

MINISTRY OF HEALTH OF UKRAINE
ODESA NATIONAL MEDICAL UNIVERSITY

Department of general and clinical pharmacology and pharmacognosy



APPROVED

Deputy rector for scientific and pedagogical activity

Edward BURIACHKIVSKYI

« 01 » 09 2023 y.

WORKING PROGRAM IN THE DISCIPLINE
«PHARMACOGNOSY »
(full-time education)

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

Field of knowledge: 22 «Health care»

Specialty: 226 «Pharmacy, industrial pharmacy»

Educational and professional program: Pharmacy, industrial pharmacy

The working program is compiled on the basis of the educational and professional program “Pharmacy, industrial pharmacy” for the training of specialists of the second (master’s) level of higher education in the specialty 226 “Pharmacy, industrial pharmacy” of the field of knowledge 22 “Health care”, approved by the Academic Council of ONMedU (minutes No. __ dated __/__/2022).

Authors:

Head of the department, Doctor of Medical Sciences, Prof. Rozhkovsky Yaroslav

Head of the educational part of the department, Ph.D. in biology, docent Prystupa Bohdan

The work program was approved at the meeting of the department of pharmacology and pharmacognosy

Protocol No. 1 dated August 28, 2023

Head of the department



Yaroslav ROZHKOVSKY

Approved by the guarantor of
the educational and professional program



Liana UNGURYAN

Approved by the subject-cycle methodological commission on pharmacy of ONMedU

Protocol No. 1 dated 29.08.2023

Head of the subject-cycle methodological commission on pharmacy of ONMedU



Natalia FIZOR

Revised and approved at the meeting of the department of Pharmacology and Pharmacognosy

Protocol No. __ dated __/__/20__.

Head of the department
ROZHKOVSKY

_____ Yaroslav

Revised and approved at the meeting of the department of Pharmacology and Pharmacognosy

Protocol No. __ dated __/__/20__.

Head of the department
ROZHKOVSKY

_____ Yaroslav

1. Description of the discipline:

Name of indicators	Field of knowledge, specialty, specialization, level of higher education	Characteristics of the discipline
Total number:	Field of knowledge 22 «Health care»	<i>Full-time (day) education</i>
Credits of ECTS: 8.5		<i>Required discipline</i>
Hours: 255	Specialty 226 « Pharmacy, industrial pharmacy »	<i>Course: III</i>
Content topics - 2		<i>Semester: V-VI</i>
		<i>Lectures (30 hours)</i>
		<i>Seminars (0 hours)</i>
		<i>Practical classes (140 hours)</i>
	Level of higher education second (master's degree)	<i>Laboratories (0 hours)</i>
		<i>Independent work (85 hours)</i>
		<i>including individual tasks (0 hours)</i>
		<i>Form of final control – Exam</i>

2. The purpose and objectives of the discipline

Purpose: to learn the morphological features to find and identify medicinal plants in nature, to know the periods and rational methods of collection, primary processing, drying conditions, packaging, rules of storage of LRS; perform commodity, macroscopic, microscopic, phytochemical, luminescent and chromatographic analysis of LRS, products of its processing and raw materials of animal origin, which is necessary in the practical activities of the pharmacist.

The ultimate goals of the discipline:

- apply the characteristics of medicinal plants (LR) and LRS in professional activities;
- to develop a plan of measures for the rational procurement of raw materials;
- apply knowledge of the chemical composition of LRS in the collection, storage and analysis of raw materials of plant and animal origin and drugs;
- to draw a conclusion about the quality of raw materials based on the results of pharmacopoeial analysis;
- to interpret the connection of the chemical structure of BAS with pharmacological action.
- develop information leaflets, make reports for doctors and provide advice to the public on issues related to LR, raw materials and drugs of natural origin.

Task:

Definition of medicinal plant (LR), medicinal plant raw materials, biologically active substances (BAS);

- Study of the concept of identity and good quality of LRS;
- Study of methods of harvesting, drying, storage of LRS depending on morphological groups and classes of BAS;
- Studying the issue of developing an action plan for the rational procurement of raw materials;
- Study of approaches to procurement of LRS of different morphological groups;
- Study of issues of primary processing of LRS;
- Study of drying methods taking into account morphological features and chemical composition of raw materials;

- Study of ways to bring LRS to a standard state;
- Study of approaches to packing, marking of LRS; storage of LRS
- Study of the relationship between the chemical structure of BAS with pharmacological action.

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

Integral (IR):

- IC - Ability to solve typical and complex specialized problems and practical problems in professional activities in the field of health / pharmacy, or in the learning process, which involves research and / or innovation and is characterized by complexity and uncertainty of conditions and requirements.

- GC 2. Ability to apply knowledge in practical situations.
- GC 3. The desire to preserve the environment.
- GC 4. Ability to abstract thinking, analysis and synthesis, to learn and be modernly trained.
- GC 6. Knowledge and understanding of the subject area and understanding of professional activity.
- GC 8. Ability to communicate in the state language both orally and in writing, the ability to communicate in a foreign language (mainly English) at a level that ensures effective professional activity.
- GC 9. Skills in the use of information and communication technologies.
- GC 11. Ability to assess and ensure the quality of work performed.
- GC 12. Ability to conduct research at the appropriate level.
- SC 1. Ability to conduct sanitary and educational work among the population.
- SC 20. Ability to develop methods of quality control of medicines.

Program learning outcomes (PLO):

- PLO 8. To carry out professional communication in the state language, use oral communication skills in a foreign language, analyzing specialized texts and translating foreign language information sources.
- PLO 11. Use methods of evaluating indicators of the quality of activity; identify reserves for increasing labor efficiency.
- PLO 20. To carry out a complex of organizational and management measures to provide the population and health care institutions with medicines and other products of the pharmacy assortment. Carry out all types of accounting in pharmacies, administrative records, product analysis processes.
- PLO 21. Calculate the main economic indicators of pharmacy establishments, as well as taxes and fees. Form all types of prices (wholesale, purchase and retail) for medicinal products and other products of the pharmacy assortment.
- PLO 22. Manage pharmaceutical organizations and determine its effectiveness using management functions. Make management decisions on the basis of the developed leadership and communication skills of pharmaceutical personnel regarding the strategic planning of enterprise activities.
- PLO 23. To take into account data on socio-economic processes in society for the pharmaceutical supply of the population, to determine the effectiveness and availability of pharmaceutical care in terms of medical insurance and reimbursement of the cost of drugs.
- PLO 24. Plan and implement professional activities on the basis of normative legal acts of Ukraine and recommendations of proper pharmaceutical practices.

