

Danylo Halytsky Lviv National Medical University

Department of Pharmaceutical, Organic and Bioorganic Chemistry

APPROVED

The first vice-rector for scientific and
pedagogical work
prof. Mechyslav Gzhegotskyi

“ ” _____ 2021

WORKING PROGRAM OF THE DISCIPLINE
Pharmaceutical chemistry
training of specialists of the second (master's) level of higher education
field of knowledge 22 "Health"
specialty 226 "Pharmacy, industrial pharmacy"

Discussed and approved
at the methodical meeting of the
department of pharmaceutical, organic
and bioorganic chemistry
Protocol № 1
from "31" August 2021
Head of Department
prof. Lesyk R.

Approved
profile methodical commission
in pharmaceutical disciplines
Protocol № 3
from "31" August 2021
Chairman of the profile methodical
commission
assoc. prof. Bilous S.

Working curriculum of discipline Pharmaceutical Chemistry for 3-4th year students of the Faculty of Pharmacy, studying in the specialty 226 "Pharmacy" compiled by prof. Lesyk R, assoc prof. Sementsiv G., assoc prof. Kryshchyshyn-Dylevych A., senior lect. Novikevych OT on the basis of the sample program of the elective discipline modern methods of research of biological systems, approved by the State Institution "Central Methodical Cabinet for Higher Medical Education of the Ministry of Health of Ukraine" and the curriculum approved by the profile methodical commission (protocol №3 from 31.08.2021)

Changes and additions to the curriculum for the academic discipline for 2021-2022 academic year

| № | Contents of changes (additions) | Date and № protocol of the meeting | Notes |
|----------|--|---|--------------|
| | None | | |
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Head of Department
Prof. Lesyk Roman

(підпис)

INTRODUCTION

The program of study of the discipline "Pharmaceutical Chemistry" compiled in accordance with the requirements of the draft Standard of Higher Education of Ukraine second (master's) level of knowledge 22 Healthcare specialty 226 "Pharmacy, industrial pharmacy", specialization 226.01 "Pharmacy", educational program of master of pharmacy, approximate curriculum in the discipline "Pharmaceutical Chemistry".

Description of the discipline (abstract)

The discipline "Pharmaceutical Chemistry" belongs to the obligatory disciplines of the cycle of professionally-oriented training of specialists in the specialty "Pharmacy". Pharmaceutical chemistry, as a science based on the general laws of chemical sciences, studies the methods of production and creation, structure, chemical and physical properties of drugs, the relationship between chemical structure and action on the body, methods of quality control and changes in storage. The discipline "Pharmaceutical Chemistry" is the basis for the study of drugs, understanding their action and practical activities of specialists in pharmaceutical specialties.

The program is made according to requirements of the project of the standard of higher education of Ukraine for a specialty 226 "Pharmacy, industrial pharmacy". According to the "Model curriculum for training specialists of the second (master's) level of higher education in the field of knowledge 22" Health "in higher educational institutions of the Ministry of Health of Ukraine in Specialty 226" Pharmacy "qualification educational" Master of Pharmacy "from July 26, 2016 and on the basis of approximate training programs in the discipline "Pharmaceutical Chemistry". The study of the discipline is carried out in 3-4 courses, the study of which is allocated: 420 hours (lectures - 32 hours, practical classes - 74 hours, independent work - 314 hours).

The program is divided into two content blocks: Pharmaceutical Analysis and Special Pharmaceutical Chemistry. The program is designed so that during the academic year, the current and final control of knowledge and the implementation of four semester tests. The program contains the necessary list of knowledge, skills and abilities, taking

into account the international requirements for the credit transfer system, international regulations and standards governing the professional activities and training of masters of pharmacy.

| The structure of the discipline | The number of credits, hours | | | Self-study | Year of study | Type of control |
|---------------------------------|------------------------------|------------|-------------------|------------|---|-------------------------|
| | Total Credit hours | Auditorium | | | | |
| | | Lectures | Practical classes | | | |
| Pharmaceutical chemistry | 14,0 credits ECTS / 420 h. | 32 | 74 | 314 | 3 th -4 th year (V – VIII semesters) | 4 credits, credit, exam |
| за семестрами | | | | | | |
| Pharmaceutical analysis | 3,5 credits ECTS / 105 h. | 8 | 20 | 77 | V semester | 1 credit, credit |
| Pharmaceutical chemistry | 3,5 credits ECTS / 105 h. | 8 | 18 | 79 | VI semester | 1 credit, credit |
| Pharmaceutical chemistry | 3,5 credits ECTS / 105 h | 8 | 18 | 79 | VII semester | 1 credit, credit |
| Pharmaceutical chemistry | 3,5 credits ECTS / 105 h | 8 | 18 | 79 | VIII semester | 1 credit, exam |

The subject of study of the discipline is chemical structure of drugs, their physical and chemical properties; the relationship between chemical structure and action on the body, methods of quality control and changes that occur during storage and metabolism, as well as methods of production and purification of drugs, biologically active compounds and their metabolites.

Interdisciplinary links: general and inorganic chemistry, organic and bioorganic chemistry, analytical chemistry, biophysics, biology, biological chemistry, normal physiology, pathological physiology, pharmacology, toxicological chemistry, pharmacognosy, drug technology, clinical pharmacy, drug standardization.

1. The purpose and objectives of the discipline

1.1. *The purpose of teaching the discipline "Pharmaceutical Chemistry" is:* to 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, patterns of relationship 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.

1.2. *The main objectives of the discipline "Pharmaceutical Chemistry" are:* acquiring skills in providing quality pharmaceutical care to patients, taking into account knowledge of physical, physicochemical and chemical properties of drugs, the basic patterns of "structure-activity", avoiding possible drug interactions in the process their manufacture and use, establishing the quality of individual drugs, their multicomponent mixtures and ensuring their proper storage, acquiring knowledge of the basic methods of synthesis of drugs or extraction from natural raw materials; in the field of pharmaceutical analysis.

1.3. *Competences and learning outcomes*, the formation of which is facilitated by the discipline (relationship with the normative content of training of higher education seekers, formulated in terms of learning outcomes in the Standard of Higher Education).

In accordance with the requirements of the Standard of Higher Education, the discipline provides students with the acquisition of competencies:

- *general*: ЗК2; ЗК6; ЗК11; ЗК12.

- *professional*: ФК 4; ФК 7; ФК 12; ФК 19; ФК 20

Деталізація компетентностей відповідно до дескрипторів НРК у формі «Матриці компетентностей».

Матриця компетентностей

| № | Competence | Knowledge | Skills | Communication | Autonomy and responsibility |
|---|--|---|---|------------------------------------|--|
| 1 | ЗК 2. Ability to apply knowledge in practical situations | Know the methods of knowledge realization in solving practical issues | Be able to use professional knowledge to solve practical situations | Establish links with practitioners | Be responsible for the timeliness of decisions |

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| 2 | 3K 6. Knowledge and understanding of the subject area and understanding of the profession. | Know the structure and features of professional activity | Be able to carry out professional activities that require updating and integration of knowledge | To form a communication strategy in professional activity | Be responsible for professional development with a high level of autonomy |
| 3 | 3K 11. Ability to evaluate and ensure the quality of work performed. | Know assessment methods performance indicators | Be able to ensure the quality of professional work | Establish connections to ensure quality work | Be responsible for the quality of work |
| 4 | 3K 12. Ability to conduct research at the appropriate level | Know the components of the system health care, research planning and evaluation | Search for scientific sources of information; to make a choice of methods of carrying out scientific research; use methods of mathematical analysis and modeling, theoretical and experimental research in pharmacy. | Use information from data from scientific sources | Be responsible for the development and implementation of planned projects |
| 5 | ФК 4. Ability to ensure the rational use of prescription and over-the-counter drugs and other pharmaceutical products in accordance with the physicochemical, pharmacological characteristics, biochemical, pathophysiological features of a particular disease and pharmacotherapeutic regimens for its treatment | Know: the chemical structure of drugs; main groups of biologically active substances of medicinal plant raw materials; connection "chemical structure - pharmacological action"; mechanism of action, pharmacological effects, indications for the use of drugs; characteristic features of certain pharmacological and pharmacotherapeutic groups; clinical and biopharmaceutical features of different dosage forms; new dosage forms of prolonged action. Therapeutic drug delivery systems; characteristics of types of action and routes of administration of drugs; the influence of endogenous factors (genetic, age and sexual anatomical and physiological features of man, diseases of individual organs and systems) on the pharmacokinetics and pharmacodynamics (pharmacological and | Conduct a comparative characteristics of drugs, taking into account the chemical structure, mechanism of action and pharmacological properties in order to determine the advantages and disadvantages of individual drugs to provide comparative characteristics of original (innovative) drugs (brands) and their copies - generic drugs, guided by clinical and pharmacological studies, pharmacoeconomic indicators and information database on medicines to justify the optimal choice of drug; determine the advantages and disadvantages of a particular dosage form of specific drugs of different pharmacological groups, taking into account the biopharmaceutical, pharmacokinetic and pharmacological characteristics of the drug, as well as anatomical and physiological characteristics of the patient (age, sex, physical condition, etc.); determine | Obtain the necessary information from identified sources to ensure the conditions for quality and safe pharmaceutical care | Be responsible for the soundness of management decisions to improve the quality of pharmaceutical care |

