednisolone tab. 5 mg.	2
79.	Laboratory work: Analysis of Cortisone acetate tab. 25 mg.	2
80.	Androgens, anabolic steroids and their analogues: Testosterone propionate, Methyltestosterone. Semi-synthetic and synthetic anabolic agents: Methandienone, Nandrolone phenylpropionate.	2
81.	Progestins, estrogens. Contraceptives. Estrogens of non-steroidal structure. Estrogenic hormones: Estradiol dipropionate, Estradiol dipropionate. Estrogens of non-steroidal structure: Sinestrol, Diethylstilbestrol. Progestin hormones: Progesterone, Pregnin	2
82.	Laboratory work: Analysis of Sinestrol solution for injection, oil. 2% 1 ml.	2
83.	Solving situational and test problems on the pharmaceutical analysis of steroid hormones and their analogues.	2

84.	Water-soluble vitamins. Part 1: Ascorbic acid, Calcium pangamate, Calcium pantothenate, Nicotinic acid, Nicotinamide.	2
85.	Laboratory work: Analysis of the substance Ascorbic Acid.	2
86.	Water-soluble vitamins. Part 2: Pyridoxine hydrochloride, Thiamine hydrobromide and hydrochloride, Folic acid, Riboflavin, Rutin.	2
87.	Laboratory work: Analysis of Thiamine hydrochloride solution for intravenous administration 50 mg/ml 1 ml.	2
88.	Laboratory work: Analysis of Pyridoxine hydrochloride solution for intravenous use 50 mg/ml 1 ml.	2
89.	Fat-soluble vitamins: Retinol acetate, Ergocalciferol, Tocopherol acetate, Vikasol.	2
90.	Solving situational and test problems on the pharmaceutical analysis of Vitamins.	2
Number of hours of practical classes in the discipline		180

6. INDEPENDENT WORK OF A HIGHER EDUCATION STUDENT

№ i/o	Topic name / types of tasks	Number of hours
1.	Subject and tasks of pharmaceutical chemistry. System of assessment of quality of medicines. Stability of composition as a necessary condition of all stages of existence of a medicine. Features of pharmaceutical analysis are connected with the intended purpose of medicines and professional responsibility of the pharmacist. Pharmacopoeial analysis.	1
2.	Identification of medicinal substances of inorganic nature.	1
3.	Identification of medicinal substances of organic nature by functional groups (functional analysis).	1
4.	Reasons for changes in the structure of a medicinal substance (exposure to light, moisture, temperature and other factors. Nature and character of impurities, methods for their detection.	1
5.	Methods of quantitative analysis of the content of medicinal products. Gravimetry.	2
6.	Methods of quantitative analysis of medicinal products. Acid-base titration.	2
7.	Methods of quantitative analysis of medicinal products. Methods of redox titration.	2
8.	Methods of quantitative analysis of medicinal products. Complexometry. Precipitation titration.	2
9	Optical methods in quantitative analysis: refractometry, polarimetry, UV and IR spectrophotometry, photometry in the visible region of the spectrum.	4
10.	The use of spectroscopic methods in pharmaceutical analysis of drugs.	5
11.	Chromatographic methods.	4
12.	Express analysis of medicines. Modern trends in the development of pharmaceutical analysis.	5
13.	Principles of classification of drugs, their nomenclature. Structure-activity relationship in the creation and analysis of drugs.	4
14.	The main pathways of drug metabolism. Chemical reactions underlying metabolic transformations. Phases of metabolism. Factors influencing metabolic processes. Prodrugs.	3
15.	Nonsteroidal anti-inflammatory drugs.	2
16.	Narcotic analgesics and their analogues.	2
17.	Sleep aids.	2
18.	Anesthetic agents.	2

