Syllabus on the discipline «Technology of drugs»

1. General information	
Faculty	Faculty of foreign students
Educational program	22 Health care, 226 Pharmacy, industrial pharmacy, 2nd Master's degree of Higher education, full-time
Educational discipline, code	2021-2022
Department	Technology of drugs, OK 31 https://new.meduniv.lviv.ua/kafedry/kafedra-tehnologiyi-likiv-i-biofarmatsiyi/
Head of the depratment	Department of Drug Technology and Biopharmaceutics; 79010, Lviv, Pekarska str.,75 (032) 276-85-84, (032) 276-85-98, Kaf_biopharm@ meduniv.lviv.ua
Academic year	Bilous Svitlana, associate professor, DSc, svitlana.bilous@gmail.com
Semester	III-IV
Type of discipline	5- 8
Educators	Mandatory
Erasmus	Bilous Svitlana, PhD, DSc, associate professor, svitlana.bilous@gmail.com Vashchenko Oksana, PhD, associate professor, o_vashchenko@ukr.net Hudz Nataliia, PhD, associate professor, natali_gudz@ukr.net Yezerska Oksana, PhD, associate professor, o.yezerska@gmail.com Strus Oksana, PhD, associate professor, oxana.strus@ukr.net
Person responsible for syllabus	No
Number of credits ECTS	Vashchenko Kateryna, PhD, associate professor, vkf.07@ukr.net
Number of hours	13
Language of instruction	390 hours (lectures– 46; practical classes– 188; self-reliance work – 156)
Information on consultations	English
Faculty	Consultations are held in accordance with the schedule, approved by the Chair of the department, in either offline mode or online, using information computer technologies available to students and teaching staff

2. Short resume of the discipline
«Technology of drugs» belongs to the cycle of basic disciplines for professionaly-oriented training of spacialists on specialty «Pharmacy, industrial pharmacy" and includes two content modules: «Drug technology in pharmacy» and « Industrial technology of drugs». Program of discipline "Technology of drugs" is organized in accordance with Standard of Higher Education in Ukraine

for specialty “Pharmacy, industrial pharmacy”. Program of discipline “Technology of drugs” is intended for graduates of higher education, provides theoretical knowledge and practical skills on on the basic stages of the formation and development of pharmaceutical technology in Ukraine, current dwvelopment trends of the pharmaceutical branch and professional activity in Ukraine and abroad, general requirement for the production of drug preparations of various pharmaceutical groups in the pharmacy and industrial conditions.

3. Objective and tasks of the discipline

Purpose of the educational discipline “Technology of drugs” is learning by higher education applicants theoretical foundations and practical skills and abilities of manufacturing drugs in conditions of pharmacies and pharmaceutical companies with consideration of the requirements of good pharmacy and manufacturing practice; rules of development and completing the production documents for the manufacture of medicinal products, rules for their storage and packaging; getting knowledge on the characteristics, classification and assortment of dosage forms; studying the influence of excipients on the quality of drugs, enabling realization of scientific and creative potential of future specialists.

Primary objectives of the educational discipline“Technology of drugs” are:

- studing the requirements of current normative documents (Pharmacopoei, GPP, guidelines and orders of the Ministry of Health) for the organization of production activities of pharmacies to compound medicinal products in various dosage forms;
- familiarization with the organization of pharmaceutical production in the conditions of pharmaceutical companies in accordance with the requirements of Good Manufacturing Practice (GMP);
- use normative and legal acts, the requirements of good pharmacy practice (GPP) and good manufacturind practice (GMP) for the production of medicinal products in the conditions of pharmacies and industrial enterprises in the professional activity;
- getting the knowledge on theoretical foundations for the production of various dosage forms, conducting step-by-step quality control, ways of improving the technology of dosage forms in the pharmacy and industrial conditions;
- studying the influence of storage conditions and type of packaging on the stability of medicinal products;
- studying industrial equipment, apparatus and automatic lines.