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| | | <p>toxicological properties) of drugs; basics of pharmacogenetics. The role of hereditary (genetic) pathology in the mechanisms of individual tolerability of drugs; basics of chronopharmacology. The influence of natural and circadian human rhythms on the therapeutic efficacy of drugs; interaction of drugs and food at the stages of absorption, metabolism and excretion; the concept of bioequivalence of drugs and the principles of their clinical study; the concept of original (innovative) drugs and generics. Requirements for generic medicines; modern schemes and directions of pharmacotherapy of the most common diseases; the phenomena arising at repeated and long reception of medicines; pharmacological groups of drugs that can cause drug dependence and mechanisms of its development; basic constitutional types of man and their anomalies; features of functioning of organs and systems at typical pathological processes; clinical manifestations (symptoms and syndromes) of diseases for which drugs are prescribed; biochemical composition of food; biochemistry of enzymes.</p> | <p>the influence of factors that depend on the condition and characteristics of the human body (physiological, pathological etc.) on the processes of absorption, distribution, deposition, metabolism and excretion of the drug, based on the results of the survey and the patient's history; on the basis of anatomical and physiological features of the person, pharmacological properties of medicines and dosage forms to define an optimum mode of administration of medicines (time, multiplicity, duration); to determine the possible effect of food on the pharmacokinetic and pharmacological properties of drugs (time and amount of absorption, duration actions, route of excretion, the possibility of adverse effects, etc.) to increase efficiency and reduce side effects; on the basis of pharmacological and toxicological properties of drugs to determine the possible adverse effects of drugs (manifestations of allergies, hematotoxic and hepatotoxic effects, the emergence of addiction and addiction, etc.) to take measures to prevent them.</p> | | |
| 6 | <p>ФК 7. Ability to ensure proper storage of medicines and other pharmaceutical products in accordance with</p> | <p>Know: classification of drugs and dosage forms; orders of the Ministry of Health of Ukraine on receipt, storage and issuance of poisonous, narcotic and similar</p> | <p>Provide appropriate storage conditions for toxic, narcotic and equivalent drugs, as well as dosage forms with them; provide conditions to prevent adverse effects,</p> | <p>Carry out constant monitoring of proper storage of medicines and medical devices at pharmaceutical enterprises</p> | <p>Be responsible for the storage of medicines and medical devices in accordance with Good Storage Practice (GSP) in</p> |

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| | their physicochemical properties and the rules of Good Storage Practice (GSP) in health care facilities | drugs; physicochemical properties of drugs. Types of containers, closures and packaging materials used in medicine and pharmacy; orders of the Ministry of Health of Ukraine on the organization of storage in pharmacies of various groups of drugs and medical devices; rules of storage of medicinal substances with different physicochemical properties; pharmacological properties of drugs; stability and shelf life of drugs. | taking into account the possible impact of storage conditions on quality of pharmaceutical products, medicinal plant raw materials and medical devices; to control the conditions of storage of raw materials at pharmaceutical enterprises; determine the stability of medicines and medical devices during storage during the established shelf life; to check medicines in which the expiration date has expired for the possibility of extending the term of their further use in medical practice, to issue an appropriate quality passport. | | healthcare facilities |
| 7 | ФК 12. Ability to use in professional activities knowledge of regulations, legislation of Ukraine and recommendations of good pharmaceutical practices. | Know: - the basics of the legal system and pharmaceutical legislation; - basic mechanisms of state regulation of pharmaceutical activity; - principles of organization of pharmaceutical assistance to the population; - basic principles of organization of pharmaceutical supply of the population; - legal and ethical norms of pharmaceutical activity | Use regulations governing pharmaceutical activities in Ukraine and abroad; - monitor and identify changes and additions to domestic pharmaceutical legislation; - compile information on the material and technical base of the pharmacy and organizational documents necessary for their activities; - to form relations with patients and doctors in order to meet the ethical criteria of the WHO and the principles of good pharmacy practice to promote medicines on the market, minimize abuse and misuse of medicines | To form conclusions and professionally apply laws and regulations | Be responsible for the quality and timely use of regulations in professional activities |
| 8 | ФК 19. Ability to organize and control the quality of medicines in accordance with the requirements of the State Pharmacopoeia of Ukraine and good practices, to determine methods of sampling for | Know: - state regulation of the quality of medicines; - kinetics of chemical reactions and catalysis; - rate of chemical reactions and chemical equilibrium; - physicochemical properties of medicinal substances; - methods of qualitative and quantitative analysis of drugs; - analysis of dosage | - determine the presence of foreign substances (impurities) in raw materials and finished products; - to determine the main physical characteristics of drugs (melting point, boiling point and pour point) by physical methods; - determine the main indicators of finished drugs derived from drugs and | Carry out quality control of medicines and their certification | Be responsible for certifying and preventing the spread of counterfeit medicines |

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| <p>control of medicines and to standardize them in accordance with current requirements, to prevent the spread of counterfeit medicines</p> | <p>forms in the production process; - tests for the purity of medicines; - potentiometric analysis; - quality indicators of parenteral, solid, soft and aerosol dosage forms, stability and shelf life of drugs; - analysis of purified water, highly purified water and injection water; - cleaning, processing and disposal of industrial waste</p> | <p>excipients, visual and instrumental methods: transparency; color; pH; refractive index; angle of rotation and density of injection solutions, - to control the purified water, for injections obtained from drinking water, by chemical and instrumental methods, as well as other solvents; - determine the concentration of alcohol in aqueous-alcoholic solutions, using various calculation methods, devices; - to take samples and specimens of medicinal substances, medicinal plant raw materials, auxiliary materials, semi-finished products for analysis, including pyrogen-free and bacteriological analysis; - to issue the corresponding quality passport, to carry out selective serial control of finished goods on conformity of its quality to the analytical documentation for the purpose of prevention of marriage; - to determine the stability of medicines and medical devices during storage during the established shelf life.</p> | | |
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| 9 | <p>ФК 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 pharmacorganoleptic control methods</p> | <p>Know: - qualitative analysis of cations and anions; - drugs of inorganic nature; - elemental analysis and analysis by functional groups; - functional analysis of organic compounds by functional groups; - general methods of analysis of inorganic and organic drug compounds; - chemical titrimetric methods of analysis; - chromatographic methods of identification, study of purity and quantitative content of drugs; - optical activity and specific rotation; - gravimetric method of analysis; - functional analysis of organic compounds; - basic concepts of titrimetric analysis; - spectral methods of analysis</p> | <p>- to determine cations and anions of active substances of inorganic nature in raw materials, intermediate products and finished products by chemical methods; - to determine the functional groups of active substances of organic nature in raw materials, semi-finished products, finished products; - to prepare titrated, working solutions and solutions of indicators from chemical reagents and to establish percentage concentration and molarity by titrimetric and physicochemical methods;</p> | <p>Develop methods of quality control of pharmaceutical products</p> | <p>Be responsible for the validity of the developed quality control methods</p> |
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Learning outcomes:

Integrative final program learning outcomes, the formation of which is facilitated by the discipline:

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 Apply knowledge of general and professional disciplines in professional activities.

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

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

PPH 6 Argue information for decision-making, be responsible for them in standard and non-standard professional situations; adhere to the principles of deontology and ethics in professional activities.

PPH 7 Perform professional activities using creative methods and approaches.

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

PPH 9 Carry out professional activities using information technology, "Information Databases", navigation systems, Internet resources, software and other information and communication technologies.

PPH 12 To analyze the information received as a result of scientific researches, to generalize, systematize and use it in professional activity

PPH 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.

PPH 16 To determine the influence of 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.

PPH 19. To forecast and determine the impact of environmental factors on the quality of medicines and consumer characteristics of other products of the pharmacy range during their storage.

PPH 20 Carry out a set of organizational and managerial measures to provide the population and health care facilities with medicines and other products of the pharmacy range. Carry out all types of accounting in pharmacies, administrative records, processes of commodity analysis.

PPH 24 To plan and implement professional activity on the basis of normative legal acts of Ukraine and recommendations of good pharmaceutical practices.

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

IPPH 31 Carry out all types of quality control of medicines; draw up quality certificates for the batch of the medicinal product and the certificate of analysis, taking into account the requirements of current regulations, the State Pharmacopoeia of Ukraine and the results of quality control. Develop specifications and quality control methods in accordance with the requirements of the current State Pharmacopoeia.

IPPH 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 according to requirements of the State Pharmacopoeia of Ukraine.