19.	Psychotropic drugs.	3
20.	Anticonvulsants and antiepileptic drugs.	1
21.	Drugs for the treatment of Parkinsonism.	3
22.	Emetics and antiemetics.	2
23.	Means for the treatment of cough.	2
24.	Nootropic drugs.	2
25.	Antihistamines.	2
26.	Agents that affect the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers.	1
27.	Agents that reduce the sensitivity of afferent nerve fibers. Agents for local anesthesia.	1
28.	Drugs that affect the efferent nervous system. Drugs that act on cholinergic processes.	1
29.	Agents that act primarily on adrenergic processes.	1
30.	Cardiotonic agents.	1
31.	Antiarrhythmic drugs.	1
32.	Means that improve blood supply to organs and tissues.	1
33.	Peripheral vasodilators.	1
34.	Calcium ion antagonists. Potassium channel activators.	1
35.	Agents that affect the renin-angiotensin system.	1
36.	Hypotensive (antihypertensive) drugs. Hypertensive drugs.	1
37.	Angioprotectors.	1
38.	Antioxidants	1
39.	Hypolipidemic agents.	0,5
40.	Diuretics.	1
41.	Agents that affect platelet aggregation and blood clotting.	0,5
42.	Antiseptics and disinfectants	1
43.	Antibiotics of heterocyclic structure. β -lactamase inhibitors.	1
44.	Antibiotics tetracyclines and macrolides.	1
45.	Antibiotics of aminoglycoside structure, amphenicols, other groups of antibiotics.	1
46.	Derivatives of 8-oxyquinoline, quinoxaline and nitrofurans.	1
47.	Sulfonamides.	1
48.	Derivatives of naphthyridine and quinolonecarboxylic acids.	1
49.	Anti-tuberculosis drugs.	0,5
50.	Medicines used to treat cancer (alkaloids, antibiotics, hormonal agents and their antagonists, other groups).	2,5
51.	Examples of "targeted" anticancer drugs (drugs of different chemical groups).	3
52.	Antiviral drugs.	2
53.	Antimalarial drugs.	2
54.	Antifungal medications.	2
55.	Drugs for the treatment of protozoal infections.	2
56.	Anthelmintic agents.	2
57.	Anti-pediculosis and acaricidal agents.	2
58.	Thyroid hormone medications, antithyroid drugs.	4
59.	Pancreatic hormone medications.	4
60.	Antidiabetic drugs.	5
61.	Steroid hormones and their analogues. Corticosteroids.	1
62.	Androgens, anabolic steroids and their analogues.	3
63.	Progestogens, estrogens. Contraceptives. Estrogens of non-steroidal structure.	3
64.	Vitamins are water-soluble.	1

65.	Fat-soluble vitamins.	0
66.	Drugs that affect immune processes (immunotropic agents).	3
67.	Anorexigenic agents. Sorbents, antidotes and complexing agents. Antiulcer drugs. Drugs for the treatment of alcoholism.	2
68.	X-ray contrast agents and other diagnostic tools.	4
Total:		130

7. FORMS AND METHODS OF TEACHING

Forms of education:

The discipline is taught in the form of practical classes; organization of independent work of the applicant.

Methods of learning:

Practical classes: conversation, role-playing games, solving situational problems, solving test problems.

Independent work: independent work with the textbook, independent work with recommended basic and additional literature, with electronic information resources, independent solution of clinical tasks.

8. FORMS OF CONTROL AND CRITERIA FOR ASSESSING LEARNING OUTCOMES

Forms of current control: oral interview, testing, assessment of practical skills, assessment of communication skills during role-playing, solving situational tasks, assessment of activity in the lesson.

Final control form: exam.

Criteria for assessing the learning outcomes of higher education applicants during current control

Assessment	Assessment criteria
Excellent «5»	The applicant actively participates in the discussion of the most complex 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 draws up a protocol.
Good «4»	The applicant participates in the discussion of the most complex questions on the topic, gives at least 75% of correct answers to standardized test tasks, makes some minor errors in answers to written tasks, performs practical work and draws up a protocol.
Satisfactory «3»	The applicant participates in the discussion of the most complex questions on the topic, gives at least 60% of correct answers to standardized test tasks, makes significant errors in answers to written tasks, performs practical work and draws up a protocol.
Unsatisfactory «2»	The applicant does not participate in the discussion of complex questions on the topic, gives less than 60% of correct answers to standardized test tasks, makes gross errors 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.

