



**MINISTRY OF HEALTH OF UKRAINE
NATIONAL UNIVERSITY OF PHARMACY
Faculty of Medical and Pharmaceutical Technologies
Department of Clinical Pharmacology and Clinical Pharmacy**

PHARMACOLOGY

(the name of educational component)

**WORK PROGRAM
of educational component**

training for

Master

(Higher Educational Level Name)

in specialty

226 Pharmacy, Industrial Pharmacy

(Code and Specialty name)

field of knowledge

22 Public health

(Code and Knowledge Field Name)

of educational program

Pharmacy

(Language of Instruction — English)

(Educational Program Title)

in specialization(s)

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(Name of specialization, if available)

The work program of the educational component «Clinical Pharmacy and Pharmaceutical Care» in specialty «226 Pharmacy, industrial pharmacy» educational program «Pharmacy» in specialization(s) _____ - _____ for foreign applicants (Language of Instruction — English) for higher education 3 year of study.

EDUCATIONAL COURSE TEAM: ZUPANETS Kateryna, Head of Department of Clinical Pharmacology and Clinical Pharmacy NUPh, Doctor of Pharmacy, Professor

(Enter the printed name and academic rank of the authors)

Work program has been considered and approved at the Meeting of the Department of Clinical Pharmacology and Clinical Pharmacy of NUPh.

Record from «02» September 2022 # 1

Acting Head of the Department



Prof. Tetyana SAKHAROVA

The work program has been approved at the Meeting of the Methodical Committee on Biomedical Disciplines of NUPh.

Record from «12» September 2022 # 1

Head of the Committee



Prof. Nadia KONONENKO

1. Description of the educational component

The language of the study: English.

Course Status: obligatory.

Entrance qualification for studying the course: Pharmacology as an academic discipline:

- a) based on knowledge of biology, anatomy and normal physiology, pathological physiology, organic chemistry, Latin, biochemistry, microbiology;
- b) provides a high level of biomedical training;
- c) lays the foundation study of clinical pharmacy and pharmaceutical care, pharmacotherapy, pharmaceutical chemistry, medical and analytical toxicology, pharmacoeconomics, involves the integration of teaching with these disciplines; creates the ability to apply this knowledge in the further education and professional activities; laying the foundations professionally oriented thinking, healthy lifestyles and prevention of functions in the human life.

The purpose statement of studying the course «Pharmacology» is pharmacological properties, the conditions of modern rational use of medicines and targeted search for new drugs.

Information volume of academic course. To study the course is given 300 hours 10 ECTS credits.

2. Objectives and tasks of the educational component

The objective of teaching the course « Pharmacology» is to form and deepen the students' professional and competent knowledge of the pharmacological properties and conditions of the modern rational use of drugs.

The main tasks of the course «Pharmacology» is acquisition by students the necessary knowledge about the route of administration, types of action, dosage of drugs, mechanisms of action, pharmacodynamics, pharmacokinetics, indications, side effects and contraindications, interchangeability medicines each pharmacological group stages of medicines as well as identifying the main areas of scientific ideas and trends pharmacology.

3. Competency and planned educational outcomes

Educational component «Pharmacology» ensures the acquisition of applicants for higher education the following **competences**:

Integral - ability to solve common and complex specialized tasks and critically interpret and solve practical problems in management and administration and on the verge of subject areas using the provisions of fundamental theories and methods, socio-economic sciences and marketing strategy, which involves research and implementation / or innovation, often under conditions of incomplete / insufficient information and conflicting requirements; make decisions in complex unforeseen circumstances that require integration of knowledge, application of new approaches and forecasting; clearly and unambiguously communicate their knowledge, opinions and their validity for professional and unprofessional audience.

General competencies:

GC 1. The capacity for abstract thinking, analysis, synthesis and establish relationships between phenomena and processes.

GC 2. The ability to act in unusual situations, analyze socially significant problems and processes; carry social and ethical responsibility for deciding to accept tolerantly social, ethical, religious and cultural differences.

GC 3. The ability to adapt and actions in the new environment of the professional field; creativity.

GC 4. The ability to logically and reasonably implement business communication in their native language in speech and writing and use a foreign language (mostly English) at a level that provides effective professional activity; and work as a team with experts from other sectors.

GC 5. The capacity for personal and professional self-development, self-organization, creativity, initiative and critical evaluation.

GC 6. Ability to apply psychological and pedagogical knowledge and self-optimizing future careers.

GC 7. The ability to conduct scientific research, to justify the relevance of scientific fields, assess and ensure the quality of work and to put into practice the results.

GC 8. The ability to understand the methodology of planning experimental studies in accordance with the basic principles Laboratory Practice GLP, use setting rules and techniques of modern experimental research.

GC 9. The ability to use information technology in scientific research, work with information in global computer networks and corporate information systems.

Special (professional) competencies:

SC 18. The ability to ensure rational use of prescription and non-prescription medicines under the physical-chemical, pharmacological characteristics, biochemical, pathophysiological features of a particular disease and pharmacotherapeutic schemes of its treatment.

SC 20. Ability to counseling and pharmaceutical care in the selection and delivery of nonprescription drug by assessing the risk / benefit ratio, interoperability, indications and contraindications guided by data on the health of individual patients taking into account the biopharmaceutical, pharmacokinetic, pharmacodynamic and physicochemical characteristics of drug.

As a result of studying the course, the applicant for higher education will be able **to know:**

- the concept of «original drug», «brand», «generic», «optical isomers», «biotech drugs», etc.;
 - basic terms and principles of pharmacological classification of drugs;
 - routes of administration of drugs in the body and the types of action of drugs;
 - pharmacodynamic and pharmacokinetic factors that affect the efficacy and safety of drugs;
 - phenomena that occur with repeated and combined administration of drugs;
 - classification of doses and principles of drugs dosing;
 - classification of drugs that affect the peripheral nervous system;
 - pharmacological logic between and pharmacodynamic indications for use of drugs affecting the peripheral nervous system and antiallergy medicines;
 - the main signs and symptoms of side effects of an overdose of drugs mediator type of algorithm of performance of first aid;
 - principles of classification of anti-inflammatory drugs;
 - classification of drugs that affect the central nervous system;
 - pharmacological logic between pharmacodynamics and indications for use of drugs that affect the central nervous system, anti-inflammatory drugs;
 - differentiate neurotropic and psychotropic action of drugs;
 - comparison characteristics of drugs for each pharmaceutical group in strength and duration of pharmacological action;
 - pharmacokinetic and pharmacodynamic features of drugs that affect the central nervous system, anti-inflammatory and anti-allergy drugs, depending on their chemical structure, routes of administration dosage forms;
 - basic ways of pharmacological influence on the function of the executive bodies, blood system, metabolism and immune system;
 - classification of drugs that affect the function of the executive bodies, blood system, metabolism and immune system;
 - know the logic between pharmacological and pharmacodynamic indications for use of drugs that affect the function of the executive bodies, blood system, metabolism and immunity;
 - modern classification of drugs that used to treat cancer and infectious diseases, antiseptics and disinfectants;
 - the main manifestations of side effects of chemotherapy drugs;
 - learn the basic rules of rational antibiotic therapy to prevent of side effects and development of antibiotic resistance;
- do:**
- determine the dependence of drugs action from their medicinal form;
 - identify the group affiliation of essential medicines under modern classifications;

- provide pharmacological characteristics of traditional and new medicines logically link pharmacodynamics with indications, and the main side effects with contraindications to the use of drugs;
- evaluate the indications and contraindications to the use of essential medicines;
- substantiate selecting the appropriate medicinal form according to route of administration;
- Identify signs of side effects of drugs, symptoms of overdose of potent and poisonous drugs;
- conduct search of information in modern pharmacological reference books and professional journals;

have:

- basic concepts and terms of discipline;
- information on the basic and advanced medicinal forms in each pharmacological group of drugs;
- information about modern medications in each pharmacological group of drugs;
- information on modern directions of create drugs and international standards for drug quality during clinical trials.