Learning outcomes for the discipline:

know:

- chemical and pharmacological classification of drugs;
- international non-proprietary names of medicinal substances and preparations of which they are a part
- The basic laws of the relationship "structure-activity", approaches to adequate replacement of drugs
- the main pathways of drug metabolism, optimal conditions for the action of prodrugs
- the most common hazards of chemical interactions of drugs with each other and with food, which may impair bioavailability, safety and efficacy
- chemical bases of rational use of drugs
- state regulation of the quality of medicines
- methods of qualitative and quantitative analysis of drugs
- qualitative analysis of cations and anions; - elemental analysis and analysis by functional groups; - functional analysis of organic compounds by functional groups; - chemical titrimetric methods of analysis; - chromatographic methods of identification, gravimetric method of analysis; - spectral methods of analysis, etc.);
- methods of purity research;
- methods of prevention and express detection of possible falsification of medicines

be able:

- to determine the affiliation of the drug to the pharmacological group, taking into account the chemical structure, to make recommendations for possible replacement of the drug within the pharmacological group
- provide qualified pharmaceutical care to patients, taking into account the physical, physicochemical and chemical properties of drugs;
- to determine the possible interaction of drugs in their joint use and provide recommendations for its prevention
- provide information to the patient about possible adverse effects on the action of the food product.
- to determine the optimal conditions for storage of drugs.
- provide recommendations to the pharmacist in the manufacture of drugs on possible chemical incompatibilities and ways to avoid it
- use analytical documentation that regulates the quality of medicines (State Pharmacopoeia, International Pharmacopoeia, national and regional pharmacopoeias, AND, relevant orders and instructions);

- use industry standards, guidelines for the implementation of methods of quality control of substances and drugs;
- use chemical, physical, physico-chemical methods in quality control of medicines;
- choose and perform express methods of qualitative and quantitative analysis of dosage forms of intra-pharmacy manufacturing;
- to give a qualified assessment of the quality of medicines in accordance with the results of the analysis.

1. Information volume of the discipline

13.0 ECTS credits, 390 hours are allocated for the study of the academic discipline.

Discipline structure:

Pharmaceutical analysis

Drug quality assessment system, Comprehensive drug quality assessment: methods of identification, establishment of purity and quantitative content of drugs

Special pharmaceutical chemistry

Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of production, methods of analysis, use in medicine, metabolism, storage conditions of drugs from specific pharmacological groups.

3. The structure of the discipline

| Topic | Lectures | Practical (seminar) classes | Self-study | Individual work | |
|---|-------------------------|-----------------------------|------------|-----------------|--|
| PHARMACEUTICAL ANALYSIS | | | | | |
| Subject and tasks of pharmaceutical chemistry. Drug quality assessment system. Consistency of the composition as a necessary condition for all stages of existence of the drug. | 0,5 | 1,5 | - | - | |
| Peculiarities of pharmaceutical analysis are related to the purpose of drugs and the professional responsibility of the pharmacist. Pharmacopoeial analysis | 0,5 | 1,5 | 7 | | |
| Analysis of physicochemical properties of drugs as one of the elements of drug quality assessment. | 0,5 | 1,5 | 7 | | |
| The use of spectroscopic and chromatographic methods in the identification of drugs; features of use of standard samples of medicinal substances and standard spectra. | 0,5 | 1,5 | 7 | | |
| Identification of medicinal substances of inorganic nature by cations. | 0,5 | 1,5 | 7 | | |
| Identification of drugs of organic nature by functional groups (functional analysis) | 0,5 | 1,5 | 7 | | |
| Causes that cause changes in the structure of the drug (exposure to light, moisture, temperature and other factors provided by the conditions and terms of storage). Nature and nature of impurities, methods of their detection. | 0,5 | 1,5 | 7 | | |
| Methods of quantitative analysis of drug content. Gravimetry. | 0,5 | 1,5 | 7 | | |
| Methods of quantitative analysis of drug content. Titrimetric methods. | 1 | 3,5 | 7 | | |
| Optical methods in quantitative analysis of drugs | 0,5 | 1,5 | 7 | | |
| Chromatographic methods, electrophoresis. Methods based on thermodynamic properties of substances: Combination of extraction, chromatographic and optical methods in the analysis of dosage forms. | 0,5 | 1,5 | 7 | | |
| Express analysis of drugs. Current trends in the development of pharmaceutical analysis. | 2 | 1,5 | 7 | | |
| Total | 8 | 20 | 77 | | |
| Final control | 1 credit, credit | | | | |
| Special pharmaceutical chemistry | | | | | |

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| Principles of classification of drugs, their nomenclature. Relationship structure-activity in the creation and analysis of drugs. | 0,5 | 1 | 5 | |
| The main ways of drug metabolism. Chemical reactions that underlie metabolic transformations. Metabolic phases. Factors influencing metabolic processes. Prodrugs. | 0,5 | 1 | 5 | |
| Nonsteroidal anti-inflammatory drugs. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Narcotic analgesics and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 0,5 | 2 | 5 | |
| Hypnotics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. means. | 0,5 | 1 | 5 | |
| Remedies for anesthesia. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Psychotropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Anticonvulsants and antiepileptics. Remedies for parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Vomiting and antiemetics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Remedies for cough. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Nootropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 2 | 5 | |

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| Antihistamines. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Agents affecting the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Means that reduce the sensitivity of afferent nerve fibers. Means for local anesthesia. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Drugs that affect the efferent nervous system. Agents acting on cholinergic processes. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Means that act mainly on adrenergic processes. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Total | 8 | 18 | 79 | |
| Final control | 1credit, credit | | | |
| Cardiotonic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Antiarrhythmic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Drugs that improve blood supply to organs and tissues. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 2 | 4 | |
| Peripheral vasodilators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |

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| Calcium ion antagonists. Potassium channel activators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 5 | |
| Drugs affecting the renin-angiotensin system Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 5 | |
| Antihypertensive (antihypertensive) drugs. Hypertensive drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Angioprotectors. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Antioxidants. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Hypolipidemic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 1 | 5 | |
| Diuretics. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Agents that affect platelet aggregation and blood clotting. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Antibiotics of heterocyclic structure. B-lactamase inhibitors. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |

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| Tetracycline antibiotics and macrolides. Characteristics, classification, connection between structure and action, mechanism of action, methods of metabolism, production, methods of analysis, application in medicine | 0,5 | 1 | 5 | |
| Aminoglycoside antibiotics, amphenicols, other groups of antibiotics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Sulfanilamides. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Derivatives of naphthyridine and quinolonecarboxylic acids. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| Total | 8 | 18 | 79 | |
| <i>Final control</i> | 1credit, credit | | | |
| Derivatives of 8-oxyquinoline, quinoxaline and nitrofurane. Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 5 | |
| TB drugs. Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Drugs used to treat cancer (alkaloids, antibiotics, hormonal agents and their antagonists, other groups). Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 5 | |
| Examples of targeted (targeted) anticancer drugs (drugs of different chemical groups). Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,2 5 | 0,5 | 5 | |
| Antiviral drugs. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Antimalarial drugs. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 4 | |

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|--|----------|-----|---|--|
| Drugs for the treatment of protozoal infections. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Anthelmintics. Antifungal drugs Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 0,5 | 4 | |
| Antipediculosis and acaricides. Antiseptics and disinfectants Characteristics, classification, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 4 | |
| Drugs of thyroid hormones, antithyroid drugs. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 4 | |
| Drugs of pancreatic hormones, Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 1 | 4 | |
| Antidiabetic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,2 5 | 1 | 4 | |
| Steroid hormones and their analogues. Corticosteroids. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 1 | 4 | |
| Androgens, anabolic steroids and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 1 | 4 | |
| Progestogens, estrogens. Birth control. Estrogens of non-steroidal structure. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 0,5 | 1 | 4 | |
| Water-soluble and fat-soluble vitamins. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine.. | 0,5 | 1 | 4 | |

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|--|-------------------------|-----------|-----------|--|
| Drugs that affect the immune system (immunotropic drugs). Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Anorexigenic drugs. Sorbents, antidotes and complexes. Antiulcer drugs. Remedies for alcoholism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| X-ray contrast and other diagnostic tools. Characteristics, classification, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 | 1 | 4 | |
| Total | 8 | 18 | 79 | |
| | <i>1 credit, credit</i> | | | |

4. Thematic plan of lectures

| № | TOPIC | HOURS |
|--|---|----------|
| <i>PHARMACEUTICAL ANALYSIS</i> | | |
| 1. | Subject and tasks of pharmaceutical chemistry, history of development. Drug quality assessment system. State Pharmacopoeia of Ukraine, its structure. | 2 |
| 2. | Physico-chemical methods of analysis in the identification of drugs | 2 |
| 3. | Methods of drug identification | 2 |
| 4. | Methods of quantitative analysis of drugs | 2 |
| Разом | | 8 |
| <i>CHEMICAL FUNDAMENTALS OF ACTION OF MEDICINES. MEANS THAT AFFECT THE CNS</i> | | |
| 5. | Principles of classification of drugs, their nomenclature. The structure-activity relationship in the development and analysis of drugs funds. Creation of innovative medicines Main ways drug metabolism. Underlying chemical reactions metabolic transformations. Metabolic phases. Influencing factors on metabolic processes. Prodrugs. | 1 |
| 6. | Nonsteroidal anti-inflammatory drugs, narcotic analgesics and their analogues Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 7. | Drugs for anesthesia. Psychotropic and hypnotic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 8. | Anticonvulsants and antiepileptics. Remedies parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 9. | Vomiting and antiemetics. Antitussives. Nootropic Medicines. Antihistamines. Characteristics, classification, connection between structure and pharmacological action, metabolism, mechanism actions, methods of production, methods of analysis, application in medicine. | 1 |
| <i>MEDICINES AFFECTING THE NERVOUS, CARDIOVASCULAR, EXCLOSURE SYSTEM AND BLOOD COAGULATION SYSTEM</i> | | |
| 10. | Agents affecting the afferent nervous system. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of obtaining, methods of analysis, application in medicine. | 1 |
| 11. | Drugs that affect the efferent nervous system. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 12. | Cardiotonic, Antiarrhythmic drugs. Improving remedies blood supply to organs and tissues. Peripheral vasodilators. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| Total | | 8 |
| 13. | Calcium ion antagonists. Antioxidants. Drugs that affect the renin-angiotensin system. Hypo- and hypertensive drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, | 1 |