As a result of studying the discipline the student must:

Know:

- basic concepts of pharmacognosy, methods of pharmacognostic analysis, subject and tasks of pharmacognosy, its significance for the practical activity of a bachelor of pharmacy;

- main stages of pharmacognosy development. The main modern directions of scientific research in the field of medicinal plants;
- characteristics of the raw material base of medicinal plants (wild and cultivated);
- organization of procurement of medicinal plant raw materials, main procurement organizations and their functions;
- system of rational use, protection and reproduction of resources of medicinal plants;
- methods of resource research on the establishment of natural reserves of medicinal plant raw materials;
- general rules for harvesting medicinal plant raw materials and measures for the protection of natural operational thickets of medicinal plants;
- basics of industrial cultivation of medicinal plants;
- system of standardization of medicinal plant raw materials;
- types of classification of medicinal plant raw materials (chemical, pharmacological, botanical, morphological);
- nomenclature of medicinal plants, medicinal plant raw materials and medicinal products of plant and animal origin, permitted for use in medical practice and use in industrial production;
- basic information about the distribution and place of growth of medicinal plants used in scientific medicine;
- the impact of geographical and environmental factors on the productivity of medicinal plants;
- methods of macroscopic and microscopic analysis of whole, crushed, tableted and briquetted medicinal plant raw materials. Meeting analysis;
- morphological and anatomical features of medicinal plants and raw materials approved for use in medical practice. Possible impurities;
- main groups of biologically active substances of natural origin and their physicochemical properties. The main ways of biosynthesis of the main groups of biologically active substances;
- methods of isolation and purification of the main active substances of medicinal plant raw materials;
- basic methods of qualitative and quantitative determination of active substances in medicinal plant raw materials; biological standardization of medicinal plant raw materials;
- numerical indicators that regulate the good quality of medicinal plant raw materials and methods of their determination;
- requirements for packaging, labeling, transportation and storage of medicinal plant raw materials in accordance with the NTD;
- documentation of the results of the analysis of medicinal plant raw materials. Legal significance of pharmacognostic analysis;
- main methods and forms of application of medicinal plant raw materials in pharmaceutical practice and industrial production;
- basic information on the use in medicine of drugs of plant and animal origin;
- safety rules when working with medicinal plants and medicinal raw materials;

Be able:

- to determine by morphological features medicinal plants in live and herbarium form;
- to carry out harvesting and drying, primary processing and storage of medicinal raw materials;
- to identify LRS on the basis of microscopic analysis: marshmallow root, plantain leaves, buckthorn grass, viburnum bark, rose hips, nettle leaves, bearberry leaves, cranberry leaves, rhizome of male fern, hay leaves, buckthorn bark, rhubarb grass, St. John's wort herds, five-bladed dog nettle grass, peppermint and pochechuychy grass, knotweed grass, oak bark, snake mustard rhizome, rodovik root, legume leaves, dandelion root, peppermint leaves, sage leaves, eucalyptus leaves, valerian root calamus, ergot root, wormwood, yarrow, yarrow and thyme, anise, fennel, licorice, horsetail, foxglove leaves, lily of the valley leaves, mustard grass, jaundice, leaves, datura leaves, lanceolate thermopsis grass, celandine grass;

- have the technique of macroscopic analysis of medicinal plant raw materials;
- to determine the identity of medicinal plant raw materials of different morphological groups in whole, cut and powdered form, as well as in the form of briquettes, tablets, etc. forms using the determinant;
- determine the composition of official medical fees;
- recognize impurities of botanically related plants in the collection, acceptance and analysis of raw materials;
- to carry out qualitative and histochemical reactions to the main groups of biologically active substances contained in medicinal plants and raw materials (polysaccharides, fatty oils, anthracene derivatives, flavonoids, coumarins, tannins, iridoids, essential oils, saponins, cardiac glycosides, alkaloids).);
- apply appropriate chromatographic methods for the analysis of medicinal plant raw materials;
- determine the quantitative content in raw materials: anthracene derivatives, flavonoids, tannins, essential oils, saponins, cardiac glycosides, ascorbic acid, alkaloids, etc. the methods provided by the relevant NTD;
- to determine moisture, ash and extractives in raw materials by the methods provided by NTD;
- to carry out reception of medicinal plant raw materials and to take the samples necessary for the analysis, according to NTD; to carry out statistical processing and registration of results of the chemical analysis.

Passess

- to apply the characteristics of medicinal plants (RM) and MP in professional activities;
- develop an action plan for the rational procurement of raw materials;
- to apply knowledge of the chemical composition of medicinal plant raw materials during the harvesting, storage and analysis of raw materials of plant and animal origin and preparations;
- make a conclusion about the quality of raw materials based on the results of pharmacopoeial analysis;
- interpret the relationship of the chemical structure of BAR with pharmacological action.
- develop information sheets, make reports for doctors and provide advice to the public on issues related to HR, raw materials and products of natural origin.

3. The content of the work program

Topic 1. General part of pharmacognosy.

- Definition of pharmacognosy as a science and academic discipline; basic concepts of the subject: LR, LRS, medicinal raw materials of animal origin, BAR, standardization of LRS, identity, purity, good quality; nomenclature of LR and LRS, which are studied in the course of pharmacognosy; pharmacognosy tasks; methods of pharmacognostic analysis; ways and forms of use of medicinal raw materials of plant and animal origin; integration of pharmacognosy with basic and profile disciplines; the importance of pharmacognosy in the practical activities of the pharmacist;

-a brief historical overview of the development of pharmacognosy; main historical stages of use and study of medicinal plants in world medicine; the influence of Arab (Avicenna), European (Galen, Hippocrates, Dioscorides) and other medical systems on the development of pharmacognosy; the first manuscripts on the use of medicinal plants in Ukraine; origin and development of pharmacognosy as a science; creation of "pharmacy" gardens in Ukraine; expeditionary work to identify natural plant resources;

- raw material base of LR; import and export of LRS; prospects for the development of the raw material base: introduction of scarce drugs into the culture; tissue culture;

-chemical composition of LRS; main groups of BAR; active and concomitant compounds; primary and secondary metabolites; classification systems LR and LRS: chemical, morphological, botanical, pharmacological;

Topic 2. Methods of pharmacognosy.

-Fundamentals of the procurement process of LRS; rational methods of collecting LRS; primary processing, drying, bringing raw materials to standard condition; packing, marking, storage, transportation of LRS; LRS processing;

-standardization of LRS; standardization system in Ukraine; methods of quality control (MCC) of medicinal plant raw materials: monographs of the State Pharmacopoeia of Ukraine (SPU) and the European Pharmacopoeia pharmacopoeial articles (FS), State standards (DStU), Industry standards (GStU); the procedure for development, approval and approval of the ICJ at the LRS;

-main areas of research of the Republic of Latvia; methods of identifying promising drugs: study and use of the experience of folk medicine, chemical screening, phylogenetic principle; methods of analysis of BAS of plant and animal origin; study of the chemical composition of LR and creation on their basis of new phytopreparations; development of ICJ and recommendations for collection, drying, storage of raw materials; the contribution of domestic scientific schools in the study of LR.

Topic 3. Carbohydrates. Glycosides.

General characteristics. Chemical analysis of LRS. Determination of the swelling index of raw materials. LR and raw materials that contain polysaccharides: species of marshmallow, plantain, coltsfoot (mother-and-stepmother), flax, kelp; glucose, honey, starch and its derivatives, inulin, pectin, gums.