Only those applicants who have fulfilled the requirements of the curriculum in the discipline, have no academic debt, and their average score for current academic activity in the discipline is not less than 3.00 are allowed to take the final test.

The exam, as a form of final (semester) control, takes place as a separate control measure. Exams are taken by applicants: during the examination sessions at the end of the semester (autumn and spring) according to the schedule - with the tape system of training; according to the schedule

of the educational process after studying the educational component according to the curriculum - with the cyclical schedule of classes.

The methodology for conducting final (semester) control of the educational component in the form of an exam is unified and involves the use of standardized forms. The number of questions that are put on a standardized exam corresponds to the number of credits allocated for studying the academic discipline. The form of the examination ticket is standardized and consists of structural elements (components). The examination ticket may consist only of theoretical questions or with the addition of a situational task. Each ticket may contain from 3 to 5 questions. The questions are short, simple, understandable, clear and transparent, composed in such a way that a full answer to it takes no more than 5 minutes. The timing of the oral structured exam is standard - no more than 30 minutes. A checklist (answer template) is compiled for each question, which provides for key points that are mandatory for providing a full answer to the question posed. Each standard answer is accompanied by a literary source with pages. During an oral structured exam, the candidate sees the question, the teacher sees a checklist with standard answers and determines which components were or were not named by the candidate.

The overall score for the oral structured exam is calculated as the arithmetic average of all scores received for the answers to the questions (including situational tasks).

Criteria for assessing the learning outcomes of higher education applicants during final control

Assessment	Assessment criteria
Excellent «5»	The applicant worked systematically throughout the semester, demonstrated versatile and deep knowledge of the program material during the exam, is able to successfully complete the tasks provided for by the program, has mastered the content of the main and additional literature, has realized the interrelationship of individual sections of the discipline, their importance for the future profession, has demonstrated creative abilities in understanding and using the educational program material, has demonstrated the ability to independently update and replenish knowledge; the level of competence is high (creative);
Good «4»	The applicant has demonstrated full knowledge of the curriculum material, successfully performs the tasks provided for by the program, has mastered the basic literature recommended by the program, has shown a sufficient level of knowledge in the discipline and is capable of independently updating and renewing it in the course of further study and professional activity; the level of competence is sufficient (constructive-variative)
Satisfactory «3»	An applicant who has demonstrated knowledge of the basic curriculum material to the extent necessary for further study and subsequent work in the profession, copes with the tasks provided for by the program, made individual errors in the answers to the exam and when performing exam tasks, but has the necessary knowledge to overcome the errors made under the guidance of a scientific and pedagogical worker; the level of competence is average (reproductive)
Unsatisfactory «2»	The applicant did not demonstrate sufficient knowledge of the main educational and program material, made fundamental errors in performing the tasks provided for by the program, cannot use the knowledge in further study without the help of a teacher, and failed to master the skills of independent work; the level of competence is low (receptive-productive)

9. DISTRIBUTION OF POINTS RECEIVED BY HIGHER EDUCATION STUDENTS

Points in the academic discipline for applicants who have successfully completed the

program are converted into a traditional four-point scale according to the absolute criteria given in the table:

National assessment for discipline	Total points for the discipline
Excellent («5»)	185 – 200
Good («4»)	151 – 184
Satisfactory («3»)	120 – 150
Unsatisfactory («2»)	Lower 120

A *multi-point scale (200-point scale)* characterizes the actual success of each applicant in mastering the academic discipline. The conversion of the traditional assessment into a 200-point one is performed by the University's information and technology department using the "Contingent" program according to the appropriate formula: Average score of success (current success in the discipline) x 40.