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| | methods of production, methods of analysis, application in medicine | |
| 14. | Drugs that affect the excretory system (diuretics). Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| ANTIMICROBIAL PREPARATIONS (CHEMOTHERAPEUTICS AND ANTISEPTICS AND DISINFECTANTS) | | |
| 15. | Antibiotics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 2 |
| 16. | Antimicrobial drugs. Sulfanilamides. Derivatives of naphthyridine and quinolonecarboxylic acids. Derivatives of 8-oxyquinoline, quinoxaline and nitrofur. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 2 |
| 17. | TB drugs. Antiviral and antimalarial drugs. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 18. | Drugs for the treatment of cancer. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| Total | | 8 |
| 19. | Antifungal drugs. Drugs for the treatment of protozoal infections. Anthelmintics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 20. | Antiseptics and disinfectants. Antipediculosis and acaricides. Characteristics, classification, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| MEDICINES THAT AFFECT THE FUNCTIONS OF THE ORGANS, MATERIAL EXCHANGE AND IMMUNITY | | |
| 21. | Drugs of thyroid hormones, antithyroid drugs. Antidiabetic drugs. Drugs of pancreatic hormones, Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 22. | Steroid hormones and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 2 |
| 23. | Sex hormones, anabolic steroids and their analogues. Birth control. Estrogens of non-steroidal structure. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 24. | Vitamins. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 25. | Anorexigenic drugs. Sorbents, antidotes and complexes. Antiulcer drugs. Remedies for alcoholism. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| | | 8 |
| Number of lecture hours in the discipline | | 32 |

5. Thematic plan of practical classes

| № | Topic | Hours |
|---|---|-----------|
| PHARMACEUTICAL ANALYSIS | | |
| 1. | Subject and tasks of pharmaceutical chemistry. Drug quality assessment system. Consistency of the composition as a necessary condition for all stages of existence of the drug. Peculiarities of pharmaceutical analysis are related to the purpose of drugs and the professional responsibility of the pharmacist. Pharmacopoeial analysis | 0,5 |
| 2. | Analysis of physicochemical properties of drugs as one of the elements of drug quality assessment. | 0,5 |
| 3. | The use of spectroscopic and chromatographic methods in the identification of drugs; features of use of standard samples of medicinal substances and standard spectra. | 1 |
| 4. | Identification of medicinal substances of inorganic nature by cations. | 1 |
| 5. | Identification of medicinal substances of inorganic nature by anions. | 2 |
| 6. | Identification of drugs of organic nature by functional groups (functional analysis). | 2 |
| 7. | Causes that cause changes in the structure of the drug (exposure to light, moisture, temperature and other factors provided by the conditions and terms of storage). Nature and nature of impurities, methods of their detection. | 1 |
| 8. | Methods of quantitative analysis of drug content. Gravimetry. | 1 |
| 9. | Titrimetric methods of analysis, part 1 | 1 |
| 10. | Titrimetric methods of analysis, part 2 | 1 |
| 11. | Titrimetric methods of analysis, part 3 | 1 |
| 12. | Optical methods in quantitative analysis of drugs | 1 |
| 13. | Chromatographic methods, electrophoresis. Methods based on thermodynamic properties of substances: Combination of extraction, chromatographic and optical methods in the analysis of dosage forms. | 1 |
| 14. | Express analysis of drugs. Current trends in the development of pharmaceutical analysis. | 1 |
| 15. | Express analysis of monocomponent drugs. | 2 |
| 16. | Express analysis of multicomponent drugs.. | 2 |
| 17. | Final control | 1 |
| Total | | 20 |
| <i>CHEMICAL FUNDAMENTALS OF ACTION OF MEDICINES. MEANS THAT AFFECT THE CNS</i> | | |
| 18. | Principles of classification of drugs, their nomenclature. Relationship structure-activity in the creation and analysis of drugs. The main ways of drug metabolism. Chemical reactions that underlie metabolic transformations. Metabolic phases. Factors influencing metabolic processes. Prodrugs. | 1 |
| 19. | Nonsteroidal anti-inflammatory drugs. Part 1. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 1 |
| 20. | Nonsteroidal anti-inflammatory drugs. Part 2. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 1 |
| 21. | Narcotic analgesics and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 1 |
| 22. | Hypnotics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of | 1 |

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| | production, methods of analysis, application in medicine. means. | |
| 23. | Remedies for anesthesia. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 |
| 24 | Psychotropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 0,5 |
| 25. | Psychotropic drugs. Part 2. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 26. | Psychotropic drugs. Part 3 Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 27. | Anticonvulsants and antiepileptics. Remedies for parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 28. | Vomiting and antiemetics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 29. | Remedies for cough. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 30. | Nootropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 31. | Antihistamines. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| <i>MEDICINES AFFECTING THE NERVOUS, CARDIOVASCULAR, EXCESSIVE SYSTEM AND COLLECTION SYSTEM BLOOD</i> | | |
| 32. | Agents affecting the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 33. | Means that reduce the sensitivity of afferent nerve fibers. Means for local anesthesia. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 34. | Drugs that affect the efferent nervous system. Agents acting on cholinergic processes. Part 1. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 35. | Agents acting on cholinergic processes. Part 2. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 36. | Means that act mainly on adrenergic processes. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| Total | | 18 |
| 37. | Cardiotonic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1,5 |

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| 38. | Antiarrhythmic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 39. | Drugs that improve blood supply to organs and tissues. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 40. | Peripheral vasodilators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 41. | Calcium ion antagonists. Potassium channel activators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 42. | Drugs affecting the renin-angiotensin system Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 43. | Antihypertensive (antihypertensive) drugs. Hypertensive drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 44. | Angioprotectors. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 45. | Antioxidants. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 46. | Hypolipidemic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 47. | Diuretics. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 48. | Agents that affect platelet aggregation and blood clotting. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| <i>ANTIMICROBIAL PREPARATIONS (CHEMOTHERAPEUTICS AND ANTISEPTICS AND DISINFECTANTS)</i> | | |
| 49. | Antibiotics of heterocyclic structure. B-lactamase inhibitors. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1,5 |
| 50. | Tetracycline antibiotics and macrolides. Characteristics, classification, connection between structure and action, mechanism of action, methods of metabolism, production, methods of analysis, application in medicine | 1 |
| 51. | Aminoglycoside antibiotics, amphenicols, other groups of antibiotics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 52. | Sulfanilamides. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 53. | Derivatives of naphthyridine and quinolonecarboxylic acids. Characteristics, | 1 |

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|---|---|-----------|
| | classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | |
| Total | | 18 |
| 54. | Derivatives of 8-oxyquinoline, quinoxaline and nitrofurantoin. Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 55. | TB drugs. Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 56. | Drugs used to treat cancer (alkaloids, antibiotics, hormonal agents and their antagonists, other groups). Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 57. | Examples of targeted (targeted) anticancer drugs (drugs of different chemical groups). Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 1 |
| 58. | Antiviral drugs. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 1 |
| 59. | Antimalarial drugs. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 1 |
| 60. | Drugs for the treatment of protozoal infections. Characteristics, classification, connection between structure and action, mechanism of action, methods of production, methods of analysis, application in medicine. | 1 |
| 61. | Anthelmintics. Antifungal drugs Characteristics, classification, the relationship between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 62. | Antipediculosis and acaricides. Antiseptics and disinfectants Characteristics, classification, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| <i>MEDICINES THAT AFFECT THE FUNCTIONS OF THE ORGANS, MATERIAL EXCHANGE AND IMMUNITY</i> | | |
| 63. | Drugs of thyroid hormones, antithyroid drugs. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 64. | Drugs of pancreatic hormones, Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 65. | Antidiabetic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 66. | Steroid hormones and their analogues. Corticosteroids. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 67. | Androgens, anabolic steroids and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 1 |
| 68. | Progestogens, estrogens. Birth control. Estrogens of non-steroidal structure. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of | 0,5 |

| | | |
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| | analysis, application in medicine | |
| 69. | Water-soluble and fat-soluble vitamins. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine.. | 1 |
| 70. | Drugs that affect the immune system (immunotropic drugs). Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, methods of production, methods of analysis, application in medicine. | 0,5 |
| 71. | Anorexigenic drugs. Sorbents, antidotes and complexes. Antiulcer drugs. Remedies for alcoholism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| 72. | X-ray contrast and other diagnostic tools. Characteristics, classification, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 1 |
| Total | | 18 |
| <i>Number of hours of practical classes in the discipline</i> | | 74 |