4. The educational component structure

| Names of content modules and topics | The amount of hours | | | |
|--|---------------------|-----------|-------|------------|
| | total | including | | |
| | | lectures | pract | self-study |
| MODULE 1. | | | | |
| <i>THEMATIC SUBMODULE 1. General pharmacology.</i> | | | | |
| Introduction to Pharmacology. Kinds of action and routes of drugs administration. | 8 | 1 | 3 | 4 |
| General pharmacology. Basic principles and concepts of pharmacodynamics and pharmacokinetics. | 8 | 1 | 3 | 4 |
| Classification and principles of the drug dosing. The phenomena that occur during the repeated and combined administration of drugs. Side effects of drugs. Prescription handling. | 8 | 1 | 3 | 4 |
| Control of submodule 1. | 9 | | 3 | 6 |
| Total content submodule 1 | 33 | 3 | 12 | 18 |
| <i>THEMATIC SUBMODULE 2. Medicines affecting peripheral nervous system and neurotransmitter processes. Pharmacological correctors of pain, inflammation and allergy.</i> | | | | |
| Drugs affecting the afferent innervation. | 9 | 2 | 3 | 4 |
| Medicines affecting efferent innervation: pharmacological description of cholinergic agonists. | 8 | 1 | 3 | 4 |
| Medicines affecting efferent innervation: pharmacological description of cholinergic antagonists. | 8 | 1 | 3 | 4 |
| Medicines affecting efferent innervation: pharmacological description of adrenergic agonists. | 8 | 1 | 3 | 4 |
| Medicines affecting efferent innervation: pharmacological description of adrenergic antagonists. | 8 | 1 | 3 | 4 |
| Pharmacological correctors of pain and inflammation. | 8 | 1 | 3 | 4 |
| Pharmacological correctors of allergy. | 8 | 1 | 3 | 4 |
| Control of submodule 2. | 10 | | 3 | 7 |
| Total content submodule 2 | 67 | 8 | 24 | 35 |
| <i>THEMATIC SUBMODULE 3. Drugs that affect the function of the central nervous system and gastrointestinal tract</i> | | | | |
| Pharmacological description of CNS depressants (part I). | 8 | 1 | 3 | 4 |
| Pharmacological description of CNS depressants (part II). | 8 | 1 | 3 | 4 |
| Pharmacological description of CNS stimulants. | 8 | 1 | 3 | 4 |
| Medicines affecting GIT (part I). | 8 | 1 | 3 | 4 |
| Medicines affecting GIT (part II). | 8 | 1 | 3 | 4 |

| | | | | |
|--|------------|-----------|------------|------------|
| Control of submodule 3. | 10 | | 3 | 7 |
| Total content submodule 3 | 50 | 5 | 18 | 27 |
| TOTAL AMOUNT OF HOURS OF THE MODULE 1 | 150 | 16 | 54 | 80 |
| MODULE 2. | | | | |
| <i>THEMATIC SUBMODULE 4. Drugs that affect the functions of the executive organs.</i> | | | | |
| Antihypertensive and hypotensive drugs | 8 | 1 | 4 | 3 |
| Antianginal drugs | 8 | 1 | 4 | 3 |
| Anti-arrhythmic drugs. Cardiotoxic agents | 8 | 1 | 4 | 3 |
| Drugs that affect blood coagulative system | 8 | 1 | 4 | 3 |
| Antiatherosclerosis drugs. The pharmacological characteristics of cerebral blood flow disorders correctors | 8 | 1 | 4 | 3 |
| Diuretics. Antigouts. Drugs that affect the functions of the respiratory system. | 11 | 2 | 4 | 5 |
| Control of submodule 4 | | | | |
| Total content submodule 4 | 51 | 7 | 24 | 20 |
| <i>THEMATIC SUBMODULE 5. Chemotherapeutic drugs.</i> | | | | |
| Antibiotics: penicillins, cephalosporins, monobactams, carbapenems, macrolides, tetracyclines | 8 | 1 | 4 | 3 |
| Synthetic antibacterial drugs. Sulfonamides | 8 | 1 | 4 | 3 |
| Fluoroquinolones. Antituberculosis medicines | 8 | 1 | 4 | 3 |
| Antibiotics of different groups: polymyxins, aminoglycosides, glycopeptides, lincosamides, chloramphenicols, rifampycins etc. Antiviral, antifungal and antihelminthic drugs. | 11 | 2 | 4 | 5 |
| Control of submodule 5. | | | | |
| Total content submodule 5 | 35 | 5 | 16 | 14 |
| <i>THEMATIC SUBMODULE 6. Drugs that affect the functions of the metabolism, blood and immune system.</i> | | | | |
| Drugs with activity of adrenal gland hormones and gonads. Anabolic steroids | 8 | 1 | 4 | 3 |
| Drugs with activity of hormones of the hypothalamus, pituitary, epiphysis, thyroid, parathyroid gland, drugs that affect the myometrium. | 8 | 1 | 4 | 3 |
| Insulins. Synthetic hypoglycemic drugs | 8 | 1 | 4 | 3 |
| Pharmacology of iron medicines. Correctors of leucopoiesis. Correctors of cellular and tissue metabolism: vitamin and vitamin-like medicines; anti-hypoxants and antioxidants. | 8 | 1 | 4 | 3 |
| Control of submodule 6 | | | | |
| Upgrade of Module 2 | 10 | | 4 | 6 |
| Total content submodule 5 | 42 | 4 | 20 | 17 |
| TOTAL AMOUNT OF HOURS OF THE MODULE 2 | 150 | 16 | 60 | 74 |
| SEMESTER EXAM | | | | 22 |
| Total Hours for the educational component | 300 | 32 | 114 | 154 |

5. Content of the educational component

Module 1. General pharmacology. Medicines affecting peripheral nervous system and neurotransmitter processes

Submodule 1. General pharmacology. General prescription

Topic 1. Introduction to prescription writing. Prescription writing of solid and soft medicinal forms

Prescription writing and prescription. Functional parts of prescription. Forms of prescription. Analysis of the structure and content of the prescription. Classification of medicinal forms. Rules of solid and soft medicinal forms prescription writing. Solid medicinal forms: powders, tablets, glossets, draggee, granules, spansules, capsules, species, candies, pastilles. Soft medicinal forms: gels, ointments, pastes, liniments, suppositories, plasters.

Topic 2. Rules of liquid medicinal forms prescription writing

Rules of prescription writing of solutions for external use, emulsions, suspensions, syrups, lotions,

lemonades, scented water, infusions and decoctions, tinctures, extracts, balms, newgalenic medicines, mixtures, solutions for injections. Different medicinal forms: eye films, aerosols and others. New medicinal forms and medical delivery systems (transdermal therapeutic systems, spacers, nebulizers, etc.). Common mistakes that occur in prescription. An algorithm of pharmacist's action in finding mistakes in the prescription.

Topic 3. General pharmacology. Kinds of action and routes of administration of drugs. The mechanisms of action, pharmacodynamics and pharmacokinetics of drugs

Contents of pharmacology, its objectives and place among other pharmaceutical sciences. The main sections of pharmacology (general and particular). The main parts of development of pharmacology as a science. Modern trends in pharmacology. The law of Ukraine "About medicines". The system of state registration of medicines in Ukraine. Pharmacological "alphabet": the definitions of "medical substance", "individual pharmacological agent", "medicine" ("medication", "medicine", "remedy"), "pharmacological reaction", "pharmacological effect", "pharmacodynamics", and "pharmacokinetics" of drugs. Nomenclature of drugs: chemical, international non-proprietary (INN), commerce. Principles of classification of drugs. International ATC-classification of drugs. Stages of development and introduction of new drugs. The original (innovative) and generic medicines. International standards of medicines quality at the stage of pre-clinical (toxicological and pharmacological) research. The concept of GLP. Types of drugs action on the organism: local, resorptive, reflex, main, side, direct, reversible, irreversible, positive, negative, selective, stimulating, etiotropic, pathogenetic, symptomatic, preventive, substitutive. Routes of administration of medicines to the organism. Comparison of enteral and parenteral routes of administration of drugs. Risk/benefit ratio during election of the route of administration. The mechanisms of the pharmacological effect realization. The nature and essence of the interaction between a drug and components of cell membranes. The participation of receptors and dependent channels in the mechanisms of action of drugs. General concepts of pharmacokinetics: absorption, distribution (deposit), metabolism (biotransformation) and excretion of drugs. Factors affecting the pharmacodynamics and pharmacokinetics of drugs.

Topic 4. General pharmacology. Classification and principles of the drug dosing. The phenomena that occur during the repeated and combined administration of drugs. Side effects of drugs

Drugs dosing. Classification and identification of doses. The pattern of "dose-effect". The safety indicators of medicines. Therapeutic window and therapeutic index (TI). The concept of pharmacogenomics and chronopharmacology. Drug idiosyncrasy. Classification of side effects of drugs. Side effects of drugs: drug allergy, embryotoxicity, teratogenic, fetotoxicity, mutagenic, carcinogenic effects. Specific undesirable (organotropic) effect of drugs. Phenomena that occur in combined drug administration. Habituation, cumulation, drug addiction (psychological dependence), dysbiosis, synergism, antagonism. The system of pharmacosupervision in the world and in Ukraine. The role of pharmacists in ensuring the rational use of drugs and the prevention of side effects of drugs.

Submodule 2. Medicines affecting peripheral nervous system and neurotransmitter processes. Pharmacological correctors of pain and inflammation.