According to the *ECTS rating scale*, the achievements of the students in the academic discipline who are studying in the same course of the same specialty are evaluated, according to the points they received, by means of ranking, namely:

ECTS grade	Statistical indicator
A	The best 10% of achievers
B	Next 25% of achievers
C	Next 30% of achievers
D	Next 25% of achievers
E	Next 10% of achievers

The ECTS scale establishes the applicant's belonging to the group of the best or worst among the reference group of fellow students (faculty, specialty), that is, his rating. When converting from a multi-point scale, as a rule, the boundaries of the grades "A", "B", "C", "D", "E" do not coincide with the boundaries of the grades "5", "4", "3" according to the traditional scale. The grade "A" on the ECTS scale cannot be equal to the grade "excellent", and the grade "B" - to the grade "good", etc. Applicants who received grades "FX" and "F" ("2") are not included in the list of ranked applicants. Such applicants automatically receive an "E" grade after retaking. The "FX" grade is given to applicants who have scored the minimum number of points for current educational activities, but who have not passed the final test. A grade of "F" is given to students who attended all classroom classes in the academic discipline, but did not achieve a grade point average (3.00) for current academic activities and were not admitted to the final examination.

10. METHODOLOGICAL SUPPORT

- Syllabus of the academic discipline;
- Work program of the academic discipline;
- Methodological recommendations for practical classes;
- Methodological recommendations for independent work of higher education applicants;
- Multimedia presentations;
- Illustrative materials;
- Situational tasks.

11. QUESTIONS FOR PREPARATION FOR THE FINAL TEST

1. Analysis of physicochemical properties of medicinal products as one of the elements of assessing the quality of medicinal products. Organoleptic analysis, assessment of medicinal

product solubility as a general indicative characteristic of the test substance. Use of physical constants (relative density, viscosity, boiling/melting point, solidification) in testing medicinal products.

2. Identification of medicinal substances of inorganic nature. Reactions for identifying cations of aluminum, ammonium, potassium, sodium, calcium, magnesium, zinc and iron (II, III).
3. Identification of medicinal substances of inorganic nature. Reactions for identifying cations of antimony, bismuth, mercury, silver, arsenic, lead.
4. Identification of medicinal substances of inorganic nature. Reactions for identifying anions of chlorine, bromine, iodine.
5. Identification of medicinal substances of inorganic nature. Reactions for identification of sulfates, sulfites, nitrates, nitrites, phosphates, carbonates, hydrocarbons.
6. Identification of organic medicinal substances by functional groups (functional analysis). Reactions for identification of primary alcohols, polyhydric alcohols, secondary alcohols, phenols.
7. Identification of organic medicinal substances by functional groups (functional analysis). Reactions for identification of aldehydes, ketones, carboxylic acids, amides.
8. Identification of organic medicinal substances by functional groups (functional analysis). Reactions for identification of double bonds, covalently bonded halogen atoms, ethers, esters.
9. Identification of organic medicinal substances by functional groups (functional analysis). Reactions for identification of primary, secondary and tertiary aromatic amines.
10. Identification of organic medicinal substances by functional groups (functional analysis). Reactions for the identification of primary, secondary and tertiary aliphatic amines and primary, secondary aliphatic nitro compounds. Reactions for the identification of aromatic nitro compounds.
11. Tests for inorganic ion impurities. Conditions and chemistry of reactions for detecting ammonium and arsenic ions.
12. Tests for inorganic ion impurities. Conditions and chemistry of reactions for detecting potassium, calcium and magnesium ions.
13. Tests for inorganic ion impurities. Conditions and chemistry of reactions for detecting iron, aluminum, zinc and heavy metal ions.
14. Tests for inorganic ion impurities. Conditions and chemistry of reactions for detecting chlorides, fluorides, sulfates, phosphates.
15. Methods for quantitative analysis of the content of medicinal products. Gravimetric analysis (gravimetry).
16. Titrimetric methods of analysis. Method of acid-base titration in aqueous and non-aqueous media.
17. Titrimetric methods of analysis. Argentometry, complexometry.
18. Titrimetric methods of analysis. Mercurimetry, permanganometry, bromatometry.
19. Titrimetric methods of analysis. Iodometry, iodometry, cerimetry.
20. Titrimetric methods of analysis. Dichromatometry, nitritometry. Potentiometric titration.
21. Nonsteroidal anti-inflammatory drugs. Sodium salicylate, Acetylsalicylic acid, Paracetamol. Synthesis. Characteristics, classification. Pharmaceutical analysis.
22. Nonsteroidal anti-inflammatory drugs. Metamizole sodium, Butadion, Diclofenac sodium. Synthesis. Characteristics, classification. Pharmaceutical analysis.