Objects for self-study: types of cotton; vegetable sources of starch (potatoes, wheat, corn, rice), inulin (Jerusalem artichoke, dandelion, wild chicory, Oman tall, echinacea species), gums (apricot, Arabian and tragacanth gums, guar), pectin (apple, beetroot), figs, house plum); peels of agar and carrageenan; raw materials of raspberry, mallow, Iceland cetraria, bubbly fucus, linden species. Laurel, onion, garlic.

Objects for study by foreign students: types of cotton; marshmallow, types of plantain, coltsfoot, flax, kelp, plant sources of starch, inulin, gums, pectin; sources of agar and carrageenan; mallow, Cetraria Iceland, fucus bubbly. Types of mustard, bitter almonds, laurel, onions, garlic.

Topic 4. Fats and fat-like substances.

General characteristics of fatty acids, fats and fat-like substances. LR, raw materials and products that contain fats and fat-like substances. Analysis of fatty oils. Olive, almond, peach, castor, sunflower oil. Fish Oil. Cocoa butter. Waxes. Products of soy processing (oil, protein, phospholipids).

Objects for self-study: pumpkin seeds, peanut oil, flaxseed, corn germ; evening primrose (aspen), coconut oil, palm; oil and freon extracts of wheat germ, walnut, rose hips and chokeberry; lanolin, spermaceti, solid animal fats.

Objects for study by foreign students: Olive oil, almond, peach, castor, sunflower, cotton, peanut, rapeseed, evening primrose. Cocoa butter, coconut, palm. Fish Oil. Waxes. Products of soy processing (oil, protein, phospholipids).

Topic 5. Proteins and proteins. Macro- and microelements. Organic acids. Glucosinolates (thioglycosides) and cyanogenic glycosides.

General characteristics. LR and raw materials of plant and animal origin, containing proteins and proteins. Beekeeping products: pollen, apilak, propolis. Bee and snake venom. Phytotoxins of fungi, lectins, enzyme preparations of plant and animal origin. Medical leech, antlers. LR and raw materials containing organic acids, organic silicic acid compounds. Pomegranate, hibiscus, cranberry. LRS, which contains non-glycosidic sulfur compounds. Types of mustard, bitter almonds.

Objects for self-study: Spirulina, alfalfa, white mistletoe, black damask, melon tree, pineapple, watermelon. Bodyaga. Mummy. Garden spinach, citrus fruits, rose hips, horsetail, knotweed, plants of the family Coarse-leaved and cereal (medicinal cucumber, creeping wheatgrass, oats, etc.).

Objects for study by foreign students: Phytotoxins of fungi, lectins, bee and snake venom. Enzyme preparations of plant and animal origin. Medical leech. Spirulina, alfalfa, white

mistletoe, black damask, melon tree, pineapple, watermelon, bee products. Pomegranate, cranberry, tamarind, spinach, citrus fruits, rose hips, hibiscus, horsetail, knotweed, plants of the family Coarse-leaved and cereals (cucumber, creeping wheat, sowing oats, etc.).

Topic 6. Vitamins.

General characteristics. LR and raw materials containing vitamins: types of dog rose, black currant, mountain ash, buckthorn, calendula, nettles, corn, common buckthorn.

Objects for self-study: sources of water-soluble vitamins: wild strawberries, spring primrose, garden cabbage; sources of fat-soluble vitamins: pumpkin, carrots, viburnum.

Objects for study by foreign students: Types of dog rose, citrus fruits, kiwi fruit, calendula, nettle species, sea buckthorn, buckthorn, common viburnum.

Topic 7. Terpenoids. Iridoids.

General characteristics of LR and raw materials that contain iridoids and bitters. Yarrow is yellow, legume trifoliolate, goldenrod umbrella and beautiful, dandelion, viburnum, hops.

Objects for self-study: Types of plantain, types of dog nettle, valerian.

Objects for study by foreign students: Yellow yarrow, three-leaved legume, species of goldenrod dandelion, hops, valerian, viburnum, plantain, harpagophytum split.

Topic 8. Essential oils. LR and LRS, in the essential oil of which monoterpenoids predominate.

General characteristics Analysis of essential oils. LR and LRS, in the essential oil of which monoterpenoids predominate. Coriander, lavender, lemon balm, peppermint, sage, eucalyptus, valerian, juniper, cumin, menthol, camphor.

Objects for self-study: sources of camphor, types of roses, Siberian fir.

Objects for study by foreign students: Lavender spike, coriander, lemon balm, peppermint, sage, eucalyptus, valerian, juniper, cumin, menthol, camphor, sources of camphor,

Topic 9. Essential oils. LR and LRS, in the essential oil of which sesquiterpenoids and sesquiterpene lactones predominate.

LR and LRS, in the essential oil of which sesquiterpenoids and sesquiterpene lactones predominate. Types of linden, chamomile, fragrant chamomile, ergot high, wormwood, yarrow, birch, cane, marsh.

Objects for self-study: ginger, turmeric long, parsley, mountain arnica, black poplar,

Objects for study by foreign students: Chamomile, Roman chamomile, Oman tall, wormwood, yarrow, birch, cane, arnica, marsh, tea tree, ginger, turmeric

Topic 10. Essential oils. LR and LRS, in the essential oil of which aromatic compounds predominate.

LR and LRS, in the essential oil of which aromatic compounds predominate. Anise, fennel, thyme, thyme, oregano, thymol.

Objects for self-study: rosemary, cinnamon, fragrant cloves, cornflowers are real.

Objects for study by foreign students: Anise, star anise, fennel, thyme, thyme, oregano, thymol, cinnamon, cloves, nutmeg, barosma.

Topic 11. Diterpenoids. Resins and balms. LR and raw materials containing diterpenoids, resins and balms. General characteristics.

Objects for self-study: Scots pine, stevia Rebo, frankincense (boswellia), benzoic styrax, toluene balm, Peruvian balm, commiphora myrrh.

Objects for study by international students: Scots pine, stevia Rebo, frankincense (boswellia), benzoic styrax, toluene balm, Peruvian balm, commiphora myrrh, stinking ferula.

Topic 12. Triterpenoids. Steroids. Saponins.

General characteristics. Methods of qualitative and quantitative determination. LR and raw materials containing saponins. Natural sources of hormones and bile acids. Natural sources of bile acids. Types of licorice, bitter chestnut, horsetail, orthosiphon stamen, ginseng, Manchurian aralia, woolly astragalus. Raw materials for the semi-synthesis of glucocorticoids. Species of Dioscorea, creeping anchors, hay fever, safflower leaf, agave species, yucca, etc.

Objects for self-study: Blue cyanosis, soapwort, temptation high, ivy, birch species, calendula, cimicifuga corymbosa, primrose. Natural sources of bile acids, endocrine glands of animals as sources of hormones, stinging nettle, hawthorn, African plum, creeping serenoa. Ecdysteroids.

Objects for study by foreign students: Types of licorice, bitter chestnut, horsetail, orthosiphon stamen, ginseng, Manchurian aralia, cimicifuga corymbosa, calendula, astragalus woolly, Asian centella (gotu kola), cyanosis, blue blue ivy, Dioscorea nipon, creeping anchors, hawthorn, safflower leaf, agave species, yucca, etc., raw materials for the semi-synthesis of glucocorticoids., ruscus prickly, stinging nettle, African plum, creeping serenoa. Types of nightshade, sarsaparil.