Topic 5. Drugs affecting the afferent innervation

Classification of drugs that are mainly active in the site of afferent nerves (agents of inhibiting and stimulating type of action). Agents with inhibiting type of action: local anesthetics (LA), astringent, coating, adsorbent, antacid agents, drugs containing volatile oils. Classification of LA on their chemical structure. Types of local anesthesia. Requirements to LA. Pharmacological and pharmaceutical aspects of combining of LA with drugs from other groups in various medicinal forms. Pharmacological characteristic of LA, astringent, coating, antacid agents, drugs containing volatile oils. Side effects of LA. Classification and pharmacological characteristics of sorbents. Principles of hemo-, plasma- and enterosorption. Pharmacological characteristic of medicines with stimulative effects: irritants, bitters, expectorants, emetic drugs, laxatives with reflex action, as well as medicines containing bees and snakes poison. Comparison of the drugs from these groups, peculiarities of their use in patients of all ages and pregnant.

Topic 6. Medicines affecting efferent innervation: pharmacological description of cholinergic

agonists

The connection between physiological characteristics of the autonomic nervous system and mechanisms of pharmacological effect realisation of mediator type drugs. The concept about receptors (post-, pre-, out of synapses) and their endogenous or exogenous ligands. Selectivity of cholinotropic effect of mediator type medicines. The connection between physiological functions of the parasympathetic nervous system and pharmacodynamics of cholinergic medicines. Classification and pharmacological characteristic of cholinergic (cholinomimetics, anticholinesterase) drugs. The mechanisms of side effects development. Acute poisoning with alkaloids of cholinotropic effect and phosphororganic substances. Pharmacological characteristics of cholinesterase reactivators.

Topic 7. Medicines affecting efferent innervation: pharmacological description of cholinergic agoni antagonists

Classification and pharmacological characteristic of anticholinergic (M-cholinoblockers, ganglionic blockers, muscle relaxants) drugs. Pharmacological characteristic of M-cholinoblockers. Symptoms of poisoning by belladonna alkaloids and principles of antidote therapy. Pharmacological characteristic of ganglionic blockers. Features of the application of ganglionic blockers in the clinic. Pharmacological characteristic of muscle relaxants.

Topic 8. Medicines affecting efferent innervation: pharmacological description of adrenergic agonists and antagonists

The connection between physiological functions of the sympathetic nervous system and pharmacodynamics of adrenotropic drugs. Types and localization of adrenergic receptors. Peculiarities of the nerve impulses transmission in adrenergic synapses. Effects of excitation of the sympathetic nervous system by the executive organs. Classification and mechanism of action of adrenotropics depending on the type and localization of adrenergic receptors. Pharmacological characteristic of adrenotropics (agonists, sympathomimetics, blockers and sympatholytics). Pharmacological logic in the mechanism of action and pharmacodynamic peculiarities of adrenergic agonists and blockers, sympathomimetics and sympatholytics. The concept of cardioselectivity and internal sympathomimetic activity of adrenoblockers. The connection between pharmacodynamic and indications, side effects and contraindications of adrenotropics. Comparison of adrenomimetics and sympathomimetics, adrenoblockers and sympatholytics.

Topic 9. Intermediants. Pharmacological correctors of allergy

General determination of "Intermediants". Mechanism of action and pharmacodynamics of intermediants from the position of pharmacological role of dopamine, histamine, serotonin and prostaglandins in the body. Types of pharmacological correction of allergic reactions of immediate and delayed types. Classification and nomenclature of traditional and new anti-allergic medicines depending on their chemical structure, their generation, and mechanisms of action. Current understanding of the mechanisms of allergic reactions of different types development depending on their pathogenetic mechanism. Pharmacological characteristic of anti-allergic drugs: H₁-histamino-, serotonin-, leukotrieno- receptor blockers, inhibitors of leukotrienes synthesis, mast cell stabilizers, topical glucocorticosteroids. The logical connection between pharmacodynamics and indications of anti-allergic agents. Comparison of antiallergic agents. Side effects of anti-allergic drugs and the role of pharmacist in their prevention. Peculiarities of anti-flue drugs from OTC group containing H₁-histamine receptors blockers.

Topic 10. Pharmacological correctors of pain and inflammation. Medicines for general anesthesia. Alcohols

Ways of pharmacological correction of pain. The concept of nociceptive, antinociceptive system, opiate receptors (OR), and their physiological and pharmacological importance. Endogenous ligands of OR. Classification of narcotic analgesics (NA) depending on their chemical structure and affinity to OR. Pharmacological characteristic of NA. Potentiation of the neuroleptics, non-narcotic analgesics and medicines from other groups by NA. Mechanisms of side effects development: addiction, abstinence syndrome after prolonged administration of drugs. Signs of acute intoxication by NA. The algorithm of first aid in case of poisoning by NA. Pharmacological characteristic of antagonists of OR. Drug dependence on NA and the role of the pharmacist in its prevention. The social nature of addiction. Pharmacological characteristics of non-narcotic analgesics, analgesics-

antipyretics, spasmolytics. The terms of rational use. Side effects and their prevention. Comparison of narcotic and non-narcotic analgesics and combined agents.

The history of the general anesthetics discovery. Modern requirements for general anesthetics. Classification of general anesthetics. Pharmacological characteristic of general anesthetics for inhalative and non-inhalative anesthesia. Peculiarities of routes of administration and dosing for general anesthetics. The comparison of general anesthetics. The concept of premedication, introducing, basic and combined general anesthesia. Classification of alcohols. The pharmacological characteristic of alcohols (ethanol, camphor, boric), peculiarities of their pharmacodynamics when the medicines are applied topically. The use of ethanol in the medical and pharmaceutical practice. The algorithm of first aid in acute poisoning with ethyl alcohol. Pharmacological characteristic of drugs for the alcoholism treatment. The role of the pharmacist in prevention the effects that occur in case of combined administration of alcohol and drugs, and abuse of alcohol containing drugs.

The role and place of anti-inflammatory drugs in pharmacotherapy of inflammation as the most typical pathological process. The classification and nomenclature of modern nonsteroidal anti-inflammatory drugs (NSAIDs) depending on their chemical structure, origin and degree of selectivity to cyclooxygenases. Modern views on the mechanism of action of NSAIDs dealing with the cyclooxygenase concept. Pharmacological characteristic of NSAIDs. Comparison of traditional and new NSAIDs. The logical connection between pharmacodynamics and indications, side effects and contraindications of NSAIDs. The role of the pharmacist in providing conditions for rational use of NSAIDs. Prospects of the NSAIDs creation with non-traditional mechanism of action.

Submodule 3. Drugs that affect the function of the central nervous system and gastro-intestinal tract

Topic 11. Psychotropic and neurotropic drugs with inhibitory action. Antipsychotics. Tranquilizers. Sedatives. Hypnotics. Anticonvulsants. Antiparkinsonian

The concept of antipsychotics and neurotropic action of drugs. Classification of neuroleptics depending on their chemical structure. Pharmacological characteristic of neuroleptics. Differences between antipsychotic and neuroleptic action. The logical connection between the mechanism of action and pharmacological effects of neuroleptics. Mechanisms of side effect of neuroleptics development in case of their prolonged administration and its prevention. Neuroleptanalgesia as an example of potentiative synergism of narcotic analgesics and neuroleptics. Comparison of neuroleptics from different groups. Pharmaceutical peculiarities of phenothiazines. Classification of tranquilizers depending on their chemical structure and on their influence on the nervous system. The concept of the GABA-benzodiazepine complex. Pharmacological characteristic of tranquilizers. The differences between tranquilizers and neuroleptics. Drug dependence on tranquilizers and pharmacist role in its prevention. Terms of rational use of tranquilizers. Classification of sedative drugs in their origin. Pharmacological characteristics of bromides, sedative herbal drugs and combined ones. Clinical signs of bromism and measures to prevent it. Achievements of psychopharmacology of XXI century.

The definition of "hypnotics". Modern requirements for "ideal" hypnotics. Classification of hypnotics depending on their chemical structure. Pharmacological characteristic of hypnotics, their influence on the architecture of sleep. Dependence of hypnotics pharmacological action (falling asleep speed, sleep duration, presence of postsleeping disorders) on their chemical structure. The phenomenon of "enzyme inducers" under the influence of barbiturates and their pharmacological importance. Comparison of hypnotics from different groups. The terms of rational administration of hypnotics. Acute poisoning by hypnotics and measures to prevent them. Anticonvulsants. The concept of epilepsy and convulsions, "status epilepticus", "eclampsia." Classification of anticonvulsants depending on their chemical structure. Pharmacological characteristics of anticonvulsants. Comparison of drugs of different groups. The terms of rational administration of anticonvulsants in case of prolonged use. The role of the pharmacist in the prevention of their side effects. Pharmacology of magnesium sulfate. Antiparkinsonian drugs. Ways of pharmacological correction of Parkinson's disease, the definition of "medical parkinsonism." Classification of antiparkinsonian drugs and their pharmacological characteristics. Comparison of antiparkinsonian drugs from different groups. The terms of rational administration of antiparkinsonian drugs with prolonged administra-

tion. Pharmacological characteristic of drugs that eliminate muscle spasticity of central action genesis.