23. Narcotic analgesics and their analogues. Morphine hydrochloride, Codeine, Fentanyl, Promedol. Characteristics, classification. Pharmaceutical analysis.
24. Sleeping pills. Barbiturates: Phenobarbital, Barbitol, Chloral hydrate, Bromizoval. Synthesis. Characteristics, classification. Pharmaceutical analysis.
25. Anesthetics. Medical ether, Fluorothane, Nitrous oxide, Thiopental sodium, Hexenal. Synthesis. Characteristics, classification. Pharmaceutical analysis.
26. Psychotropic drugs. Neuroleptics: Phenothiazines (Aminazine, Tryftazine), Chlorprothixene, haloperidol. Synthesis. Characteristics, classification. Pharmaceutical analysis.
27. Psychotropic drugs. Antidepressants: Imisin, Amitriptyline, Nialamide, Transamine. Synthesis. Characteristics, classification. Pharmaceutical analysis.
28. Psychotropic drugs. Tranquilizers: Benzodiazepines (Diazepam, Nitrazepam, Phenazepam).
29. Psychotropic drugs. Sedatives: sodium and potassium bromide. Psychostimulants: phenamine, pyridrol, caffeine-sodium benzoate, cocaine. Characteristics, classification. Pharmaceutical analysis.
30. Anticonvulsants and antiepileptics. Characteristics, classification. Pharmaceutical analysis. Phenobarbital, Carbamazepine, Diphenin, Clonazepam, Hexamidine, Sodium valproate.
31. Emetics and antiemetics. Emetics: Copper sulfate, Zinc sulfate. Antiemetics: Scopolamine, Diprazine, Etaperazin, Tryftazine. Characteristics, classification. Pharmaceutical analysis.
32. Cough remedies. Codeine, Ethylmorphine. Characteristics, classification. Pharmaceutical analysis.
33. Nootropics. Piracetam, GABA, Ainalon, Picamilon, Glycine. Characteristics, classification. Pharmaceutical analysis.
34. Antihistamines. Diphenhydramine, Suprastin, Diazolin, Diprazine. Characteristics, classification. Pharmaceutical analysis.
35. Agents that stimulate afferent nerve fiber receptors. Antacids, enveloping and astringent agents: Aluminum hydroxide, Magnesium oxide, Magnesium carbonate basic, Bismuth nitrate basic. Characteristics, classification. Pharmaceutical analysis.
36. Agents that stimulate afferent nerve fiber receptors. Expectorants: Terpin hydrate, Sodium benzoate, Acetylcysteine. Irritants: racemic menthol, validol. Characteristics, classification. Pharmaceutical analysis.
37. Agents that reduce the sensitivity of afferent nerve fibers. Agents for local anesthesia. Esters of p-aminobenzoic acid: Benzocaine, Procaine hydrochloride. Acetanilide derivatives: Lidocaine hydrochloride. Characteristics, classification. Pharmaceutical analysis.
38. Agents that act on cholinergic processes. Cholinomimetics: Pilocarpine hydrochloride. Reversible anticholinesterase drugs: Neostigmine methylsulfate. Irreversible anticholinesterase drugs: Armin. Characteristics, classification. Pharmaceutical analysis.
39. Agents that act mainly on adrenergic processes. Adrenomimetics: Epinephrine, Norepinephrine, Phenylephrine hydrochloride, Ephedrine hydrochloride. Adrenoblockers (adrenolytics): Propranolol hydrochloride, Atenolol. Characteristics, classification. Pharmaceutical analysis.
40. Agents that improve blood supply to organs and tissues. Nitrovasodilators: Glycerol trinitrate solution, Pentaerythrityl tetranitrate, Erinite. Characteristics, classification. Pharmaceutical analysis.