6. Thematic plan of independent work of students

| № | Topic | Hours | Type of control |
|---|---|-----------|--------------------------------------|
| <i>ФАРМАЦЕВТИЧНИЙ АНАЛІЗ</i> | | | |
| 1. | Subject and tasks of pharmaceutical chemistry. Drug quality assessment system. Consistency of the composition as a necessary condition for all stages of existence of the drug. Peculiarities of pharmaceutical analysis are related to the purpose of drugs and the professional responsibility of the pharmacist. Pharmacopoeial analysis | 5 | Current control in practical classes |
| 2. | Analysis of physicochemical properties of drugs as one of the elements of drug quality assessment. | 5 | |
| 3. | The use of spectroscopic and chromatographic methods in the identification of drugs; features of use of standard samples of medicinal substances and standard spectra. | 5 | |
| 4. | Identification of drugs of inorganic nature | 5 | |
| 5. | Identification of drugs of organic nature by functional groups (functional analysis). | 5 | |
| 6. | Causes of changes in the structure of the drug (exposure to light, moisture, temperature and other factors. The nature and nature of impurities, methods of their detection. | 5 | |
| 7. | Methods of quantitative analysis of drug content. Gravimetry. | 5 | |
| 8. | Titrimetric methods of analysis: Mercurimetry, permanganometry, bromatometry, iodometry, iodatometry, cerimetry, dichromatometry, nitritometry. Potentiometric titration. Determination of nitrogen in organic compounds | 5 | |
| 9. | Titrimetric methods of analysis: Method of acid-base titration in aqueous and non-aqueous media, argentometry, complexometry. | 5 | |
| 10. | Optical methods in quantitative analysis: refractometry, polarimetry, UV and IR spectrophotometry, photometry in the visible region of the spectrum. | 5 | |
| 11. | Chromatographic methods. Methods based on thermodynamic properties of substances. Combination of extraction, chromatographic and optical methods in the analysis of dosage forms. | 6 | |
| 12. | Express analysis of drugs. Current trends in the development of pharmaceutical analysis. | 6 | |
| 13. | Express analysis of monocomponent drugs. | 5 | |
| 14. | Express analysis of multicomponent drugs. | 5 | |
| 15. | Express analysis of drugs. Analysis of an unknown drug | 5 | |
| Total | | 77 | |
| <i>CHEMICAL FUNDAMENTALS OF ACTION OF MEDICINES. MEANS THAT AFFECT THE CNS</i> | | | |
| 16. | Principles of classification of drugs, their nomenclature. Relationship structure-activity in the creation and analysis of drugs. The main ways of drug metabolism. Chemical reactions that underlie metabolic transformations. Metabolic phases. Factors influencing metabolic processes. Prodrugs. | 4 | Current control in practical classes |
| 17. | Nonsteroidal anti-inflammatory drugs. Part 1. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 4 | |
| 18. | Nonsteroidal anti-inflammatory drugs. Part 2. Characteristics, | 4 | |

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| | classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | | |
| 19. | Narcotic analgesics and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, production methods, methods of analysis, application in medicine. | 4 | |
| 20. | Hypnotics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. means. | 4 | |
| 21. | Remedies for anesthesia. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 22. | Psychotropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 23. | Psychotropic drugs. Part 2. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 24. | Psychotropic drugs. Part 3 Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 25. | Anticonvulsants and antiepileptics. Remedies for parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 26. | Vomiting and antiemetics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 27. | Remedies for cough. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 28. | Nootropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 29. | Antihistamines. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 30. | Principles of classification of drugs, their nomenclature. Relationship structure-activity in the creation and analysis of drugs. The main ways of drug metabolism. Chemical reactions that underlie metabolic transformations. Metabolic phases. Factors influencing metabolic processes. Prodrugs. | 4 | |
| MEDICINES AFFECTING THE NERVOUS, CARDIOVASCULAR, EXCLOSURE SYSTEM | | | |

AND BLOOD COAGULATION SYSTEM

| | | | |
|--------------|---|-----------|--------------------------------------|
| 31. | Agents affecting the afferent nervous system. Agents that stimulate the receptors of afferent nerve fibers. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | Current control in practical classes |
| 32. | Means that reduce the sensitivity of afferent nerve fibers. Means for local anesthesia. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 33. | Drugs that affect the efferent nervous system. Agents acting on cholinergic processes. Part 1. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 34. | Agents acting on cholinergic processes. Part 2. Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| Total | | 79 | |
| 35. | Cardiotonic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 36. | Antiarrhythmic drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 37. | Drugs that improve blood supply to organs and tissues. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 38. | Peripheral vasodilators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 39. | Calcium ion antagonists. Potassium channel activators. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 40. | Drugs affecting the renin-angiotensin system Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 41. | Antihypertensive (antihypertensive) drugs. Hypertensive drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 42. | Angioprotectors. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 43. | Antioxidants. Characteristics, classification, connection between | 5 | |

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| | structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | | |
| 44. | Hypolipidemic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 5 | |
| 45. | Diuretics. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 46. | Agents that affect platelet aggregation and blood clotting. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| ANTIMICROBIAL PREPARATIONS (CHEMOTHERAPEUTICS AND ANTISEPTICS AND DISINFECTANTS) | | | |
| 47. | Antibiotics of heterocyclic structure. B-lactamase inhibitors. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 48. | Tetracycline antibiotics and macrolides. Characteristics, classification, connection between structure and action, mechanism of action, methods of metabolism, production, methods of analysis, application in medicine | 5 | |
| 49. | Aminoglycoside antibiotics, amphenicols, other groups of antibiotics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 50. | Sulfanilamides. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| 51. | Derivatives of naphthyridine and quinolonecarboxylic acids. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 5 | |
| Total | | 79 | |
| 52. | Derivatives of 8-oxyquinoline, quinoxaline and nitrofurantoin. TB drugs. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 53. | Drugs used to treat cancer (alkaloids, antibiotics, hormonal agents and their antagonists, other groups). Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 3 | |
| 54. | Examples of "target" (target) anticancer drugs (drugs of different chemical groups). Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 3 | |
| 55. | Antiviral drugs. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 3 | |
| 56. | Antimalarial drugs. Characteristics, classification, connection between | 4 | |

| | | | |
|---|--|---|--|
| | structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | | |
| 57. | Drugs for the treatment of protozoal infections. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine.. | 3 | |
| 58. | Anthelmintics. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine.. | 3 | |
| 59. | Antifungal drugs. Characteristics, classification, connection between structure and action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 60. | Antipediculosis and acaricides. Characteristics, classification, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 61. | Antiseptics and disinfectants Characteristics, classification, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| <i>MEDICINES THAT AFFECT THE FUNCTIONS OF THE ORGANS, MATERIAL EXCHANGE AND IMMUNITY</i> | | | |
| 62. | Drugs of thyroid hormones, antithyroid drugs. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 63. | Drugs of pancreatic hormones, Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 64. | Antidiabetic drugs., Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 65. | Steroid hormones and their analogues. Corticosteroids. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 66. | Androgens, anabolic steroids and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 67. | Progestogens, estrogens. Birth control. Estrogens of non-steroidal structure. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine | 4 | |
| 68. | Water-soluble vitamins. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 69. | Fat-soluble vitamins. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| 70. | Drugs that affect the immune system (immunotropic drugs). | 4 | |

| | | | |
|---|---|------------|--|
| | Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | | |
| 71. | Anorexigenic drugs. Sorbents, antidotes and complexes. Antiulcer drugs. Remedies for alcoholism. Characteristics, classification, connection between structure and pharmacological action, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine.. | 4 | |
| 72. | X-ray contrast and other diagnostic tools. Characteristics, classification, mechanism of action, metabolism, methods of production, methods of analysis, application in medicine. | 4 | |
| Total | | 79 | |
| <i>Number of hours of independent work on the discipline</i> | | 314 | |

7. Methods of studies

Explanatory-illustrative, problematic presentation, partially-exploratory.

Studying Organic Chemistry students use textbooks, lecture notes, methodological guidelines, chemical computer software, molecular models, laboratory devices and glassware necessary for performing experiments.

Methods for organization and accomplishment of studies are:

- a) lectures
- b) practical classes
- c) students' independent study.

The topics of the lecture course cover the problematic issues of the appropriate sections of organic chemistry.

Practical classes are organized as laboratory classes. These classes include: laboratory studies on production and detection of specific classes of organic compounds according to their functional groups, performing specific reactions and organic compounds synthesis, its obtaining, purification and physicochemical constants determination.

Students are recommended to write short-term protocols of laboratory studies, indicating the purpose of the study and the conclusions.

The students also perform educational exercises and solve situational problems. ISIS Draw, Chemistry in motion, HyperChem computer programs, videos and models of molecules are used in practical classes.

The structure of practical classes includes:

- Discussion and explanation of the most complicated issues of the topic;
- Written test;
- Practical (laboratory) work.
- Filling in a practical lesson protocol.
- Summary of the lesson.

8. Methods of control

Types of control: current (routine) and final.

Form of final control in accordance with the curriculum: a credit (3 semester); exam (4 semester).

Verification is performed on each lesson according to specific purposes. It is also performed during students' self-study with teacher for those topics that students have learnt independently and that are not a part of the practical classes plan. It is used the standardized form of control of theoretical and practical training of students.

It is recommended to apply objective (standardized) kind of control to check theoretical and practical knowledge of students.

The standardized control of the theoretical part includes 10 tasks. Five of them are the first level test questions, and another five are referred to the tasks of the second level and required a written response (reaction schemes, structure formulas etc.).

Assessment of practical skills as a result of the implementation of the practical part - is formalized in the form of a protocol.

Criteria of assessment of current educational activity:

"Excellent" mark receives a student who actively participated in the discussion of the most difficult issues of the topic, gave at least 90% of correct answers to standardized tests, responded to written tasks without any mistake, performed practical work and filled in the protocol.

"Good" mark gets a student who participated in the discussion of the most difficult issues of the topic, gave at least 75% of correct answers to standardized tests, responded to written tasks with some insignificant mistakes, performed practical work and filled in the protocol.