Topic 12. Psychotropic and neurotropic drugs with excitatory action. Psychostimulants. Anti-depressants. Nootropics. Analeptics. Actoprotectors. Adaptogens

Classification of psychostimulants depending on their chemical structure. Pharmacological characteristics. Peculiarities of their use in clinical practice. Mechanisms of addiction development to amphetamines. Antidepressants. Classification of antidepressants depending on their chemical structure, mechanism of action. Typical and atypical antidepressants, their pharmacological characteristics. Peculiarities of antidepressants in psychiatric and therapeutic practice. Pharmacological characteristics of normothymics. Classification of nootropics depending on their chemical structure, mechanism of action. Pharmacological characteristics nootropics. Peculiarities of their use in heriatry, gynecology, neurology, psychiatry, ophthalmology, etc. Pharmacological characteristics of cerebroprotectors.

Analeptics: classification by the mechanism of action, pharmacological characteristics. Comparison of analeptics depending on their strength of action, the predominant influence on different parts of the CNS. Actoprotectors: pharmacological characteristics. Adaptogens: classification of adaptogens depending on their origin, pharmacological characteristics. Terms of rational use of drugs that stimulate the central nervous system.

Topic 13. Drugs that affect the function of the gastrointestinal tract: appetite correctors, emetic, anti-emetic, anti-ulcer, gastroprotectors

Classification and pharmacological characteristics of drugs that stimulate appetite (bitters, insulin, anabolic steroids, psychotropic drugs) or reduce appetite (anorexigenic agents). Classification and pharmacological characteristics of emetic and anti-emetic drugs (serotonin and dopamine receptors blockers, M-cholinoblockers, H₁-histaminoreceptors blockers). Classification and pharmacological characteristics of drugs that affect the secretory function of the stomach. Pharmacological characteristics of stimulants of gastric juice secretion and substitutive therapy. Pharmacological characteristics of drugs that reduce the secretion of gastric glands (H₂-histamine receptors blockers, proton pump inhibitors, M₁-cholinoreceptors blockers) gastroprotectors, antacids. Comparison of antacid of I-IV generations.

Topic 14. Drugs that affect the function of the gastrointestinal tract: hepatoprotectors, spasmolytic, choloretic (choloretics, cholekinetiks) and cholelytics, laxative drugs

Classification and pharmacological characteristics of drugs that regulate motor function of the gastrointestinal tract: propulsants, antispasmodics, antidiarrheal, laxatives. Comparison of medicines and terms for their rational use. Classification and pharmacological characteristics of hepatoprotectors, choloretic (choloretics, cholekinetiks) and cholelytics. Achievements of Ukrainian scientists in development new natural and synthetic hepatoprotectors.

The final test of modul 1.

Module 2. Drugs that affect the functions of the executive organs, metabolism, blood and immune system. Chemotherapeutic drugs

Submodule 4. Drugs that affect the functions of the executive organs

Topic 15. Drugs that affect the functions of the respiratory system. Decongestants, anti-tussive drugs, broncholytics, expectorants, mucolytics, surfactants

Classification and pharmacological characteristics of the respiratory stimulants. Comparative characteristics of drugs of central and peripheral actions. Features of use in intensive care, neonatology, pulmonology. Classification and pharmacological characteristics antitussive drugs with central and peripheral action. The logical connection between side effects and contraindications to their use. Classification and pharmacological characteristics expectorants and mucolytics. Features of sustainable use of plant origin expectorants. Classification and pharmacological characteristics of drugs that stimulate surfactant synthesis and exogenous pulmonary surfactant. Classification and pharmacological characteristics bronchodilator drugs. The logical connection between the mechanism of action and pharmacodynamics, side effects and contraindications to the use of bronchodilators of different groups (β -agonists, M-cholinoblockers, myotropic ispasmolytics). Modern formulations and therapeutic systems for inhalation bronchodilators. Pharmacological foundation of com-

bined use of bronchodilators with anti-allergic and anti-inflammatory steroid drugs.

Topic 16. Cardiotonic agents: glycoside and nonglycoside cardiotonics. Anti-arrhythmic agents

Classification of cardiac glycosides (CG) in origin and their pharmacological characteristics. The difference in cardiotonic and cardiostimulative action. The problem of efficacy and safety of cardiac glycosides and their toxicity. The therapeutic window of CG. Peculiarities of dosing of CG (digitalisation). Clinical manifestations of intoxication by CG, their prevention. Pharmacological characteristics of nonglycoside cardiotonics. Classification and pharmacological characteristics of anti-arrhythmic agents. Peculiarities of use of anti-arrhythmic agents, depending on the mechanism of occurrence and type of arrhythmia. Terms of rational use of anti-arrhythmic agents.

Topic 17. Anti-anginal drugs: nitrovasodilators, calcium channel blockers, β-adrenoblockers, coronarolytics, cardioprotectors

Classification and pharmacological characteristics of anti-anginal drugs. Classification of organic nitrates in chemical structure, pharmacokinetic profile. Modern medicinal forms of organic nitrates, their pharmaceutical characteristics. Peculiarities of organic nitrates use depending on the medicinal form and pharmacokinetics. The logical connection between the side effects of organic nitrates and contraindications. The mechanism of tolerance to nitrates and ways of pharmacological correction. Pharmacological characteristics of SH-groups donors. Classification and pharmacological characteristics of β-adrenoblockers. Peculiarities of pharmacodynamics of β-blockers, depending on the presence or absence of cardioselectivity, intrinsic sympathomimetic activity, vasodilative effect. Terms of rational use of β-adrenoblockers. Classification and pharmacological characteristics of slow calcium channel blockers. Peculiarities of pharmacodynamics of slow calcium channel blockers depending on the medicinal form and their chemical structure. Anti-anginal agents with reflex action: mechanism of action, pharmacodynamics, peculiarities of the administration. Pharmacological characteristics of new antianginal drugs - selective inhibitors of f-channels of sinus node (ivabradine). Classification and pharmacological characteristics of cardioprotectors, antioxidants.

Topic 18. The pharmacological characteristics of cerebral blood flow disorders correctors. Anti-atherosclerotic medicines

Classification and pharmacological characteristics of cerebral blood flow disorders correctors (calcium channel blockers, uterine horn derivatives, Ginkgo Biloba drugs, etc.). The logical relationship between side effects and contraindications to cerebral circulation disorders correctors circulation. Modern understanding of pharmacological correctors of atherosclerosis. Classification and nomenclature of anti-atherosclerotics. Pharmacological characteristics of statins, fibrates, bile acid sequestrants, nicotinic acid agents, anhioprotektors, essential phospholipids. Side effects of lipid-lowering drugs, contraindications. Terms of rational use of anti-atherosclerotics at their prolonged use.

Topic 19. Antihypertensive drugs: agonists of imidazoline receptors, α- i β-adrenoblockers, ganglionic blockers, sympatholytics, slow calcium channel blockers, ACE inhibitors, angiotensin II receptor antagonists, peripheral vasodilators etc

The term "spasmolytic", "vasodilative" and "hypotensive" action. Classification of antihypertensives of central and peripheral action. Antihypertensive drugs of central action of the first and the second generations, their mechanism of action. Peculiarities of their pharmacodynamics and indications. Side effects and contraindications of antihypertensives of central action. Differences in the administration of short-acting and retard forms of α₁-adrenoblockers. Peculiarities of pharmacodynamics and indications of cardioselective and noncardioselective β-adrenoblockers, that do not have or have vasodilative properties. Side effects and contraindications of β-adrenoblockers. Sympatholytics: mechanism of action, pharmacodynamics. Comparison of sympatholytics, their uses and side effects. Pharmacological justification of ganglionic blockers uses as antihypertensive drugs. Peculiarities of their pharmacodynamics depending on the pharmacokinetic profile. The logical connection between ganglionic blockers side effects and their contraindications. Classification of slow calcium channel blockers in chemical structure and generations. Pharmacological characteristics of slow calcium channel blockers. Comparison of slow calcium channel blockers of the next generation to the first generation (pharmacokinetic and pharmacodynamic properties, depending on

the chemical structure and medical form). The main side effects of slow calcium channel blockers, contraindications.

Classification of ACE inhibitors on the chemical structure and pharmacokinetic characteristics. Pharmacological characterization of ACE inhibitors. The logical connection between the side effects of ACE inhibitors and contraindications. Classification of ACE inhibitors on the chemical structure and pharmacokinetic characteristics. Pharmacological characteristic of ACE. The logical connection between the side effects of ACE inhibitors and contraindications. Angiotensin II receptor antagonists as an alternative to ACE inhibitors (mechanism of action, pharmacodynamics peculiarities, differences comparing to ACE). Pharmacological characterization of peripheral vasodilators and antispasmodics with myotropic action. Pharmacological justification for the use of diuretic drugs in hypertension. Principles of their use. Combined antihypertensive drugs. Rational and irrational combinations of antihypertensive drugs. Drugs used in hypertensive crisis elimination. Classification and pharmacological characteristics of drugs that increase blood pressure.