Competencies and educational outcomes, that discipline provides (correlation with normative content of training of higher education graduates that is formulated in terms of educational results in Standard of Higher Education).

According to the Standard of Higher Education, the discipline provides gaining the following **competencies:**

- **integrative**: The ability to solve typical and complex specialized tasks and practical problems in the professional pharmaceutical practice using statements, theories and methods of fundamental, chemical, technological, biomedical and social-economic sciences; ability to integrate knowledge and solve complex issues, to formulate judgments in case of insufficient or limited information; to reveal clearly and unambiguously conclusions and knowledge, reasoning them, to the professional and nonprofessional audience.
- **general:**

- The ability to act in socially and civil responsible manner.
- The ability to use knowledge in practical situations.
- Desire of saving the environment.
- The ability for abstract thinking, analysis and synthesis; ability to study and to be modernly trained.
- Atmosphere of entrepreneurship, the ability to be proactive.
- The knowing and understanding of subject field and the understanding of profession.
- Ability to adapt and act in a new situation.

- The ability to communicate in the mother tongue in both spoken and written ways, the ability to communicate in other language.
- The abilities to use information and communication technologies.
- The ability to choose communication strategy, ability to work in team.
- The ability to evaluate and ensure quality of performed work.
- The ability to conduct investigations in an appropriate level.

• **specific (professional, objective):**

- The ability to use knowledge of Ukrainian laws and regulations and the recommendations of good pharmaceutical practices in professional activities.
- The ability to develop and complete documents for the compounding and manufacture of drug preparations in accordance with recommendations of good practices.
- The ability to organize production activities of pharmacies for compounding drug preparation in different dosage form prescribed by doctors and by order of health facilities, including substitution of technology and choice of excipient, in accordance with Good Pharmacy Practice (GPP).
- The ability to organize and participate in the manufacture of drug products in pharmaceutical enterprises, including choice of manufacturing process and equipment, in accordance with Good Manufacturing Practice (GMP).
- The ability to ensure proper storage of medicinal preparations and medical devices in accordance with Good Storage Practice (GSP) in healthcare facilities.

4. Prerequisites of the discipline

«Technology of drugs» as a discipline is based on studying physics, general and neorganic chemistry, physical and colloidal chemistry, physiology, pharmacognosy, pharmacology.

The discipline is a basis for studying good practices in pharmacy, pharmaceutical chemistry, management and marketing in pharmacy, biopharmaceuticals, drug standardization, technology of medicinal cosmetics, that involves the integration of disciplines to train skills of applying knowledge in the process of further studying and the professional activity.

The discipline is a foundation for professional training and promotes the formation of pharmaceutical and technical thinking necessary for professional activities.

5. Program results of study

List of results of study

Code of the learning outcomes	**The content of the learning outcomes**	**Link to the competencies matrix code**
*Code is created while filling out the syllabus (categories: **Kn** – knowledge, **Ab** – ability, **C** – competence, **AR** – autonomy and responsibility)*	*Results of study determine that the student must know, understand and be able to perform, after completing the discipline. Results of study follow from the set learning goals. To enroll in the discipline, it is necessary to confirm the achievements of each result of study.*	*Symbol of the Program Result (PR) of Study Code in the Higher Education Standard*
Kn -1	To have specialized conceptual knowledge acquired in the learning process	*PR-1, 4, 23*
Kn-2	To have deep knowledge of the structure of professional activity	*PR-2, 14, 15, 17*
Kn-3	To know ways for self-regulation, leading a healthy life	
Kn-4	To know the tactics and strategies of communication, laws and ways of communicative behavior	*PR-5, 6, 7* *PR-8, 9, 12*
Kn-5		