"Satisfactory" mark receives a student who did not take part in the discussion of the most difficult issues of the topic, gave at least 60% of correct answers to standardized tests, responded to written tasks with a lot of mistakes, performed practical work and made the protocol.

"Unsatisfactory" mark receives a student who did not take part in the discussion of the most difficult issues of the topic, gave less than 60% of correct answers to standardized tests, responded to written tasks with gross mistakes or did not give answer, didn't perform practical work and didn't make the protocol.

The final control is carried out upon completion of the study of the discipline in the form of a credit (3d semester) and the exam (4d semester).

Only those students who completed all types of works provided by syllabus and during study scored points not less than the minimum (3,0), and don't have any undone lectures and practical classes are allowed to put the exam. The standardized form of the exam includes control of theoretical and practical knowledge.

The exam includes: 50 tests (Form A), which are evaluated by 1 point (50 minutes), 6 "open" questions, which are evaluated by 5 points (40 minutes)

The maximum number of points a student can score for an exam is 80.

The minimum number of points during the examination - 50.

9. Scheme of accrual and distribution of scores received by students is as follows:

The maximum number of points that a student can get for current educational activity during study is 120 points.

The minimum number of points that a student score for the current academic activity to enroll in the discipline is 72 points.

Calculating the number of points is performed by the way of calculating the arithmetical average (AA) of student's received marks by traditional rate during the semester the discipline is studied, and rounded to two decimal places. The received value is converted into points by multi-point rate as follows:

$$xX = (AA \times 200)/5$$

For convenience, there is a table of conversion to 200-point rate:

Recalculation of the average mark for current activity into multi-point rate for disciplines, ending with exam.

| | | | | | | | |
|--------------|----------------|--------------|----------------|--------------|----------------|--------------|----------------|
| 4-point rate | 200-point rate | 4-point rate | 200-point rate | 4-point rate | 200-point rate | 4-point rate | 200-point rate |
| 5 | 120 | 4.45 | 107 | 3.91 | 94 | 3.37 | 81 |
| 4.95 | 119 | 4.41 | 106 | 3.87 | 93 | 3.33 | 80 |
| 4.91 | 118 | 4.37 | 105 | 3.83 | 92 | 3.29 | 79 |
| 4.87 | 117 | 4.33 | 104 | 3.79 | 91 | 3.25 | 78 |
| 4.83 | 116 | 4.29 | 103 | 3.74 | 90 | 3.2 | 77 |
| 4.79 | 115 | 4.25 | 102 | 3.7 | 89 | 3.16 | 76 |
| 4.75 | 114 | 4.2 | 101 | 3.66 | 88 | 3.12 | 75 |
| 4.7 | 113 | 4.16 | 100 | 3.62 | 87 | 3.08 | 74 |
| 4.66 | 112 | 4.12 | 99 | 3.58 | 86 | 3.04 | 73 |
| 4.62 | 111 | 4.08 | 98 | 3.54 | 85 | 3 | 72 |
| 4.58 | 110 | 4.04 | 97 | 3.49 | 84 | Less than 3 | Insufficient |
| 4.54 | 109 | 3.99 | 96 | 3.45 | 83 | | |
| 4.5 | 108 | 3.95 | 95 | 3.41 | 82 | | |

Students out-of-classes works is assessed during the current verification of topic on the lesson.

The maximum number of points that a student can get on the exam is 80 points.

The minimum number of points in the exam is 50 points.

The minimum number of points that a student must get during semester of study to be allowed to put the exam is 72 points.

A mark on a discipline is defined as the sum of points for the current educational activity (not less than 72) and marks for the exam (not less than 50).

Points from discipline are converted into ECTS rate, and 4-point (national) rate.

Points from ECTS rate can't be converted into 4-point rate and vice versa. Marks of students, who study in one specialty, and taking into account the number of points gained by him/her in the discipline are ranked by ECTS rate as follows:

| ECTS Mark | Statistical index |
|-----------|----------------------|
| A | Top 10% of students |
| B | Next 25% of students |
| C | Next 30% of students |
| D | Next 25% of students |
| E | Last 10% of students |

A, B, C, D, E rankings are awarded to students of actual course, who study in one specialty and successfully completed the study of the discipline. Students who received FX, F ("2") ratings are not included in the list of ranked students. Students with an FX score after repassing the exam receive an "E" score automatically.

Score points for students who have successfully completed the program are converted to the traditional 4-point scale by the absolute criteria listed in the table below:

| Points from discipline | Mark by 4-point rate |
|---|-----------------------------|
| From 170 to 200 points | 5 |
| From 140 to 169 points | 4 |
| From 139 to the minimum number of points which student must get | 3 |
| Below the minimum number of points which student must get | 2 |

Mark written by ECTS can't be converted into traditional scale because the ECTS scale and 4-point scale are independent (do not coincide).

Objectivity of assessment students' educational activities is checked by statistical methods (correlation coefficient between the ECTS mark and mark by national scale).

10. Methodical support

Methodical instructions for preparation for practical classes and independent work:

- lecture plan,
- plans for practical classes,
- tasks for laboratory work, independent work,
- questions, tasks and test tasks for current and final control of knowledge and skills of students, after attestation monitoring of acquired knowledge and skills in the discipline.

8. A list of practical skills and knowledge that a student must master in the process of studying the discipline

Know:

- basic reactions of identification of organic and inorganic drug compounds;
- methods of establishing the structure of organic compounds, physical and physico-chemical methods, chemical methods;
- types of chemical analysis;
- instrumental methods of analysis;
- methods of qualitative and quantitative analysis of drugs;
- purity research;
- state regulation of the quality of medicines
- physicochemical properties of medicinal substances;
- methods of qualitative and quantitative analysis of drugs;
- qualitative analysis of cations and anions; - drugs of inorganic nature; - elemental analysis and analysis by functional groups; - functional analysis of organic compounds by functional groups; - general methods of analysis of inorganic and organic drug compounds; - chemical titrimetric methods of analysis; - chromatographic methods of

identification, study of purity and quantitative content of drugs; - light propagation in matter, methods of luminescent analysis; - optical activity and specific rotation; - gravimetric method of analysis; - functional analysis of organic compounds; - basic concepts of titrimetric analysis; - spectral methods of analysis

- analysis of dosage forms in the production process;
- study of the purity of medicines;
- potentiometric analysis;
- quality indicators of dosage forms,
- stability and shelf life of medicines

Be able:

- conduct qualitative and quantitative rapid analysis of active substances;
- to carry out identification, determination of impurities and quantitative content of medicinal substances, including using physicochemical methods: thin layer chromatography; polarimetry, refractometry, spectrophotometry, spectroscopy, photoelectrocolorimetry, high performance liquid chromatography, gas chromatography, fluorometry
- to determine the main physical characteristics of drugs (melting point, boiling point and pour point) by physical methods; - determine the main indicators of finished drugs derived from drugs and excipients, visual and instrumental methods: transparency; color; pH; refractive index; angle of rotation and density of injection solutions - to control purified water for injections obtained from drinking water, chemical and instrumental methods, as well as other solvents; - to take samples and specimens of medicinal substances, including for analysis; - draw up an appropriate quality passport, carry out selective serial control of finished products for compliance with the quality of analytical documentation in order to prevent defects; - to determine the stability of medicines and medical devices during storage during the established shelf life.
- determine the quantitative content of active substances;
- to carry out statistical processing of results of the quantitative analysis and to register results in the corresponding accounting journals
- to analyze the dependence of "structure-activity" in a certain group of biologically active compounds

Перелік питань що виносяться на підсумковий контроль

- 1.** The structure of the State Pharmacopoeia of Ukraine. Drug quality assessment system.
- 2.** The structure of the monograph. The difference between pharmacopoeial requirements from the norms and methods of analysis for chemical and others. products manufactured in accordance with State Standards (DSTU) and technical conditions (TU).
- 3.** Features of pharmaceutical analysis are related to the purpose of the drug and the professional responsibility of the pharmacist. Relativity of requirements and methods of quality assessment depending on the pharmacological action of the drug (purpose, dosage, method of administration), method of production, the presence of excipients and related substances in the dosage form.
- 4.** Unification and standardization of similar tests in groups of medicinal substances. General provisions, general articles and monographs of the Pharmacopoeia, their relationship.
- 5.** Analysis of physicochemical properties of drugs as one of the elements of drug quality assessment. Organoleptic analysis, evaluation of drug solubility as a general approximate characteristic of the test substance. Use of physical constants (relative density, viscosity, boiling / melting point, solidification) in drug trials.
- 6.** Analysis of physicochemical properties of drugs as one of the elements of their quality assessment. The use of physical constants such as refractive index, optical rotation in drug testing.
- 7.** The use of spectroscopic and chromatographic methods in the identification of drugs; features of use of standard samples of medicinal substances and standard spectra. IR, UV spectrophotometry, NMR spectroscopy.
- 8.** The use of spectroscopic and chromatographic methods in the identification of drugs; features of use of standard samples of medicinal substances and standard spectra. Mass spectrometry (MS); high performance liquid chromatography; thin layer chromatography.
- 9.** Identification of medicinal substances of inorganic nature. Reactions for the identification of cations of aluminum, ammonium, potassium, sodium, calcium, magnesium, zinc and iron (II, III).
- 10.** Identification of medicinal substances of inorganic nature. Reactions for the identification of cations of antimony, bismuth, mercury, silver, arsenic, lead.
- 11.** Identification of medicinal substances of inorganic nature. Reactions for identification of chlorine, bromine, iodine anions.
- 12.** Identification of medicinal substances of inorganic nature. Reactions for the identification of sulfates, sulfites, nitrates, nitrites, phosphates, carbonates, hydrocarbons.