Topic 13. Cardioglycosides.

General characteristics Methods of qualitative and quantitative determination. LR and raw materials that contain cardioglycosides (cardiac glycosides). Purple foxglove, woolly foxglove, large-flowered foxglove, strophanthus species, spring mustard, lily of the valley, jaundice.

Objects for self-study: species of hellebore, bulb above sea level.

Objects for study by foreign students: purple foxglove, woolly foxglove, types of strophanthus, spring mustard, lily of the valley, species of hellebore, bulb, seaweed, oleander, jaundice.

Topic 14. Phenolic compounds.

General characteristics Methods of qualitative and quantitative determination. LR and raw materials containing simple phenols and their glycosides. Common bearberry, cranberry, rhodiola rosea, violet tricolor and field, species of echinacea.

Objects for self-study: Peony unusual, sowing artichoke, knotweed, willow species, male fern, hemp.

Objects for study by foreign students: Common bearberry, cranberry, Rhodiola rosea, violet tricolor and fragrant, species of echinacea, artichoke, knotweed, species of willow, male fern, hemp.

Topic 15. Coumarins and chromones.

General characteristics Methods of qualitative and quantitative determination. LR and LRS, which contain coumarins and chromones. Cranberry, horse chestnut, parsnip, ami large, fig tree.

Objects for self-study: Dill, wild carrots, spring carrots, angelica.

Objects for study by foreign students: Cranberry, horse chestnut, parsnip, ami large, fig tree, angelica, spring carrot.

Topic 16. Lignans. Xanthoni.

General characteristics. Methods of qualitative and quantitative determination. LR and raw materials containing lignans. Chinese lemongrass, prickly eleutherococcus, podophyllum, milk thistle, Indian sesame. LR and raw materials that contain xanthones: alpine licorice, St. John's wort, species of goldenrod.

Objects for self-study: Alpine licorice.

Objects for study by foreign students: Prickly Eleutherococcus, podophyllum, milk thistle, Indian sesame. Alpine licorice, species of goldenrod, species of St. John's wort.

Topic 17. Flavonoids.

General characteristics Methods of qualitative and quantitative determination. LR and raw materials: Japanese sophora, types of dog nettle, pepper bitter, bitter gourd, knotweed, marsh dried flowers, sand cumin, hawthorn species, herd three-part, sweet naked, wolf field, blue cornflower, chokeberry

Objects for self-study: buckwheat, black elder, Baikal sagebrush, horsetail, species of St. John's wort, species of lespedecei, species of goldenrod, erva woolly, robinia common, ginkgo biloba, lemon, etc. citrus, Chinese tea.

Objects for study by foreign students: Japanese sophora, dog nettle, bitter pepper, bitter gourd, knotweed, sand cumin, Chinese tea, lemon, hawthorn species, sweet naked, blue cornflower, chokeberry, prickly wolf, ginkgo biloba, red grapes.

Topic 18. Quinones.

General characteristics Methods of qualitative and quantitative determination. Medicinal plants and raw materials that contain quinones. *Anthraquinones* : buckthorn alder, ragweed, rhubarb tangut, horse sorrel, aloe species, cassia sharp-leaved and narrow-leaved, madder, species of St. John's wort.

Objects for self-study: *benzoquinones*: ubiquinone; *naphthoquinones* : walnut, sundew, rowan.

Objects for study by foreign students: Buckthorn alder and buckthorn Pursha, ragweed, rhubarb Tangut, horse sorrel, aloe species, species of cassia, madder, St. John's wort.

Topic 19. Tannins.

General characteristics Methods of qualitative and quantitative determination. Medicinal plants and raw materials that contain procyanidins and tannins. Sumac ordinary, bitter snake, species of alder, rodovik medicinal, species of oak, foxglove erect, blueberries, bird cherry.

Objects for self-study: tanning sumac, bergamot, Chinese and Turkish gal, red grapes, Chinese tea.

Objects for study by foreign students: Chinese and Turkish galls, sumac, tannin, bergamot, snake bitter, alder species, medicinal rodovik, oak species, foxglove, blueberry, bird cherry, acacia catechu, witch hazel, chestnut.

Topic 20. Alkaloids. Proto- and pseudoalkaloids.

General characteristics Methods of qualitative and quantitative determination. Medicinal plants and raw materials that contain proto- and pseudoalkaloids: lobelia hellebore, annual capsicum, horsetail ephedra, late-flowering species.

Objects for self-study: species of dolphin, species of aconite, yew berry, nightshade lobed.

Objects for study by foreign students: lobelia hellebore, annual capsicum, species of ephedra, late autumn flowers, species of dolphin, species of aconite, yew berry, nightshade.

Topic 21. Alkaloids. True alkaloids.

General characteristics Methods of qualitative and quantitative determination. Medicinal plants and raw materials that contain alkaloids: belladonna, black black, dope, thermopsis, opium poppy, yellow cat, celandine, barberry, hornbeam, chilibuha, Rauwolfia, pink catharanthus, periwinkle.

Items for self-study, lobelia puffy, yizhachnyk leafless, groundsel ploskolyste, coca bush scopolia carniolica, yellow lilies, moss Baranec, Sophora tovstoplodna, cinchona, Fumaria officinalis, Stephanie smooth shoots sekurynehy, makleya, ipecac, yohimbe, source caffeine (Chinese tea, coffee, cocoa beans, cola, paulinia).

Objects for study by foreign students: Belladonna ordinary, black blackberry, datura ordinary, types of thermopsis, yellow grass, opium poppy, yellow catkin, celandine ordinary, barberry ordinary, uterine horns, chillibuha, species Rauwolfia, catharanthus pink, periwinkle small, lobelia, carniolian scopolia, ipecac, yohimbe, sources of caffeine (Chinese tea, coffee, cocoa beans, cola, paulinia).

Topic 22. LR and raw materials that contain various biologically active substances. Tissue culture.

General characteristics. Culture of isolated tissues. Chaga, Kalanchoe periste.

Objects for self-study: sources of allantoin (cucumber, types of comfrey, types of beans), types of pumpkin, prickly iron, wormwood, pyrethrum, lovage.

Objects for study by foreign students: Chaga, Kalanchoe periste, sources of allantoin (cucumber, species of comfrey, beans), types of pumpkin, prickly iron, wormwood, pyrethrum,

Topic 23. Commodity analysis.

Sampling methods for analysis; determination of purity and good quality of LRS. Methods of quality control (QMS) of raw materials of natural origin. Analysis of LRS in accordance with the current ICC. Analysis of drug fees and teas.