Topic 20. Drugs that affect the function of the urinary-genital system. Diuretics. Antigouts.

The common definition of "diuretics". Classification of diuretics on their mechanism of action, origin, nomenclature of diuretic drugs. Pharmacological characteristics of diuretics. Comparison of diuretic drugs based on mechanisms of action, peculiarities of pharmacodynamics and indications. Principles of rational combined administration of diuretics from different groups.

The common definition of "antigouts". Pharmacological characteristics of drugs affecting uric acid metabolism, inhibit the formation and facilitate the excretion of urinary calculi.

The common definition of "prostatoprotectors." Classification, nomenclature and pharmacological characteristics of prostatoprotectors considering their origin and composition (combined drugs). Side effects and contraindications. Classification, nomenclature and pharmacological characteristics of erectile dysfunction correctors. Risk/benefit ratio of their use in patients taking nitrovasodilators and other drugs.

Submodule 5. Chemotherapeutic drugs

Topic 21. Antiblastomic drugs. The principles of treatment of poisoning by drugs and substances. Antidotes. Radioprotectors

Classification and mechanisms of cytostatic action of general groups of antiblastomies. Pharmacological characteristics of antiblastomic drugs. Types of side effects of antiblastomic drugs and measures to prevent them. Pharmacological correctors of complications of chemotherapy. Principles of combined use of antiblastomic drugs from different groups. Pharmaceutical peculiarities of work with cytostatics.

Classification, pharmacological characteristics of radioprotectors and peculiarities of their use in oncology in case of treatment and prevention of radiation sickness.

Classification of medical intoxications. The concept of antidotes and their classification. Pharmacological characteristics of antidotes. Methods of active detoxication. Peculiarities of vomiting, laxatives, inducers of microsomal oxidation, adsorbents, hepatoprotectors, plasma substitutes and detoxicants in acute poisoning administration. Forced diuresis.

Topic 22. Synthetic antibacterial drugs. Sulfonamides. Fluoroquinolones. Antituberculous medicines

Classification and pharmacological characteristics of sulfonamides. The spectrum of action and dosing regimen sulfonamides. Pharmacological characteristics of quinolone antibiotics and fluoroquinolones, terms of rational use. Classification and pharmacological characteristics of hinoxalin, nitrofurans and 8-oxihinolin derivatives, the spectrum of antimicrobial activity, features of intestinal and kidney infections. Classification and pharmacological characteristics of antituberculous medicines. Principles of rational use of antituberculous medicines with prolonged use.

Topic 23. Antibiotics: penicillins, cephalosporins, monobactams, carbapenems, macrolides, tetracyclines

Classification of antibiotics in chemical structure and mechanism of action. Types and antimicrobial spectrum of antibiotics. Mechanisms of antibiotic resistance development and its possible pharmacological overcome. The term "superinfection", "postantibiotic effect." Beta-lactam antibiotics: penicillins, cephalosporins, monobactams, carbapenems. The classification according to chemical

structure, spectrum of antimicrobial action and generations, pharmacological characteristics and features of the combined drugs use. Pharmacological characteristics, antimicrobial spectrum of macrolides, tetracyclines.

Topic 24. Antibiotics of different groups: aminoglycosides, glycopeptides, lincosamides, polymyxins, chloramphenicols, rifamycins etc

Pharmacological characterization of aminoglycosides, glycopeptides and lincosamides. Terms of rational application. Pharmacological characteristics, antimicrobial spectrum of chloramphenicol, rifamycin, terms of rational use. Polymyxins. Classification of their spectrum of action and pharmacological characteristics, possible complications and their prevention. The concept of dysbiosis, pre-and probiotics. Principles of effective and safe use of antibiotics, pre-and probiotics.

Topic 25. Antiviral, antifungal and antihelminthic drugs

The main stages of virus replication and possible interference of antiviral drugs in the process of virus replication. Pharmacological characteristics of antiviral drugs. Features of antiviral drugs in pregnant women and patients of different age groups. Pharmacological characteristics of antiherpethetical drugs, peculiarities of their application. Tools for the treatment and prevention of AIDS (ARVs): classification by mechanism of action, pharmacological characteristics. Interferons and interferon synthesis inducers, classification, pharmacological characteristics, indications for use.

Classification of antifungal drugs in chemical structure, route of administration and forms of mycoses infection, the type and the range of antymycose action. Antifungal antibiotics. Pharmacological characteristics of antifungal drugs. Terms of rational use. Pharmacological aspects of the combined use of glucocorticoides, antihistamines, anti-bacterial drugs. Anthelmintic drugs. Classification by origin and according to the classes of worms. Modern requirements to anthelmintic agents. Pharmacological characteristics of medicines used in intestinal nematodoses, cestodoses, trematodoses and those drugs, used in extraintestinal forms of helminthiasis. Terms of rational use.

Topic 26. Antiprotozoal and antispirochetal drugs.

Classification, pharmacological characteristics of antiprotozoal and antispirochetal drugs, terms of rational use.

Topic 27. Antiseptics and disinfectants

The concept about asepsis, antisepsis, disinfection and their peculiarities in the pharmaceutical practice. The difference between antiseptics and disinfectants. Modern requirements to antiseptics and disinfectants. Basic mechanisms of antimicrobial and antiparasitic action antiseptics and disinfectants. Pharmacological characteristics of products containing halogens, oxidants, acids and alkalis, dyes, ethyl alcohol, detergents, heavy metals, phenols, tar and antibacterial agents of plant origin. Conditions of effective and safe use of antiseptics and disinfectants.

Submodule 6. Drugs that affect the functions of the metabolism, blood and immune system

Topic 28. Correctors of cellular and tissue metabolism: vitamin and vitamin-like medicines; enzyme and anti-enzyme medicines; antihypoxants and antioxidants

Classification of vitamins and coenzyme medicines. Pharmacological characteristics of water-soluble vitamins and coenzyme medicines. Pharmacological characteristics of lipid-soluble vitamins. Pharmacological characteristics of enzymes drugs. Enzyme medicines as agents for replacement therapy for diseases of the digestive system. Enzyme medicines that are used locally for necrotic process, with scars and spikes. Pharmacological characteristics of enzyme systemic therapy. Complications of enzyme therapy. Anti-enzyme medicines. Inhibitors of proteolysis. Pharmacological characteristics of aminoacids, biogenic stimulants, reparants, medicines for parenteral nutrition, plasma substitutes, desintoxicative solutions. Pharmacological characteristics of medicines, which are used to correct acid-base status and ion balance in the body: alkali, acids, dextrose, medicines containing calcium, potassium, iron, cobalt, iodine, phosphorus, fluorine, magnesium. Classification and pharmacological characteristics of antioxidants and antihypoxants. Medicins that affect the metabolism of bone and cartilage tissues. Pharmacological characteristics of chondroprotectors.

Topic 29. Drugs that affect blood coagulative system

Modern ideas about ways of pharmacological effect on hemostasis. Classification, pharmacological characteristics of drugs that affect the processes of blood clotting (direct and indirect anticoagulants). Comparison of anticoagulants of direct and indirect actions, low molecule heparin and hepa-

rin with sulodexid. The logical relationship between side effects and contraindications of anticoagulants.

The common definition of "fibrinolytics", "antiaggregants", "hemostatics", their classification, nomenclature and sources. Pharmacological characteristics of fibrinolytics, antiaggregants, hemostatics. Peculiarities of plant origin hemostatics use. Terms of rational use of drugs affecting hemostasis.

Topic 30. Drugs that affect blood formation. Pharmacology of iron medicines. Correctors of leucopoiesis

Classification and pharmacological characteristics of medicines that regulate hematopoiesis. Stimulators and inhibitors of erythropoiesis. Classification and pharmacological characteristics of iron medicines. Comparison of two- and trivalent iron. Pharmaceutical peculiarities of modern iron drugs. Interaction between iron medicines with drugs from the other pharmacological groups. Conditions for effective and safe use of iron medicines. Classification and pharmacological characteristics of stimulators and inhibitors of leucopoiesis. Their use in oncology.

Topic 31. Drugs with activity of hormones of the hypothalamus, pituitary, epiphysis, thyroid, parathyroid gland. Insulins. Synthetic hypoglycemic drugs

The general concept of medicines containing hormones. Sources of hormones, their dosing, types of hormone therapy. Terms of rational use of hormonal drugs. Classification and pharmacological characteristics of hormones of the hypothalamus, pituitary, epiphysis. Classification of thyroid and parathyroid glands hormones and their pharmacological characteristics. The concept of antihormonal drugs and their pharmacological characteristics.