- 13.** Identification of drugs of organic nature by functional groups (functional analysis). Reactions for the identification of primary alcohols, polyhydric alcohols, secondary alcohols, phenols.
- 14.** Identification of drugs of organic nature by functional groups (functional analysis). Reactions for the identification of aldehydes, ketones, carboxylic acids, amides.
- 15.** Identification of drugs of organic nature by functional groups (functional analysis). Identification reactions of double bonds, covalently bonded halogen atoms, ethers, esters.
- 16.** Identification of medicinal substances of organic nature by functional groups (functional analysis). Reactions for the identification of primary, secondary and tertiary aromatic amines.
- 17.** Identification of medicinal substances of organic nature by functional groups (functional analysis). Identification reactions of primary, secondary and tertiary aliphatic amines and primary, secondary aliphatic nitro compounds. Reactions for the identification of aromatic nitro compounds.
- 18.** Causes that cause changes in the structure of the drug (exposure to light, moisture, temperature and other factors provided by the conditions and terms of storage). The effect of impurities on the qualitative and quantitative composition of the drug and the possibility of changing its pharmacological activity (specific and general impurities).
- 19.** Nature and nature of impurities, methods of their detection. Production impurities, intermediates, raw materials. Unification of tests.
- 20.** General provisions for determining the content of impurities on the indicators of "transparency, turbidity" and "color" of the solution, etc. Approaches to setting the limits of permissible impurities based on the degree of sensitivity of chemical reactions. Reference solutions.
- 21.** Tests for impurities of inorganic ions. Conditions and chemistry of ammonium and arsenic ion detection reactions.
- 22.** Tests for impurities of inorganic ions. Conditions and chemistry of reactions for the detection of potassium, calcium and magnesium ions.
- 23.** Tests for impurities of inorganic ions. Conditions and chemistry of reactions for the detection of ions of iron, aluminum, zinc and heavy metals.
- 24.** Tests for impurities of inorganic ions. Conditions and chemistry of reactions for detection of chlorides, fluorides, sulfates, phosphates.
- 25.** Production and properties, purity research, conditions and terms of storage of purified water, highly purified water and water for injections.
- 26.** Methods of quantitative analysis of the content of drugs. The choice of method that allows you to assess the content of the drug by functional groups that characterize its properties. Features of quantitative determination of individual substances and dosage forms. Validation of analytical methods.

27. Methods of quantitative analysis of the content of drugs. Relative specificity, sensitivity, correctness (accuracy) and reproducibility of the method. Comparative evaluation of the suitability of modern chemical and physicochemical methods for the quantitative determination of the active substance.
28. Methods of quantitative analysis of the content of drugs. The influence of polyfunctionality of drugs on the choice of quantitative method. Weight analysis (gravimetry).
29. Methods of quantitative analysis of the content of drugs. The influence of polyfunctionality of drugs on the choice of quantitative method. Determination of nitrogen in organic compounds after mineralization (Kjeldahl method).
30. Titrimetric methods of analysis. Acid-base titration method in aqueous and non-aqueous media.
31. Titrimetric methods of analysis. Argentometry, complexometry.
32. Titrimetric methods of analysis. Mercurimetry, permanganometry, bromatometry.
33. Titrimetric methods of analysis. Iodometry, iodometry, cerimetry.
34. Titrimetric methods of analysis. Dichromatometry, nitritometry. Potentiometric titration.
35. Optical methods in quantitative analysis. Refractometry, polarimetry.
36. Optical methods in quantitative analysis. UV and IR spectrophotometry, photometry in the visible region of the spectrum.
37. Chromatographic methods: gas-liquid chromatography (GC) and high performance liquid chromatography (HPLC), electrophoresis.
38. Methods based on thermodynamic properties of substances: thermographic methods, phase solubility method. Combination of extraction, chromatographic and optical methods in the analysis of dosage forms.
39. Express analysis of drugs. Current trends in the development of pharmaceutical analysis.
40. Modern strategies for creating innovative medicines. Sources of new drugs. Leaders, methods of their optimization.
41. Organic synthesis - the basis for obtaining synthetic small molecules. Combinatorial synthesis and its role in drug design. Strategy for the development and synthesis of libraries of chemical compounds. Prospects for the development of combinatorial synthesis.
42. Stages of drug development - "from molecule to drug".
43. The main aspects of chemical interaction of drugs, transformation and their metabolism. Metabolic phases.
44. Mechanisms of action of drugs and methods of their research.
45. Remedies for anesthesia. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
46. Hypnotics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.

47. Psychotropic drugs Neuroleptics. Tranquilizers Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
48. Psychotropic drugs. Antidepressants Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
49. Psychotropic drugs. Analeptics Sedatives Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
50. Means for the treatment of parkinsonism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
51. Narcotic analgesics and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
52. Vomiting and antiemetics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
53. Remedies for cough. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
54. Nootropic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
55. Nonsteroidal anti-inflammatory drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
56. Means that reduce the sensitivity of afferent nerve fibers. Means for local anesthesia. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
57. Agents acting on cholinergic processes. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
58. Means that act mainly on adrenergic processes. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
59. Antihistamines. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
60. Agents that stimulate the receptors of afferent nerve fibers. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
61. Cardiotonic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
62. Antiarrhythmic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
63. Means that improve blood supply to organs and tissues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.

- 64.** Peripheral vasodilators. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 65.** Calcium ion antagonists. Potassium channel activators. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 66.** Angioprotectors. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 67.** Drugs that affect the renin-angiotensin system Characteristics, classification, the relationship between structure and pharmacological action, mechanism of action, examples.
- 68.** Antihypertensive (antihypertensive) drugs. Hypertensive drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 69.** Hypolipidemic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 70.** Drugs that affect platelet aggregation and blood clotting. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 71.** Diuretics. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 72.** Drugs of thyroid hormones, antithyroid drugs. Drugs of pancreatic hormones, Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 73.** Antidiabetic drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 74.** Sex hormones, androgens, anabolic steroids and their analogues. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 75.** Sex hormones, progestogens, estrogens. Birth control. Estrogens of non-steroidal structure Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 76.** Corticosteroids. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 77.** Vitamins. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples
- 78.** Antibiotics with beta-lactams. B-lactamase inhibitors. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 79.** Tetracycline antibiotics and macrolides. Characteristics, classification, relationship between structure and action, mechanism of action, examples.

- 80.** Antibiotics of aminoglycoside structure, amphenicols, other groups of antibiotics. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 81.** Sulfanilamides. Characteristics, classification, relationship between structure and action, mechanism of action, examples
- 82.** Derivatives of naphthyridine and quinolonecarboxylic acids. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 83.** Derivatives of 8-oxyquinoline, quinoxaline and nitrofurazone. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 84.** Anti-tuberculosis drugs. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 85.** Antiviral drugs. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 86.** Drugs for the treatment of protozoal infections. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 87.** Anthelmintics. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 88.** Antifungal drugs. Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 89.** Drugs used to treat cancer (Alkylating agents, Antimetabolites). Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 90.** Drugs used to treat cancer (alkaloids, antibiotics, hormonal drugs and their antagonists, other groups). Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 91.** "Target" (target) anticancer drugs (drugs of different chemical groups). Characteristics, classification, relationship between structure and action, mechanism of action, examples.
- 92.** Antiseptics, disinfectants and insecticides Characteristics, classification, mechanism of action, the relationship between structure and action, examples.
- 93.** Antipediculosis and acaricides. Characteristics, classification, the relationship between structure and action, examples.
- 94.** X-ray contrast and other diagnostic tools. Characteristics, classification, mechanism of action, the relationship between structure and action, examples.
- 95.** Antioxidants. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, relationship between structure and action, examples

- 96.** Drugs that affect the immune system (immunotropic drugs). Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 97.** Anorexigenic drugs. Remedies for alcoholism. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 98.** Sorbents, antidotes and complexes. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 99.** Antiulcer drugs. Characteristics, classification, relationship between structure and pharmacological action, mechanism of action, examples.
- 100.** Schemes of synthesis of selected drugs with indication of starting substances, types of reactions; in the case of semi-synthetic drugs - reactions of modification of compounds of natural origin