4. The structure of the discipline

Topic	Number of hours					
	That's all	Including				
		Lect.	Sem.	Pract.	Labor	IWS
<p>The general part of pharmacognosy. Methods of pharmacognosy: macroscopic analysis. Historical review of the development of pharmacognosy. Chemical composition of LRS, the main groups of BAR. Basics of LRS procurement process: rational methods of LRS harvesting; primary processing, drying, bringing raw materials to standard condition; packing, marking, storage, transportation of LRS; LRS processing. Standardization of LRS, quality control methods (QMS) of medicinal plant raw materials. Analysis of integral LRS of different morphological groups.</p>	7	1	0	4	0	4
<p>Methods of pharmacognosy: microscopic analysis. Analysis of crushed LRS of different morphological groups, microchemical reactions to some classes of BAS.</p>	11	1	0	4	0	6
<p>Carbohydrates. Glycosides. Chemical analysis of LRS. LR and LRS, which contain polysaccharides: species of marshmallow, species of plantain, coltsfoot (mother-and-stepmother), flax, types of kelp. Determination of the swelling index of raw materials.</p>	10	2	0	4	0	4
<p>Fats and fat-like substances. Analysis of fatty oils. Olive, almond, peach, castor, sunflower oil. Cocoa butter.</p>	7	1	0	2	0	4
<p>Proteins and proteins. Macro- and microelements. Organic acids. Glucosinolates (thioglycosides) and cyanogenic glycosides. Beekeeping products: pollen, apilak, propolis. LR and raw materials containing organic acids, silicic acid. Pomegranate, hibiscus, four-petalled cranberry. LR and raw materials containing glycosides and non-glycosidic sulfur compounds. Types of mustard, bitter almonds.</p>	7	1	0	4	0	6
<p>Vitamins. General characteristics. LR and raw materials containing vitamins: types of dog rose, black currant, mountain ash,</p>	6	2	0	2	0	2

buckthorn, calendula, nettles, corn, common buckthorn.						
Terpenoids. Iridoids. Medicinal plants and raw materials that contain terpenoids (isoprenoids): iridoids and bitters. Yarrow is yellow, three-leaved legume, goldenrod umbrella and beautiful, dandelion, valerian, viburnum.	8	2	0	4	0	2
Essential oils. Analysis of essential oils. LR and LRS containing essential oils (monoterpenoids). Coriander, lemon balm, peppermint, sage, eucalyptus, valerian, juniper, cumin.	16	0	0	8	0	8
Essential oils. LR and LRS containing essential oils (sesquiterpenoids and sesquiterpene lactones). Chamomile, fragrant chamomile, ergot high, wormwood, yarrow, birch, cane, marsh.	6	0	0	4	0	2
Essential oils. LR and LRS containing essential oils (aromatic compounds). Anise, fennel, thyme, thyme, oregano.	6	2	0	2	0	2
Diterpenoids. Resins and balms. Medicinal plants and raw materials that contain diterpenoids, resins and balms. General characteristics.	14	2	0	6	0	6
Triterpenoids. Steroids. Saponins. General characteristics. Methods of qualitative and quantitative determination. LR and raw materials containing triterpenoids and triterpene saponins. Types of licorice, bitter chestnut, horsetail, orthosiphon stamen, <i>ginseng</i> , Manchurian aralia, astragalus woolly-flowered	16	2	0	6	0	8
Cardioglycosides. Methods of qualitative and quantitative determination. LR and raw materials that contain cardioglycosides (cardiac glycosides). Foxglove purple, foxglove woolly, foxglove large-flowered, species of strophanthus, mustard, lily of the valley, jaundice.	8	2	0	2	0	4
Phenolic compounds. Methods of qualitative and quantitative determination. LR and LRS containing simple phenols and their glycosides. Common bearberry, cranberry, rhodiola rosea, violet tricolor and field, male fern.	9	1	0	4	0	4
Coumarins and chromones. Methods of qualitative and quantitative determination. LR and LRS containing	9	1	0	4	0	4

coumarins and chromones. Cranberry, horse chestnut, parsnip, but large, fig tree.						
Lignans. Xanthoni. LR and LRS containing lignans and xanthones. Chinese lemongrass, prickly eleutherococcus, milk thistle. Species of yarrow, St. John's wort.	22	2	0	8	0	12
Flavonoids. Methods of qualitative and quantitative determination. LR and LRS containing flavonoids: Sophora japonica, dog nettle species, pepper bitter, marsh dried flower, sand cumin, wolfberry, hawthorn species, cornflower blue, chokeberry, herd three-parted, ginkgo biloba, elderberry.	14	2	0	8	0	4
Quinones. Methods of qualitative and quantitative determination. LR and LRS, containing anthraquinones: buckthorn alder, laxative, rhubarb Tangut, horse sorrel, aloe species, cassia sharp-leaved and narrow-leaved, madder, species of St. John's wort.	16	2	0	8	0	6
Tannins. Methods of qualitative and quantitative determination. LR and LRS containing procyanidins and tannins. Sumac ordinary, bitter snake, species of alder, rodovik medicinal, species of oak, foxglove erect, blueberries, bird cherry.	12	4	0	4	0	4
Alkaloids. Proto- and pseudoalkaloids. General characteristics Methods of qualitative and quantitative determination. LR and LRS, which contain proto- and pseudoalkaloids: lobelia hellebore, annual pepper, horsetail ephedra, late-flowering species.	18	0	0	8	0	10
Alkaloids. True alkaloids. Medicinal plants and raw materials that contain alkaloids: belladonna, black black, datura, thermopsis, opium poppy, yellow cat, celandine, barberry, hornbeam, chilli, species of Rauwolfia, catharanthus pink, periwinkle.	6	0	0	2	0	4
LR and raw materials that contain various biologically active substances. Chaga, Kalanchoe periste.	6	0	0	2	0	4
Commodity analysis. Analysis of drug fees and teas. Final test control	240	30	0	100	0	110
Hours in general:						

5. Topics of lectures / seminars / practical / laboratory classes

5.1. Topics of lectures

№ p / p	Topic name and content	hours
1	2	3
<i>V semester</i>		
1	Topic 1. Lecture 1. The general part of pharmacognosy. Pharmacognosy methods.	1
2	Topic 2. Lecture 1. Carbohydrates. Glycosides.	1
3	Topic 3. Lecture 2. Fats and fat-like substances.	2
4	Topic 4. Lecture 3. Proteins and proteins. Macro- and microelements. Organic acids. Glucosinolates (thioglycosides) and cyanogenic glycosides.	1
5	Topic 5. Lecture 3. Vitamins.	1
6	Topic 6. Lecture 4. Terpenoids. Iridoids.	2
7	Topic 7. Lecture 5. Essential oils.	2
8	Topic 10. Lecture 6. Diterpenoids. Resins and balms.	2
9	Topic 11. Lecture 7. Triterpenoids. Steroids. Saponins	2
10	Topic 12. Lecture 8. Cardioglycosides.	2
11	Topic 13. Lecture 9. Phenolic compounds.	2
12	Topic 14. Lecture 10. Coumarins and chromones.	1
13	Topic 15. Lecture 10. Lignans. Xanthones.	1
	Total	20
<i>VI semester</i>		
14	Topic 16. Lecture 11. Flavonoids.	2
15	Topic 17. Lecture 12. Quinones.	2
16	Topic 18. Lecture 13. Tannins.	2
17	Topic 19. Lecture 14. Alkaloids.	4
	Total	10

5.2. Topics of seminar classes

Seminar classes are not provided.