41. Agents affecting platelet aggregation and blood clotting. Antiplatelet agents: Acetylsalicylic acid. Anticoagulants: Neodicoumarin. Hemostatics: Vikasol. Characteristics, classification. Pharmaceutical analysis.
42. Agents affecting the renin-angiotensin system. Hypotensive (antihypertensive) agents. Angiotensin-converting enzyme (ACE) inhibitors. Characteristics, classification, extraction, pharmaceutical analysis. Captopril, enalapril maleate.
43. Agents affecting the renin-angiotensin system. Antispasmodics. Characteristics, classification, extraction, pharmaceutical analysis. Papaverine hydrochloride, drotaverine hydrochloride, dibazole.
44. Hypertensive agents. Characteristics, extraction, pharmaceutical analysis. Adrenaline tartrate, noradrenaline hydrotartrate, mezaton.
45. Angioprotectors. Antioxidants. Characteristics, classification, extraction, pharmaceutical analysis. Ascorbic acid, rutin, nicotinic acid, tocopherol acetate, retinol acetate.
46. Antioxidants. Characteristics, classification, extraction, pharmaceutical analysis. Rutin, tocopherol acetate, retinol acetate.
47. Diuretics. Characteristics, classification, extraction, pharmaceutical analysis. Chlorthiazide, hydrochlorothiazide, furosemide.
48. Diuretics. Characteristics, classification, extraction, pharmaceutical analysis. Potassium acetate, ephylline, theophylline, theobromine.
49. Antiseptics and disinfectants. Characteristics, classification, extraction, pharmaceutical analysis. Halogens and halogen-containing agents: chloramine, iodine, alcohol iodine solution 5, 10%, triiodomethane (Iodoform).
50. Antiseptics and disinfectants. Characteristics, classification, extraction, pharmaceutical analysis. Oxidizing agents: hydrogen peroxide solution 3, 30%, potassium permanganate.
51. Antiseptics and disinfectants. Acids and alkalis: Benzoic acid, Salicylic acid, Boric acid, Sodium tetraborate. Synthesis. Characteristics, classification. Pharmaceutical analysis.
52. Antiseptics and disinfectants. Aldehydes: Formaldehyde solution 35%. Alcohols: Ethanol 96%. Synthesis. Characteristics, classification. Pharmaceutical analysis.
53. Antiseptics and disinfectants. Heavy metal salts: Silver nitrate, Cupric sulfate pentahydrate, Zinc oxide, Zinc sulfate heptahydrate. Synthesis. Characteristics, classification. Pharmaceutical analysis.
54. Antiseptics and disinfectants. Phenols: Phenol, Resorcinol, Phenyl salicylate. Dyes: Ethacridine lactate. Synthesis. Characteristics, classification. Pharmaceutical analysis.
55. Heterocyclic antibiotics. Penicillins. Characteristics, classification. Pharmaceutical analysis of Benzylpenicillin sodium salt, Amoxicillin trihydrate.
56. Heterocyclic antibiotics. Cephalosporins. Characteristics, classification. Pharmaceutical analysis of Cephalexin, Cefotaxime sodium salt.
57. Tetracycline antibiotics. Characteristics, classification, pharmaceutical analysis.
58. Macrolide antibiotics. Erythromycin. Characteristics, pharmaceutical analysis.
59. Aromatic antibiotics. Levomycetin. Characteristics. Synthesis. Pharmaceutical analysis.
60. Lincosamide antibiotics: Lincomycin. Aminoglycoside antibiotics: Streptomycin sulfate, Gentamicin sulfate.
61. Nitrooline, Nitrofur, Furazolidone. Characteristics, synthesis, pharmaceutical analysis.
62. Sulfanilamide, Albucid, Norsulfazole, Phtalazole. Characteristics, synthesis, pharmaceutical analysis.