Classification of insulin in origin and duration. Pharmacological characteristics of insulin. Pharmacokinetic profile of insulin and their dosage. New medicinal forms of insulin. Side effects in prolonged administration of insulin. First aid for hyperglycemic and hypoglycemic coma.

Classification and pharmacological characteristics of synthetic oral antidiabetic drugs. The requirements imposed on them. Principles of combined administration of antidiabetic drugs from different groups. Correctors of diabetic complications.

Topic 32. Drugs with activity of adrenal gland hormones and gonads. Anabolic steroids

Classification of corticosteroids depending on their origin, chemical structure, route of administration or type of pharmacological action. The pharmacological characteristics of drugs of adrenal cortex: mineralocorticoids, glucocorticoids and their synthetic analogues. The logical relationship between the pharmacological effects of glucocorticoids, their indications, side effects and contraindications. Comparison of natural and synthetic glucocorticoids (pharmacokinetic and pharmacodynamic differences), especially drugs containing fluoride. Peculiarities of glucocorticoids dosing, depending on the type of drug therapy (substitutive or pathogenetic). The mechanism of withdrawal syndrome development in case of hormonal drugs administration. Peculiarities of new medicinal forms and conditions of rational use of drugs for topical application.

Classification of estrogen and progestin drugs in their origin and chemical structure and pharmacological characteristics. The concept of contraception (hormonal and non-hormonal). The role of the pharmacist in the application of modern contraceptive technology, practice of family planning, prevention of abortion and reproductive health of women. Classification and pharmacological characteristics of modern hormonal contraceptives. Modern medicinal forms of hormonal contraceptives (subcutaneous implants, depot medicines, plasters) and their uses. Combined oral contraceptives, their comparative characteristics depending on the dose of estrogen and progestin components. Combined oral estrogen-progestin medicines that have antiandrogenic properties, peculiarities of their administration. Medical aspects of hormonal contraceptives administration. Side effects and contraindications. Nonhormonal contraceptives, their mechanism of action. Pharmacological characteristics of male contraception. Anti-estrogenic and antigestagenic drugs: mechanism of action, pharmacodynamics, indications. Pharmacological characteristics of androgenic drugs, anabolic steroids. Peculiarities of main actions and indications of anti-androgens.

The final test of modul 2

Examination

6. Topics of lectures

| № | Name of topic | Hours |
|--------------------|--|-----------|
| 1 | Introduction to Pharmacology. Basic principles and concepts of pharmacodynamics and pharmacokinetics. Placebo effect. | 1 |
| 2 | General pharmacology. Classification and principles of the drug dosing. The phenomena that occur during the repeated and combined administration of drugs. Side effects of drugs. Prescription handling. | 1 |
| 3 | Drugs affecting the afferent innervation (part I). | 1 |
| 4 | Drugs affecting the afferent innervation (part II). | 1 |
| 5 | Medicines affecting efferent innervation: pharmacological description of cholinergic agonists. | 1 |
| 6 | Medicines affecting efferent innervation: pharmacological description of cholinergic antagonists. | 1 |
| 7 | Medicines affecting efferent innervation: pharmacological description of adrenergic agonists. | 1 |
| 8 | Medicines affecting efferent innervation: pharmacological description of adrenergic antagonists. | 1 |
| 9 | Pharmacological correctors of pain and inflammation. | 1 |
| 10 | Pharmacological correctors of allergy. | 1 |
| 11 | Pharmacological description of CNS depressants (part I). | 1 |
| 12 | Pharmacological description of CNS depressants (part II). | 1 |
| 13 | Pharmacological description of CNS stimulants (part I). | 1 |
| 14 | Pharmacological description of CNS stimulants (part II). | 1 |
| 15 | Medicines affecting GIT (part I). | 1 |
| 16 | Medicines affecting GIT (part II). | 1 |
| 17 | Antianginal drugs. | 1 |
| 18 | Anti-arrhythmic drugs. Cardiotonic agents. | 1 |
| 19 | Drugs that affect blood coagulative system | 1 |
| 20 | Antiatherosclerosis drugs. The pharmacological characteristics of cerebral blood flow disorders correctors. | 1 |
| 21 | Diuretics. Antigouts. | 1 |
| 22 | Drugs that affect the functions of the respiratory system. | 1 |
| 23 | Antibiotics: penicillins, cephalosporins, monobactams, carbapenems, macrolides, tetracyclines | 1 |
| 24 | Synthetic antibacterial drugs. Sulfonamides. | 1 |
| 25 | Fluoroquinolones. Antituberculosis medicines | 1 |
| 26 | Antibiotics of different groups: polymyxins, aminoglycosides, glycopeptides, lincosamides, chloramphenicols, rifampycins etc | 1 |
| 27 | Antiviral, antifungal and antihelminthic drugs | 1 |
| 28 | Drugs with activity of adrenal gland hormones and gonads. | 1 |
| 29 | Anabolic steroids | 1 |
| 30 | Drugs with activity of hormones of the hypothalamus, pituitary, epiphysis, thyroid, parathyroid gland, drugs that affect the myometrium. | 1 |
| 31 | Insulins. Synthetic hypoglycemic drugs | 1 |
| 32 | Pharmacology of iron medicines. Correctors of leucopoiesis. Correctors of cellular and tissue metabolism: vitamin and vitamin-like medicines; antihypoxants and antioxidants | 1 |
| Total hours | | 32 |

7. Topics of seminars — Not provided by curriculum.

8. Topics of practical lessons

| № | Name of topic | Hours |
|----|--|-------|
| 1 | Introduction to Pharmacology. Kinds of action and routes of drugs administration. | 3 |
| 2 | General pharmacology. Basic principles and concepts of pharmacodynamics and pharmacokinetics. | 3 |
| 3 | Classification and principles of the drug dosing. The phenomena that occur during the repeated and combined administration of drugs. Side effects of drugs. Prescription handling. | 3 |
| 4 | Control of submodule 1. | 3 |
| 5 | Drugs affecting the afferent innervation. | 3 |
| 6 | Medicines affecting efferent innervation: pharmacological description of cholinergic agonists. | 3 |
| 7 | Medicines affecting efferent innervation: pharmacological description of cholinergic antagonists. | 3 |
| 8 | Medicines affecting efferent innervation: pharmacological description of adrenergic agonists. | 3 |
| 9 | Medicines affecting efferent innervation: pharmacological description of adrenergic antagonists. | 3 |
| 10 | Pharmacological correctors of pain and inflammation. | 3 |
| 11 | Pharmacological correctors of allergy. | 3 |
| 12 | Control of submodule 2. | 3 |
| 13 | Pharmacological description of CNS depressants (part I). | 3 |
| 14 | Pharmacological description of CNS depressants (part II). | 3 |
| 15 | Pharmacological description of CNS stimulants. | 3 |
| 16 | Medicines affecting GIT (part I). | 3 |
| 17 | Medicines affecting GIT (part II). | 3 |
| 18 | Control of submodule 3. | 3 |
| 19 | Antihypertensive and hypotensive drugs | 4 |
| 20 | Antianginal drugs | 4 |
| 21 | Anti-arrhythmic drugs. Cardiotonic agents | 4 |
| 22 | Drugs that affect blood coagulative system | 4 |
| 23 | Antiatherosclerosis drugs. The pharmacological characteristics of cerebral blood flow disorders correctors | 4 |
| 24 | Diuretics. Antigouts. Drugs that affect the functions of the respiratory system. Control of submodule 4 | 4 |
| 25 | Antibiotics: penicillins, cephalosporins, monobactams, carbapenems, macrolides, tetracyclines | 4 |
| 26 | Synthetic antibacterial drugs. Sulfonamides | 4 |
| 27 | Fluoroquinolones. Antituberculosis medicines | 4 |
| 28 | Antibiotics of different groups: polymyxins, aminoglycosides, glycopeptides, lincosamides, chloramphenicols, rifampycins etc. Antiviral, antifungal and antihelminthic drugs. Control of submodule 5. | 4 |
| 29 | Drugs with activity of adrenal gland hormones and gonads. Anabolic steroids | 4 |
| 30 | Drugs with activity of hormones of the hypothalamus, pituitary, epiphysis, thyroid, parathyroid gland, drugs that affect the myometrium. | 4 |
| 31 | Insulins. Synthetic hypoglycemic drugs | 4 |
| 32 | Pharmacology of iron medicines. Correctors of leucopoiesis. Correctors of cellular and tissue metabolism: vitamin and vitamin-like medicines; antihypoxants and antioxidants. | 4 |
| 33 | Control of submodule 6 | 4 |

| № | Name of topic | Hours |
|---|----------------------------|------------|
| | <i>Upgrade of Module 2</i> | |
| | Total Hours | 114 |