5.3. Thematic plan of practical classes

№ p / p	Topic name and content	hours
1	2	3
<i>V semester</i>		
1	Topic 1. Practical lesson 1. The general part of pharmacognosy. Pharmacognosy methods: macroscopic analysis.	2
2	Topic 1. Practical lesson 2. Methods of pharmacognosy: microscopic analysis.	2
3	Topic 2. Practical lesson 3. Carbohydrates. Glycosides.	4
4	Topic 3. Practical lesson 4. Fats and fat-like substances.	4
5.	Topic 4. Practical lesson 5. Proteins and proteins. Macro- and microelements. Organic acids. Glucosinolates (thioglycosides) and cyanogenic glycosides.	2
6	Topic 5. Practical lesson 6. Vitamins.	4
7	Topic 6. Practical lesson 7. Terpenoids. Iridoids.	2

№ p / p	Topic name and content	hours
1	2	3
8	Topic 7. Practical lesson 8. Essential oils. Analysis of essential oils. LR and LRS containing essential oils (monoterpenoids).	2
9	Topic 8. Practical lesson 9. Essential oils. LR and LR containing essential oils (sesquiterpenoids and sesquiterpene lactones).	8
10	Topic 9. Practical lesson 10. Essential oils. LR and LRS containing essential oils (aromatic compounds).	2
11	Topic 10. Practical lesson 11. Diterpenoids. Resins and balms.	2
12	Topic 11. Practical lesson 12. Triterpenoids. Steroids. Saponins	6
13	Topic 12. Practical lesson 13. Cardioglycosides.	6
	Hours in general	50
VI semester		
14	Topic 13. Practical class 14. Phenolic compounds.	2
15	Topic 14. Practical lesson 15. Coumarins and chromones.	4
16	Topic 15. Practical lesson 16. Lignans. Xanthones.	4
17	Topic 16. Practical lesson 17. Flavonoids.	8
18	Topic 17. Practical class 18. Quinones.	8
19	Topic 18. Practical lesson 19. Tannins.	8
20	Topic 19. Practical lesson 20. Alkaloids. Proto- and pseudoalkaloids.	4
21	Topic 20. Practical lesson 21. Alkaloids. True alkaloids.	8
22	Topic 21. Practical lesson 22. LR and raw materials containing various biologically active substances.	2
23	Topic 22. Practical lesson 23. Commodity analysis.	2
	Hours in general	50

5.4. Topics of laboratory classes

Laboratory classes are not provided.

6. Independent work

№ p / p	Topic name and content	hours.
V semester		
1	Тема 1. Загальна частина фармакогнозії. Методи фармакогнозії. Підготовка до практичного заняття 1, 2	4
2	Тема 2. Вуглеводи. Глікозиди. Підготовка до практичного заняття 3	6
3	Тема 3. Жири і жироподібні речовини. Підготовка до практичного заняття 4	4
4	Тема 4. Протеїни і білки. Макро- і мікроелементи. Органічні кислоти. Глюкозинолати (тіоглікозиди) і ціаногенні глікозиди. Підготовка до практичного заняття 5	4
5	Тема 5. Вітаміни. Підготовка до практичного заняття 6	6
6	Тема 6. Терпеноїди. Іридоїди. Підготовка до практичного заняття 7	2
7	Тема 7, 8, 9. Ефірні олії (ч. 1 – 3).	12

	Підготовка до практичного заняття 8, 9, 10	
8	Тема 10. Дитерпеноїди. Смоли і бальзами. Підготовка до практичного заняття 11	2
9	Тема 11. Тритерпеноїди. Стероїди. Сапоніни. Підготовка до практичного заняття 12	6
10	Тема 12. Кардіоглікозиди. Підготовка до практичного заняття 13	8
	Hours in general	56
<i>VI semester</i>		
11	Тема 13. Фенольні сполуки. Підготовка до практичного заняття 14	4
12	Тема 14. Кумарини і хромони. Підготовка до практичного заняття 15	4
13	Тема 15. Лігнани. Ксантони. Підготовка до практичного заняття 16	4
14	Тема 16. Флавоноїди. Підготовка до практичного заняття 17	12
15	Тема 17. Хінони. Підготовка до практичного заняття 18	4
16	Тема 18. Дубильні речовини. Підготовка до практичного заняття 19	6
17	Тема 19. Алкалоїди (прото- та псевдо алкалоїди). Підготовка до практичного заняття 20	4
18	Тема 20. Алкалоїди (істинні алкалоїди). Підготовка до практичного заняття 21	10
19	Тема 21. ЛР і сировина, які містять різні біологічно активні речовини. Підготовка до практичного заняття 22	4
20	Тема 22. Товарознавчий аналіз. Підготовка до практичного заняття 23	4
	Hours in general	56

7. Teaching methods

Practical classes: conversation, solving situational problems, demonstration of collection and procurement of raw materials.

Independent work: independent work with recommended basic and additional literature, with electronic information resources, independent work with a bank of test tasks Step-2.

9. Control methods and criteria for evaluating learning outcomes

Current control: oral survey, testing, assessment of performance of practical skills, solution of situational tasks, assessment of activity in class.

Final control: exam, testing.

Evaluation of the current educational activity in a practical session:

1. Evaluation of theoretical knowledge on the subject of the lesson:

- methods: survey, solving a situational problem

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

2. Evaluation of practical skills and manipulations on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills

- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

3. Evaluation of practical work on the subject of the lesson:

- methods: assessment of the correctness of the performance of practical skills
- maximum score – 5, minimum score – 3, unsatisfactory score – 2.

The grade for one practical session is the arithmetic average of all components and can only have a whole value (5, 4, 3, 2), which is rounded according to the statistical method.

Current evaluation criteria in practical training

Rating	Evaluation criteria
Perfectly "5"	worked systematically during the semester, showed versatile and deep knowledge of the program material during the exam, was able to successfully perform the tasks provided for in the program, mastered the content of the main and additional literature, realized the interrelationship of individual sections of the discipline, their importance for the future profession, showed creative abilities in understanding and using educational program material, demonstrated the ability to independently update and replenish knowledge; the level of competence is high (creative);
Fine "4"	is presented to a student who has demonstrated complete knowledge of the curriculum material, successfully completes the tasks provided for by the program, mastered the basic literature recommended by the program, has shown a sufficient level of knowledge in the discipline and is capable of their independent updating and renewal in the course of further education and professional activity; the level of competence is sufficient (constructive and variable);
Satisfactorily "3"	is awarded to a student who has demonstrated knowledge of the main curriculum material in the amount necessary for further education and subsequent work in the profession, copes with the tasks provided for by the program, made some mistakes in the answers on the exam and when completing the exam tasks, but has the necessary knowledge for overcoming mistakes made under the guidance of a scientific and pedagogical worker; the level of competence is average (reproductive);
Unsatisfactorily "2"	is presented to a student who has not demonstrated sufficient knowledge of the main educational program material, has made fundamental mistakes in the performance of the tasks provided for by the program, cannot use the knowledge in further studies without the help of a teacher, has not managed to master the skills of independent work; the level of competence is low (receptive-productive).