63. Antituberculosis drugs. Characteristics, classification. Isoniazid, Ftivazid. Synthesis, pharmaceutical analysis.
64. Antituberculosis drugs. Characteristics, classification. p-aminosalicylic acid: Sodium p-aminosalicylate. Synthesis, pharmaceutical analysis.
65. Drugs used for the treatment of cancer. Myelosan, Fluorouracil, Fluorofur, Cyclophosphamide, Sarcolysin. Synthesis, pharmaceutical analysis.
66. Corticosteroids: Hydrocortisone acetate, Prednisolone, Dexamethasone, Triamcinolone. Characteristics, synthesis, pharmaceutical analysis.
67. Estrogens: Ethinylestradiol, Sinestrol. Characteristics, synthesis, pharmaceutical analysis.
68. Antivirals. Nucleoside analogues: Acyclovir. Characteristics, synthesis, pharmaceutical analysis.
69. Antivirals. Adamantane derivatives: Midantane, Remantadine. Characteristics, synthesis, pharmaceutical analysis.
70. Drugs for the treatment of protozoal infections: Metronidazole, Hingamine. Characteristics, synthesis, pharmaceutical analysis.
71. Antimalarials: Quinine hydrochloride, Quinine sulfate, Furazolidone. Characteristics, synthesis, pharmaceutical analysis.

12. RECOMMENDED LITERATURE

Basic:

1. Pharmaceutical analysis: навч. посіб. для студ. вищ. навч. закл. / V.A. Georgiyants, P.O. Bezugly, I.V. Ukrainets [et al.]; edited by V.A. Georgiyants. – Kharkiv : NUPh: , 2018. – 400 p.
2. Pharmaceutical chemistry. Section 2.3. Analysis of medicines of the hormone group: study and methodical guide for 4th year students of the specialty "Pharmacy, Industrial Pharmacy" / K. Shabelnik, N. Derevianko, S. Borsuk. – Zaporizhzhia: ZSMPhU, 2024. - 104 p.
3. Pharmaceutical Chemistry. Analysis of the Medicinal Substances according to Functional Groups: study guide (III—IV a. 1.) / O.O. Tsurkan, I.V. Nizhenkovska, O.O. Hlushachenko. – 2018. – 152 p.
4. Pharmaceutical, Biological and Chemical Patents. RA Dr. Marco Stief, LL.M., RiOLG Prof. Dr. Maximilian Haedicke, LL.M., Dr. Annelie Wünsche. Nomos, 1. Edition 2025, 1200 p.

Additional:

1. 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.
2. Коновалова О.Ю., Геращенко І.І., Джан Т.В., Гуртовенко І.О., Гудзенко Н.В., Рибак Л.М. Фармацевтична хімія. Навчальний посібник для студентів вищих медичних та фармацевтичних навчальних закладів III-IV рівнів акредитації. - К.: Книга-плюс, 2023. - 384 с.
3. Фармацевтична хімія / П.О. Безуглий, В.А. Георгіянц, І.С. Гриценко, І.В. та ін.: за ред. П.О. Безуглого. – Вінниця: Нова книга, 2017. – 456 с.
4. Фармацевтичний аналіз : Підручник / П. О. Безуглий, В. А. Георгіянц, Р. Б. Лесик та ін. ; за заг. ред. В. А. Георгіянц. – Харків : Вид-во НФаУ : Золоті сторінки, 2019. – 568 с.

5. Фармацевтична хімія. Загальна та спеціальна фармацевтична хімія. Лікарські засоби неорганічної природи: лабораторно-практичні заняття. Навчальний посібник / Л.Г. Мішина. – Вінниця: ПП «ТД «Едельвейс і К»», 2010. – 384 с.
6. Туркевич М., Владзімірська О., Лесик Р. Фармацевтична хімія (стероїдні гормони, їх синтетичні замінники і гетероциклічні сполуки як лікарські засоби). Підручник. – Вінниця: Нова Книга, 2003. – 464 с.
7. Цуркан О.О. Фармацевтична хімія. Аналіз лікарських речовин за функціональними групами: навч. посіб. / О.О. Цуркан, І.В. Ніженковська, О.О. Глушаченко. – К.: ВСВ «Медицина», 2012. – 152 с.
8. 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.
9. 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.

13. INFORMATION RESOURCES

1. Materials in the ONMedU information system
https://info.odmu.edu.ua/chair/pharmaceutical_chemistry/files/214/ua
2. [Компендіум - лікарські препарати](#)
3. [European Pharmacopoeia \(Ph. Eur.\)](#)
4. [DrugBank онлайн](#)