7-ACC and 7-ADC as starting compounds for the synthesis of cephalosporins

γ -Aminobutyric acid

Ampicillin

Anesthesia

Ascorbic acid

Acetaminophen

Acetylsalicylic acid

Acetylcysteine

Barbital

Benzazole hydrochloride

Bromhexine hydrochloride

Dexamethasone

Epinephrine hydrotartrate

Ibuprofen

Izadrin

Iodoform

Isoniazid

Calcium gluconate

Carbenicillin disodium salt

Cortisone acetate

Caffeine

Lidocaine hydrochloride

Menadione sodium bisulfite

Methyldopa

Methyltestosterone

Sodium benzoate

Sodium p-aminosalicylate

Sodium citrate

Nitrofur

Nifedipine

Prednisolone

Procaine hydrochloride

Propranolol hydrochloride

Resorcinol

Salicylamide

Sulfadimethoxine

Sulfanilamide

Theobromine

Testosterone propionate

Phenobarbital

Ftivazide

Chloral hydrate

Chloramine

Chloramphenicol

Chlorpromazine hydrochloride

- 100.** Give the characteristics of a particular drug according to the following scheme: structural formula; chemical, international non-proprietary and trade names;

pharmacological and chemical groups of compounds; brief description of physicochemical properties; identification reactions; quantification; application; storage conditions

| | |
|-----------------------------------|-------------------------|
| γ -Aminobutyric acid | Bisoprolol |
| Adenosine triphosphate | Bicillin |
| Azathioprine | Bleomycin |
| Azithromycin | boric acid |
| Aliskiren | Bromhexine g / hl |
| Amantadine | Budesonide |
| Ambroxol g / hl | Butamide |
| Sodium amidotrisoate (Triombrast) | Valsartan |
| Amikacin | Warfarin |
| Amiloride | Verapamil |
| Aminocaproic acid | Bismuth subcitrate |
| Aminophylline | Hydrogen peroxide |
| Amiodarone hydrochloride | Haloperidol |
| Amitriptyline | Halothane (Fluorothane) |
| Amlodipine | Hexamethylenetharamine |
| Amoxicillin | Gentamicin |
| Ampicillin | Hydrocortisone acetate |
| Amrinon | Hydroxyprogesterone |
| Antipyrine | Hydrochlorothiazide |
| Ascorbic acid | Glaucine g / hl |
| Atorvastatin | Glibenclamide |
| Atropine sulfate | Glycerin |
| Aceclidine | Glucose |
| Acetaminophen | Desloratadine |
| Acetylsalicylic acid | Dexamethasone |
| Acetylcysteine | Dibazole |
| Acyclovir | Digitoxin |
| Barbital | Digoxin |
| Barium sulfate | Diltiazem g / hl |
| Bendazole g / hl | Diprofen |
| Benzyl benzoate | Disulfiram |
| Benzylpenicillin | Diphenhydramine g / hl |
| Benznidazole | Diazepam |
| Benzohexonium hydrochloride | Diethylstilbestrol |
| Benzocaine | Dobutamine |
| Betamethasone | Doxylamine g / hl |
| Bisacodyl | Domperidone maleate |

| | |
|------------------------|--------------------------------|
| Dopamine g / hl | Camphor |
| Droperidol | Captopril |
| Drotaverine | Carbamazepine |
| Econazole | Carbacholin |
| Enalapril | Carbenicillin disodium salt |
| Enflurane | Carbidopa |
| Epinephrine tartrate | Carbocysteine |
| Ergocalciferol | Carvedilol |
| Erythromycin | Quercetin |
| Estradiol dipropionate | Ketamine g / hl |
| Etamzilate | Ketotifen |
| Sodium etaminal | Clarithromycin |
| Ethylmorphine g / hl | Clemastine hydrofumarate |
| Ethyl chloride | Clindamycin |
| Etimizole | Clonazepam |
| Ethosuccinimide | Clonidine g / hl |
| Ephedrine g / hl | Clopidogrel |
| Zolpidem tartrate | Clopidogrel |
| Zopiclone | Clotrimazole |
| Ibuprofen | Clofibrate |
| Isoniazid | Codeine phosphate |
| Isoprenaline g / hl | Cortisone acetate |
| Isosorbide dinitrate | Caffeine |
| Isoflurane | Caffeine sodium benzoate |
| Imehin | Labetolol |
| Imipramine | Lamotrigine |
| Indapamide | Lansoprazole |
| Inosine | Levamisole |
| Ipratropium bromide | Levodopa |
| Iodine | Levomepromazine |
| Iopic acid | Levothyroxine |
| Potassium bromide | Lidocaine g / hl |
| Potassium iodide | Lincomycin |
| Potassium orotate | Losartan |
| Potassium permanganate | Loperamide g / hl |
| Potassium chloride | Loratadine |
| Calcium pangamate | Magnesium carbonate |
| Calcium pantothenate | |
| Calcium chloride | |

Magnesium oxide
Magnesium sulfate
Mebhydrolin
Mebendazole
Meloxicam
Menadione sodium bisulfite
Menthol
Mepivacaine
Meproamate
Mercaptopurine
Metamizole sodium
Methyltestosterone
Metoclopramide
Methotrexate
Metronidazole
Metformin hydrochloride
Mefloquine
Copper sulfate
Miconazole nitrate
Milrinon
Moxifloxacin
Molsidomine
Morphine hydrochloride
Morpholine thiazotate
Nalbuphine hydrochloride
Naloxone hydrochloride
Naltrexone hydrochloride
Nandrolone decanoate
Naproxen
Sodium benzoate
Sodium bromide
Sodium valproate
Sodium bicarbonate
Diclofenac sodium
Sodium iodide
Sodium nitrite
Sodium oxybutyrate
Sodium p-aminosalicylate
Sodium tetraborate
Sodium thiosulfate
Sodium chloride
Naphazoline nitrate
Nicotinamide
Nicotinic acid
Nimesulide
Nystatin
Nitrazepam
Nitroglycerin
Nitroxoline
Nitrofurantoin
Nitrofurantoin
Nifedipine
Nifurtimox
Nicergoline
Novembikhin
Norepinephrine g / hl
Norethisterone
Norsulfazole
Norfloxacin
Oxazepam
Oxacillin sodium salt
Oxeladine citrate
Omeprazole
Ondasetron
Ornidazole
Oseltamivir
Ofloxacin
Pantocide
Papaverine g / hl
Parmidine
Pentazocine
Pentoxifylline
Permethrin
Perphenazine
Sodium picosulfate
Pilocarpine g / hl
Piperazine adipinate
Piracetam

Pyriditol
Pyridoxine g / hl
Pyridostigmine
Pregnin
Prednisolone
Prenoxdiazine hydrochloride
Primidone
Progesterone capronate
Proserine
Procainamide hydrochloride
Procaine hydrochloride
Promethazine
Propofol
Propranolol hydrochloride
Protamine sulfate
Ramipril
Ranitidine
Riboflavin
Rimantadine hydrochloride
Rifampicin
Rosuvastatin
Mercury chloride
Routine
Salbutamol
Salmeterol
Sarcocollin
Sibutramine
Scopolamine hydrobromide
Spironolactone
Silver nitrate
Suxamethonium iodide
Sulfamethoxazole /
Trimethoprim
Sodium sulfacetamide
Sulfocamphocaine
Tamoxifen
Theobromine
Theophylline
Terpene hydrate
Testosterone propionate
Tetracaine hydrochloride
Tetracycline hydrochloride
Thymol
Tinidazole
Thiamazole
Thiamine hydrochloride
Sodium thiopental
Tocopherol acetate
Tolperisone hydrochloride
Tramadol hydrochloride
Tranexamic acid
Trihexyphenidyl
Trimedoxime bromide
Trimecaine hydrochloride
Trimeperidine hydrochloride
Trichlorethylene
Triazolam
Triamteren
Triamcinolone
Troloxerutin
Unithiol
Phenazepam
Phenibut
Phenytoin
Phenobarbital
Phenol
Fenoterol hydrobromide
Fenofibrate
Fentanyl
Fepranon
Folic acid
Formaldehyde solution
Phthalylsulfathiazole
Ftivazide
Fluorofur
Fluorouracil
Furagin
Furazoline

| | |
|-----------------------------------|-------------------|
| Furosemide | Cetirizine |
| Quinidine sulfate | Cefazolin sodium |
| Quinine sulfate and hydrochloride | Cephalexin |
| Quinoxidine | Cephalotin sodium |
| Chloral hydrate | Cefotaxime |
| Chlorambucil | Ceftazidime |
| Chloramine | Ceftriaxone |
| Chloramphenicol | Cefuroxime |
| Chlorhexidine | Cyclosporine |
| Chlordiazepoxide | Cyclophosphamide |
| Chloropyramine hydrochloride | Cinnarizine |
| Chloroquine | Zinc oxide |
| Chlorpromazine hydrochloride | Zinc sulfate |
| Chlorpropamide | Zinc chloride |
| Chlorquinaldol | |

9. Recommended literature

Basic literature

1. Державна фармакопея України: в 3 т. / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів». 2014. – Т.1. – 1128 с.; – Т.2. – 724 с.; – Т.1. – 732 с.
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3. Медична хімія: навч. посіб. для студентів вищих навчальних закладів / І.С. Гриценко, С.Г. Таран, Л.О. Перехода та ін.; за заг. ред. І.С. Гриценка. – Харків: НФаУ: Золоті сторінки, 2017. – 552с.
4. 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.
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Supporting literature

1. От субстанции к лекарству: Учеб. пособие / [Безуглый П. А., Болотов В. В., Гриценко И. С. и др.]; под ред. В. П. Черныха – Х.: Изд-во НФаУ: Золотые страницы, 2005. – 1244 с.
2. 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.

3. В.Г. Беликов. Фармацевтическая химия. – М.: «МЕДпресс-информ», 2008. – 615 с.
4. Фармацевтическая химия: за ред. А.П. Арзамасцева. – 3-е изд. – М.: ГЭОТАР-Медиа, 2006. – 635 с.
5. Скакун М.П., Посохова К.А. Фармакологія. Підручник. – Укрмедкнига, 2003. - 740 с.
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