The procedure for evaluating the student's educational activity

Current performance. Evaluation of the success of the study of subjects of the discipline is carried out according to the traditional 4-point scale.

In a practical (laboratory) class, students must be interviewed at least once in 2-3 practical (laboratory) classes (no more than 75% of students), and in a seminar - at least once in 3-4 classes (no more than 50 % of students). At the end of the semester (cycle), the number of grades of students in the group should be the same on average.

At the end of each class, the teacher must announce their grades to the students, make a corresponding entry in the Logbook of students' attendance and success and the Student Attendance and Class Attendance Record.

At the end of studying the discipline, the current success rate is calculated - the average current score (arithmetic average of all current grades on a traditional scale, rounded to two decimal places).

At the last practical lesson, the teacher is obliged to provide information to students about the results of their current academic performance and academic debt (if any), as well as to fill out the student's record book when completing the training program in the discipline.

Current grades of "3" or "4" are not transferred to increase the grade point average in the discipline.

In the student's record book, the teacher enters the assessment of the discipline according to the traditional and 200-point scales.

A student is admitted to the exam if he fulfills the requirements of the educational program and if he received at least 3.00 points for the current educational activity and passed the test control of the "Step-2" tests with at least 90% (50 tasks). The test control is held in the Educational and Production Complex of Innovative Technologies of Learning, Informatization and Continuous Education of ONMedU in the last class before the exam.

Exam structure

The content of the evaluated activity	Number
Questions by sections	1
Identification of plants by herbarium specimens	2
Identification of raw materials	1
Solving chains	1

Criteria for evaluating the learning outcomes of education seekers in the exam:

«5»	It is presented to a student who has worked systematically during the semester, has shown versatile and deep knowledge of the program material during the exam, is able to successfully complete the tasks provided for by the program, has mastered the content of the main and additional literature, has realized the interrelationship of individual sections of the discipline, their importance for the future profession, showed creative abilities in understanding and using the educational program material, showed the ability to independently update and replenish knowledge; the level of competence is high (creative);
«4»	It is awarded to a student who has demonstrated complete knowledge of the curriculum material, successfully completes the tasks provided for by the program, has mastered the basic literature recommended by the program, has shown a sufficient level of knowledge in the discipline and is capable of their independent updating and renewal in the course of further education and professional activity; the level of competence is sufficient (constructive and variable)
«3»	It is issued to a student who has demonstrated knowledge of the main curriculum material in the amount necessary for further education and subsequent work in the profession, copes with the tasks provided for by the program, made some mistakes in the answers on the exam and when completing the exam tasks, but has the necessary knowledge for overcoming mistakes made under the guidance of a scientific and pedagogical worker; level of competence - average (reproductive)
«2»	It is issued to a student who has not demonstrated sufficient knowledge of the main curriculum material, has made fundamental mistakes in the performance of the tasks provided for by the program, cannot use the knowledge in further studies without the

help of a teacher, has not managed to master the skills of independent work; the level of competence is low (receptive-productive)
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9. Distribution of points received by students of higher education

The grade for the discipline consists of 50.0% of the grade for the current academic performance and 50.0% of the grade for the exam.

The average score for the discipline is translated into a national score and converted into points on a multi-point scale.

The conversion of a traditional grade for a discipline into a 200-point grade is carried out by the information and computing center of the university using the "Contingent" program.

Average success score (current success in the discipline) x 40

Table of conversion of a traditional assessment into a multi-point assessment:

national assessment	points
Excellent "5"	185-200
Good "4"	151-184
Satisfactory "3"	120-150
Unsatisfactory "2"	below 120

Points from the discipline are independently converted into both the ECTS scale and the four-point scale. ECTS scale scores are not converted to a four-point scale and vice versa. Further accounts are carried out by the information and computer center of the university.

Conversion of traditional assessment in the discipline and the amount of points on the ECTS scale

ECTS assessment	Statistical indicator
A	the best 10% of students
B	the next 25% of students
C	the next 30% of students
D	the next 25% of students
E	the last 10% of students

The ECTS scale is given by the ONMedU educational subdivision or the dean's office after ranking the grades in the discipline among students studying in one course and in one specialty. The ranking of students - citizens of foreign countries is recommended by the decision of the Academic Council to be conducted in one array.

Methodical support of the discipline:

- Working program of the academic discipline
- Syllabus
- Multimedia presentations
- Methodical developments for lectures
- Methodical developments for practical classes
- Methodical recommendations for independent work of higher education applicants

List of didactic teaching aids

№	List of technical and didactic teaching aids (DZH), educational equipment	Number	Numbers of topics where it is used	Notes
1.	Multimedia projector	1	1-20	
2.	Educational videos (on electronic media)	2	7.8	

3.	Lecture presentations (on electronic media) Overhead projector	20	1-20
4.	Slides	1	1-20
5.	Training tables	70	1-20
6.	Color images of deficient LR	40	1-20
7.	Thematic herbarium collections of LR	85	1-20
8.	Thematic collections of LRS samples	18	2-19
9.	Thematic collections of drugs based on LRS	18	1-20
10.	Microscope	18	2-19
11.	Distiller	30	1-19
12.	Refractometer	1	1-20
13.	Polarimeter	1	3.5-7
14.	Muffle furnace	1	7
15.	Soxhlet apparatus	1	1,5,10
16.	Microtome	2	3
17.	Desiccator	1	1-19
18.	Refrigerator	1	1,5,10
19.	Box	5	7
20.	Petri dishes	20	1,5,10
21.	Technochemical scales, equilibria	35	1-20
22.	Test tubes	2	1-20
23.	Electric stove	100	1-20
24.	Evaporating cups	2	1-20
25.	The flasks are different	15	1-20
26.	The cylinders are different	30	1-20
27.	Water bath	25	1-20
28.	Set of sieves	2	1,5,10
29.	Chromatographic plates "Sylufol"	2	20
30.	Funnels separate cylindrical VD-1	50	1-19
31.	Laboratory funnels	2	3-9,15,17,18
32.	Mortar and pestle	30	2-18
33.	Beakers	20	1,3,5,17
34.	Cover glass	10	2-19
35.	Glass slide	100	1-19
36.	The thermometer is laboratory	50	1-19
37.	Indicator paper	3	
38.	Chromatographic paper	30	1-19
39.	Filter paper	1	1-19
40.	Etna	4	1-19
41.	Tweezers	20	2,7,12,15
42.	Scalpel	20	1-20
43.	Dissecting needle	30	1-19
44.	Agate stopwatch	30	1-20
45.	Tripods	1	
46.	Bottles for solutions	10	1-19
47.	Chemical reagents	20	1-19