9. Topics of laboratorial lessons — Not provided by curriculum.

10. Self-study work

| № | Name of topic | Hours |
|----|--|-------|
| 1 | Introduction to Pharmacology. Kinds of action and routes of drugs administration. | 4 |
| 2 | General pharmacology. Basic principles and concepts of pharmacodynamics and pharmacokinetics. | 4 |
| 3 | Classification and principles of the drug dosing. The phenomena that occur during the repeated and combined administration of drugs. Side effects of drugs. Prescription handling. | 4 |
| 4 | <u>Control of submodule 1.</u> | 6 |
| 5 | Drugs affecting the afferent innervation. | 4 |
| 6 | Medicines affecting efferent innervation: pharmacological description of cholinergic agonists. | 4 |
| 7 | Medicines affecting efferent innervation: pharmacological description of cholinergic antagonists. | 4 |
| 8 | Medicines affecting efferent innervation: pharmacological description of adrenergic agonists. | 4 |
| 9 | Medicines affecting efferent innervation: pharmacological description of adrenergic antagonists. | 4 |
| 10 | Pharmacological correctors of pain and inflammation. | 4 |
| 11 | Pharmacological correctors of allergy. | 4 |
| 12 | <u>Control of submodule 2.</u> | 7 |
| 13 | Pharmacological description of CNS depressants (part I). | 4 |
| 14 | Pharmacological description of CNS depressants (part II). | 4 |
| 15 | Pharmacological description of CNS stimulants. | 4 |
| 16 | Medicines affecting GIT (part I). | 4 |
| 17 | Medicines affecting GIT (part II). | 4 |
| 18 | <u>Control of submodule 3.</u> | 7 |
| 19 | Antihypertensive and hypotensive drugs | 3 |
| 20 | Antianginal drugs | 3 |
| 21 | Anti-arrhythmic drugs. Cardiotonic agents | 3 |
| 22 | Drugs that affect blood coagulative system | 3 |
| 23 | Antiatherosclerosis drugs. The pharmacological characteristics of cerebral blood flow disorders correctors | 3 |
| 24 | Diuretics. Antigouts. Drugs that affect the functions of the respiratory system. | 5 |
| | <u>Control of submodule 4</u> | |
| 25 | Antibiotics: penicillins, cephalosporins, monobactams, carbapenems, macrolides, tetracyclines | 3 |
| 26 | Synthetic antibacterial drugs. Sulfonamides | 3 |
| 27 | Fluoroquinolones. Antituberculosis medicines | 3 |
| 28 | Antibiotics of different groups: polymyxins, aminoglycosides, glycopeptides, lincosamides, chloramphenicols, rifampycins etc. Antiviral, antifungal and antihelminthic drugs. | 5 |
| | <u>Control of submodule 5.</u> | |
| 29 | Drugs with activity of adrenal gland hormones and gonads. Anabolic steroids | 3 |

| № | Name of topic | Hours |
|--------------------|---|-------|
| 30 | Drugs with activity of hormones of the hypothalamus, pituitary, epiphysis, thyroid, parathyroid gland, drugs that affect the myometrium. | 3 |
| 31 | Insulins. Synthetic hypoglycemic drugs | 3 |
| 32 | Pharmacology of iron medicines. Correctors of leucopoiesis. Correctors of cellular and tissue metabolism: vitamin and vitamin-like medicines; antihypoxants and antioxidants. | 3 |
| 33 | Control of submodule 6 <i>Upgrade of Module 2</i> | 6 |
| 34 | EXAM | 22 |
| Total hours | | 154 |

Tasks for self-study work

1. To study the basics of medical prescriptions. To master the rules of prescription of solid, soft and liquid medicinal forms.
2. To prepare essay on the topic «New medicinal forms and delivery systems of drugs and their impact on the effectiveness of medicines».
3. To describe medicines containing bees and snakes poison.
4. To prepare essay «Social values and pharmacological aspects of drug addiction».
5. To prepare essay «Ethyl alcohol. Areas of application in medicine and pharmacology».
6. To prepare essay «Pharmacological peculiarities of hypertensive drugs».
7. To prepare essay «Classification, nomenclature and pharmacological characteristics of cerebral blood flow disorders correctors «.
8. To inquire classification and pharmacological characteristics of drugs that affect metabolism.
9. To describe antitumor medicines.
10. To analyze the types of drugs poisoning. Define the concept of antidotes and radioprotectors.
11. Give the pharmacological characteristic of antiseptics and disinfectants.
12. To prepare essay on the topic «Antiprotozoal and antiparasitic drugs».
13. Features of sustainable use of plant origin expectorants.
14. To prepare essay on the topic « Classification and pharmacological characteristics of drugs that stimulate surfactant synthesis and exogenous pulmonary surfactant «.
15. To describe medicines containing natural substances which are used for the brain blood circulation disorders.
16. To prepare essay «Pharmacological characteristics of nonglycoside cardiotonics».
17. To prepare essay «The logical connection between the side effects of organic nitrates and contraindications».
18. To prepare essay «Selective inhibitors of f-channels of sinus node».
19. To prepare essay «Terms of rational use of anti-atherosclerotics in case of long-term use».
20. To inquire classification and pharmacological characteristics of drugs that affect metabolism.
21. To describe sympatholytics and their mechanism of action, pharmacodynamics.
22. To analyze the drugs used in case of hypertensive crisis.
23. Specify anti-enzyme medicines. Inhibitors of proteolysis.
24. To prepare essay on the topic «Actoprotectors. Adaptogens».

11. Criteria and evaluation order of educational outcomes

Success of applicant in each semester is estimated by 100-point scale which consists of assessment for theoretical and practical training at each class, self-study work, results of thematic module control and also the results of final module control which is conducted at the last class in the semester.

The maximum points, which applicant can receive during the studying of each module (credit) – 100, the minimum points - 60.

During the assessment of applicant's knowledge the advantage is given to the standardized quality monitoring — oral interview, written interview, test, control of practical skills

| Current control | | | | | | SUM |
|-----------------|---------|-----------------|---------|-----------------|---------|--------|
| M1. Submodule 1 | | M1. Submodule 2 | | M1. Submodule 3 | | |
| T1-T3 | Control | T5-T11 | Control | T13-T17 | Control | 60-100 |
| 3-5 | 5-8 | 3-5 | 5-8 | 3-5 | 5-8 | |

| Current control | | | | | | SUM |
|-----------------|---------|-----------------|---------|-----------------|---------|--------|
| M2. Submodule 4 | | M2. Submodule 5 | | M2. Submodule 6 | | |
| T1-T6 | Control | T7-T10 | Control | T11-T14 | Control | 60-100 |
| 3-5 | 6-10 | 3-5 | 6-10 | 3-5 | 6-10 | |

The *rating of the current control* is calculated on a cumulative basis. Depending on the curriculum of the current academic year, the number of classes per semester and the mark in a practical classes (seminars) may vary, but the overall ranking is in accordance with the ECTS scale. Study activity in practical class is estimated according criteria in **table 1**.

Table 1. Criteria of study activity assessment on practical classes

| Scale | Criteria |
|--------------------------------|---|
| «5» excellent 90-100% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson are done full and correctly • Answers to theoretical questions on the topic of the lesson are given correctly and clearly • Practical tasks during the in-class work were carried out full and correctly • Final test has done in within 90-100%. |
| «4» very good 82-89% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson are done full and correctly • Answers to theoretical questions on the topic of the lesson are given full with negligible error • Practical tasks during the in-class work were carried out with negligible error • Final test has done in within 82-89%. |
| «4-» good 74-81% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson are done with negligible error • Answers to theoretical questions on the topic of the lesson are given incomplete with error • Practical tasks during the in-class work were carried out with negligible deviation • Final test has done in within 74-81%. |
| «3» satisfactory 64-73% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson are done with significant error • Answers to theoretical questions on the topic of the lesson are given incomplete or with significant error • Practical tasks during the in-class work were carried out with significant deviation • Final test has done in within 64-73%. |
| «3-» enough 60-63% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson are done partly with significant error • Answers to theoretical questions on the topic of the lesson are given incomplete with significant error • Practical tasks during the in-class work were carried out partly with significant deviation • Final test has done in within 60-63%. |
| «2» unsatisfactory 0-59% | <ul style="list-style-type: none"> • Tasks for self-study for the lesson aren't done or are done incorrect • Answers to theoretical questions on the topic of the lesson aren't given • Practical tasks during the in-class work weren't carried out are done incorrect • Final test has done in within 0-59% |

Current control includes an assessment of the applicant's theoretical knowledge, practical skills and self-study work, as well as the control of the thematic module, and is conducted during the in-class work.

In-class work control is carried out in a practical (seminary) class. In accordance with the lesson objectives the in-class-work control can include: oral interview, individual interview, testing, assessment of practical tasks.