11. List of questions for the exam

1. The purpose and objectives of pharmacognosy. The role of pharmacognosy in the practical activities of the pharmacist.
2. Formulate the definition of "Polysaccharides", give a general description and their classification.
3. Formulate the definition of "Homopolysaccharides". Describe the raw material sources of starch and its chemical structure.
4. Formulate the definition of "Heteropolysaccharides" as a class of natural compounds. Give their general characteristics and classification.
5. Formulate the definition of "Glycosides". Give classifications by type of bond and structure of the carbohydrate component. Specify the features of drying and storage of glycosidic raw materials.
6. Formulate the definition of "Lipids" as a class of natural compounds. Give their classification, physicochemical properties and methods of application of lipids and lipoids in medicine.
7. Formulate the definition of "Fatty oils". Give the types of classifications, methods of obtaining and research.
8. Formulate the definition of "Vitamins" as a group of biologically active substances. List the types of classifications of vitamins. List the main plant sources of vitamins.
9. Formulate the definition of "Terpenoids"; give their classification. Specify the main groups of natural compounds of isoprenoid structure.
10. Formulate the definition of "Iridoids" as a class of natural compounds, describe monoterpene glycosides, the structure of their aglycones and pharmacological action.
11. Formulate the definition of "Essential oils". Indicate their classification, localization in plants and methods of extraction from raw materials.
12. Describe the chemical composition of essential oils, give examples of compounds of different classes of BAS and their pharmacological action. List the quality indicators of essential oils and name the method of quantitative determination of the content of essential oils in raw materials.
13. Formulate the definition of "Saponins" as a group of BAR. Give the classification of saponins and their general characteristics.
14. Formulate the definition of "Cardiosteroids". Give their classification. Specify methods for the identification and quantification of cardiosteroids. Define "ZHOD".
15. Describe the relationship between the chemical structure of cardiac glycosides with biological action. Indicate the methods of drying, storage and quality assessment of raw materials containing cardiac glycosides.
16. Formulate the definition of "Phenolic compounds". Give the classification and write the structural formulas of individual groups of BAR.
17. Formulate the definition of "Coumarin"; give their classification and methods of determination in raw materials. What is the pharmacological action of coumarins?
18. Formulate the definition of "Chromones" as a class of natural compounds. Give their classification, physicochemical properties and pharmacological action.
19. Formulate the definition of "Lignans" as a class of natural compounds and the criterion for their classification. List the LRS that contains lignans.
20. Formulate the definition of "Flavonoids" as a class of natural compounds. Give the classification of true flavonoids (euflavonoids). Indicate methods of identification and pharmacological action.
21. Formulate the definition of "Anthracene derivatives". Give their classification and detection methods in raw materials.
22. Formulate the definition of "Tannins". Give their classification; write structural formulas or their basic fragments. Indicate the main methods of identification and types of pharmacological action of tannins.

23. Formulate the definition of "Alkaloids" as a class of natural compounds. Name the types of classifications. Describe the "chemical" classification. Name the methods of identification of alkaloids in LRS.
24. Formulate the definition of "Pseudoalkaloids" as a class of natural compounds and the criterion for their classification. List LRS that contains pseudoalkaloids.
25. Give raw materials of animal origin. Indicate its sources and applications in medicine.

List of practical skills to be taken for the exam:

- to determine by morphological features of LR in live and herbarium form;
- identify the LRS of the following medicinal plants on the basis of microscopic analysis: marshmallow; periwinkle small; blackness black; cranberries; valerian; ginkgo biloba; bitter chestnut ordinary; hawthorn; common oak; common yarrow; dioecious nettle; buckthorn alder; dandelion; peppermint; madder dye; foxglove purple; castor oil; milk thistle; chamomile; sweet naked; Japanese sophora; horsetail; thyme; celandine large; dog rose;
- have the technique of macroscopic analysis of LRS; to determine the identity of medicinal plant raw materials of different morphological groups in whole, crushed and powdered form, as well as in the form of briquettes, tablets and other forms using a determinant;
- recognize impurities of botanically related plant species during harvesting, acceptance and certification of raw materials;
- to carry out qualitative and microchemical reactions to the main groups of biologically active substances contained in LR and raw materials;
- apply thin layer chromatography for LRS analysis;
- to determine the content of ascorbic acid, essential oil, saponins, cardiac glycosides, anthracene derivatives, flavonoids, coumarins, tannins, alkaloids, etc. in vegetable raw materials. BAR methods provided by the relevant ICC;
- to carry out acceptance of LRS and to take the samples necessary for its analysis, according to MKYA;
- to determine moisture, ash and extractives in raw materials by the methods provided by MCY;
- to carry out statistical processing and registration of results of the analysis.

12. Recommended reading

Basic:

- 1.armacognosy: textbook (I-III years) / I.A. Бобкова, Л.В. Варлахова. - 3rd edition All-Ukrainian specialized publishing house "Medicine" 2018, 504p.
2. Pharmacognosy: a basic textbook. for students. Higher pharmacy. Textbook zakl. (pharmac. f-tiv) IV level of accreditation / V.S. Кисличенко, І.О. Журавель, С.М. Marchyshyn and others; for order. V.S. Кисличенко. - Kharkiv: NUPh: Golden Pages, 2015. - 736 p.
3. Textbook on the discipline "Pharmacognosy" / Ya. V. Rozhkovsky, BV Prystupa, IA Boyko, NV Gerasimyuk, VV Chernogoryuk -: Methodical development of the Department of Pharmacognosy ONMedU. - Odessa: ONMedU, 2019 - 51 p.
4. State Pharmacopoeia of Ukraine: in 3 volumes / State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines". - 2nd type. - Kharkiv: State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines", 2015. - Vol. 1. - 1500 p.

Additional:

1. State Pharmacopoeia of Ukraine: in 3 volumes / State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines". - 2nd type. - Kharkiv: State Enterprise "Ukrainian Scientific Pharmacopoeial Center for Quality of Medicines", 2014. - Vol. 3. - 732 p.
2. Workshop on the identification of medicinal plant raw materials: textbook. way. / [B. M. Kovalev, SM Marchyshyn, OP Khvorost and others]; for order. VM Kovaleva, SM Marchishin. - Ternopil: TSMU, 2014. - 250 p.

13. Electronic information resources

1. Botany in figures. Text & multimedia lectures [Electronic resource] / TN Gontovaya, VP Rudenko, Ya. S. Kichimasova, V. R. Gaponenko, M. A. Kulagina. - Electron. text, graph. data (1.31 GB). - H.: NUPh, 2012. - 1 electr. Wholesale disk (CD-ROM); count system requirements: PC 486 and above; 8 MB RAM; Win 98, WinXP, Win 7; SVGA 32768 and more count.; 640x480; 4x CD-ROM drive; 16 bits. zv. map. - Disk in a container 18x13 cm.
2. Materials for independent work of applicants for higher education in the discipline "Pharmaceutical Botany", which are posted on the website of the Center for Distance Learning Technologies ONMedU. - Access mode: <https://moodle.odmu.edu.ua/course/view.php?id=257>
3. Official site of the scientific library of ONMedU: <https://onmedu.edu.ua/biblioteka/>
4. Page of methodical work of the department on the site of ONMedU: <https://info.odmu.edu.ua/chair/pharmacognosy/files>.