Control of self-study work assesses the level of knowledge that applicants acquire during their own self-study, and also by working out a list of questions submitted for self-study study in particular modules. It provides the inclusion of relevant questions to the final module control.

The scale of the thematic module rating, current rating and the final module control are presented in **table 2**.

Table 2. Correspondence scale

| Scale | Credit | Content module 50 points | Content 20 points | Current rating 30 points |
|--------------------------|-----------|-----------------------------|----------------------|-----------------------------|
| «5» excellent 90-100% | credit | 45-50 | 18-20 | 27-30 |
| «4» very good 82-89% | credit | 41-44.5 | 16.5-17.5 | 25-26.5 |
| «4-» good 74-81% | credit | 37-40.5 | 15-16 | 22.5-24.5 |
| «3» satisfactory 64-73% | credit | 32-36.5 | 13-14.5 | 19.5-22 |
| «3-» enough 60-63% | credit | 30-31.5 | 12-12.5 | 18-19 |
| «2» unsatisfactory 0-59% | no credit | 17.5-29.5 | 7-11.5 | 10.5-17.5 |
| | — | 0-17 | 0-6.5 | 0-10 |

Applicants who have completed all types of work provided for by the curriculum and who have scored at least 18 points based on the results of current study activities are admitted to the **contant module control**.

The form of the contant modul control is standardized and includes the control of theoretical training and practical training (control of practical skills) in the form of test and situational tasks. The maximum points of the contant control is 20, minimum - 12 points

According to the total result of the current and final control, a mark is assigned to the credit book according to the systems presented in **table 3**.

Table 3. Rating scale in ECTS (European Credit Transfer System)

| Rating assessment, points | Definition |
|---------------------------|--|
| 90-100 A | excellent |
| 82-89 B | good |
| 74-81 C | |
| 64-73 D | satisfactory |
| 60-63 E | |
| 35-59 F | unsatisfactory with possibility of repeated pass |
| 1-34 FX | unsatisfactory with an obligatory repeated course (additional work is necessary) |

Applicants can get A, B, C, D, E rates if they were granted credits of all modules of academic subject.

Applicants can get FX or F if they weren't granted at list one modules of academic subject after completing its study.

The FX ("2") is graded to applicants who have received the minimum quantity of points for the current academic activity, but did not pass a final modular control. They have the rights to repeat the final modular control no more than 2 times within 2 weeks after the end of the semester according to the schedule approved by the rector.

Applicants who got F (they did not complete a program at least one module or did not receive the minimum quantity of points for the current academic activity) should repeat grade according to an individual curriculum.

13. Form of progress and semester supervision of academic achievements

Semester credit, semester exam.

Criteria for the exam assessment

| National scale | ECTS | Points | Criteria |
|----------------|--|--------|--|
| 5 | A – excellent | 100-90 | Applicant of master level answers correct and comprehensive to all questions, theoretical knowledge can be freely used to solve practical problems |
| 4 | B – very good | 89-82 | Applicant of master level answers correct to all questions, but not completely, theoretical knowledge can be freely used to solve practical problems |
| 4- | C - good | 81-74 | Applicant of master level answers correct to all questions, but with some errors that he found and corrected himself, theoretical knowledge can be used to solve practical problems |
| 3 | D - satisfactory | 73-64 | Applicant of master level answers correct but not complete on 75% of questions. During the answer, mistakes were made, and an applicant is able to correct after clarifying the examiner's questions. Theoretical knowledge can be used to solve practical problems, but practical tasks are not completed, there are minor errors |
| 3- | E – enough | 63-60 | Applicant of master level answers correct, but not complete, for 50% of questions. During the answer, mistakes were made, and an applicant is able to partially correct after clarifying the examiner's questions. Theoretical knowledge can be used to solve practical problems, but only under the guidance of an examiner |
| 2 | FX – unsatisfactory | 59-35 | Applicant of master level answers correct, but partial, to less than 40% of questions, with errors that can not be corrected after clarifying questions of the examiner. Theoretical knowledge can not be used to solve practical problems, even partially |
| no permission | F – unsatisfactory with an obligatory repeated course (additional work is necessary) | 0-34 | Applicant of master level did not score 36 points for the current educational activity from the module, was not admitted to the final module control or the applicant did not score 24 points from the final module control |

14. Methodological Support

- 1) Educational program on an educational component
- 2) Work program on an educational component
- 3) Course schedule of lectures and practical classes
- 4) Learning success assessment system
- 5) List of theoretical questions and cases for content module controls
- 6) Set of tests
- 7) Set of cards for content module controls (cards, standard of answers, criteria of knowledge assessment)
- 8) Set of cards for exam (examination cards, standard of answers, criteria of knowledge assessment)
- 9) Set of cards for comprehensive test (cards, standard of answers, criteria of knowledge assessment)
- 10) Set of examination cards and criteria of knowledge assessment for State Exam
- 11) Methodical recommendations for practical classes
- 12) Methodical recommendations for self-study work
- 13) Methodical recommendations for master work implementation
- 14) Methodical recommendations for pharmaceutical manufacturing practice
- 15) Methodical recommendations for content module control training
- 16) Methodical recommendations for exam training
- 17) Methodical recommendations for State exam training

- 18) Report of Pharmaceutical Manufacturing Practice
- 19) Textbooks
- 20) Guidelines, atlases, handbooks, manuals
- 21) Multimedia lectures according the schedule

15. Reading suggestions Guidance

The main reading suggestions

- 1). Фармакологія для Крок-1: Dual tests / Сахарова Т.С., Зупанець К.О., Ратушна К.Л., Пропіснова В.В., Отрішко І.А, Жулай Т.С.- 3-тє вид., допов - Харків.: НФаУ. 2023. 368 с.
- 2). SMART Pharmacology: Practice Book : manual in 2 parts : part I / K. O. Zupanets, T. S. Sakharova, I. A. Otrishko, K. L. Ratushna ; edited by K. O. Zupanets. Kharkiv : NUPh. 2021. 95 p.
- 3). SMART Pharmacology: Practice Book : manual: in 2 parts: part II / K. O. Zupanets, T. S. Sakharova, I. A. Otrishko, K. L. Ratushna ; edited by K. O. Zupanets. Kharkiv : NUPh. 2021. 100 p.
- 4). Workbook on prescription writing : educational and methodical manual for classroom and extracurricular work of the aspirants of higher education by specialty "Pharmacy, industrial pharmacy" / Shtrygol S. Yu., Belik G. V., Butko Ya. O. 2020. Kharkiv : NUPh

Supplementary reading suggestions

- 1) Applied Therapeutics : The Clinical Use Of Drugs / ed. by Caroline S. Zeind, Michael G. Carvalho. – 11th ed. – New York : Wolters Kluwer ; Lippincott Williams & Wilkins, 2018. – 2379 p.
- 2) British Medical Association. New Guide to Medicines and Drugs. – 9th ed. – London : Dorling Kindersley, 2015. – 512 p.
- 3) Clinical Pharmacy and Therapeutics. – 6th ed. / Eds Cate Whittlesea and Karen Hodson. – London : Churchill Livingstone, 2019. – 1094 p.
- 4) Harrison's Principles of Internal Medicine / L. J. Jameson [et al.]. – 20th ed. – McGraw Hill Professional, 2018. – 4048 p.
- 5) Oxford Handbook of Clinical Pharmacy Third Edition / eds Ph. Wiffen. M. Mitchell, M. Snelling, N. Stoner. – Oxford : Oxford University Press, 2017. – 730p.
- 6) Symptoms in the Pharmacy : A Guide to the Management of Common Illness. – 8th ed. / Ed. A. Blenkinsopp, M. Duerden and J. Blenkinsopp. – Oxford : John Wiley & Sons Ltd, 2018. – 405 p.

16. Electronic Resources, including the Internet

- 1) Drugs.com. Prescription Drug Information, Interactions and Side Effects [Electronic resource]. – Access mode: <https://www.drugs.com/> (Date of access: 12.01.2023). – The name from the screen.
- 2) FDA Approved drug products [Electronic resource] // Federal Drug Administration. – Access mode: <https://www.accessdata.fda.gov/scripts/cder/daf/> (Date of access: 12.01.2023). – The name from the screen.
- 3) Medicines [Electronic resource] // European Medicines Agency. – Access mode: <https://www.ema.europa.eu/en/medicines> (Date of access: 12.01.2023). – The name from the screen.
- 4) Orange Book: Approved Drug Products with Therapeutic Equivalence Evaluations [Electronic resource]. – Access mode: <https://www.accessdata.fda.gov/scripts/cder/ob/index.cfm> (Date of access: 12.01.2023). – The name from the screen.
- 5). Rxlist. The Internet Drug Index for prescription drug information, interactions and side effects [Electronic resource]. – Access mode: <https://www.rxlist.com/> (Date of access: 12.01.2023). – The name from the screen.