Kn-6	To have advanced knowledge of native language and basic knowledge of foreign language	*PR-8*
Kn-7	To have deep knowledge in the field of information and communication technologies used in professional activities	*PR-12*
Kn-8	To know the methods of analysis, synthesis and further modern learning	*PR-4,6*
Kn-9	To know methods for evaluation of work quality	*PR-9, 12, 17, 31*
Kn-10	To know the responsibilities and ways to accomplish the tasks	
Kn-11	To know social and community rights and responsibilities	*PR-1, 22, 24*
Kn-12	To know the basics of the legal system and pharmaceutical legislation	*PR-3, 5* *PR-24, 25*
Kn-13	To know the features of the use of prescription and over-the-counter drugs and other products of the pharmacy range	*PR-14*
Kn-14	To know the conditions in healthcare facilities of proper storage of medicines and other products of the pharmacy range in accordance with the physical and chemical properties and the rules of Good Storage Practice (GSP)	*PR- 19,30,32*
Kn-15	To know the technology of manufacturing pharmaceuticals in various dosage forms	*PR-26, 32*
	To know the technology of industrial drugs; GMP requirements and other good pharmaceutical practices for the manufacture of finished medicinal products	*PR-27, 31, 32*
Ab-1	To be able to solve complex issues and issues that arise in the professional activities	*PR-2, 4, 23*
Ab-2	Be able to carry out professional activity that requires updating and integrating of knowledge	*PR-2, 14, 15, 17*
Ab-3	To be able to apply methods of self-regulation, to be able to lead a healthy life and to adapt to new situations of life and activity	*PR-5, 6, 7*
Ab-4	To be able to choose ways and strategies of communication to ensure effective teamwork	*PR-8, 9, 12*
Ab-5	To be able to apply knowledge of the native language, both orally and in writing, to be able to communicate in a foreign language	*PR-8*
Ab-6	To be able to use information and communication technologies in the professional field, which requires updating and integration of knowledge	*PR-12*
Ab-7	To be able to analyze information, to make informed decisions, to be able to acquire modern knowledge	*PR-4,6* *PR-9, 12, 17, 31*
Ab-8	To be able to ensure quality performance of the work	
Ab-9	To be able to set goals and objectives, to be persistent and conscientious in the performance of responsibiliteis	*PR-1, 22, 24*
Ab-10	To be able to form one's civic consciousness, to be able to act in accordance with it	*PR-3, 5*
Ab-11	To be able to use laws and other normative documents that regulate pharmaceutical activity in Ukraine and abroad	*PR-24, 25*
Ab-12	To be able to justify the use of prescription and OTC drug products and other products of the pharmaceutical assorment	*PR-14, 17*
Ab-13	To be able to create conditions in healthcare facilities for proper storage of medicines and other products in accordance with the physical and chemical properties and the rules of Good Storage Practice (GSP).	*PR- 30,32*
Ab-14		*PR-26, 32*

Ab-15	To be able to characterize dosage forms by types of dispersed systems, method of use, destination, physical state, taking into account the physicochemical properties of active substances and excipients To be able to conduct research on pharmaceutical drug development; to compile technological documentation on industrial production of drugs	*PR-27, 31, 32*
C-1	To give the conclusions and explanations clearly and unambiguously to specialists and non-specialists	*PR-1, 4, 23*
C-2	To form effectively a communication strategy in the professional activities	*PR-2, 14, 15, 17*
C-3	To establish appropriate connections to achieve results	*PR-5, 6, 7*
C-4	To use communication strategies and interpersonal interaction skills	*PR-8, 9, 12*
C-5	To use native language in the professional and business communications and for the preparation of documents	*PR-8*
C-6	To use foreign language in the professional activities	*PR-12*
C-7	To use information and communication technologies in the professional activities	*PR-4,6*
C-8	To establish appropriate connections to achieve goals	*PR-9, 12, 17, 31*
C-9	To establish connections for ensuring the quality work performance	*PR-1, 22, 24*
C-10	To be able to convey one's public and social position	*PR-3, 5*
C-11	To use knowledge of laws and other normative documents which regulate pharmaceutical activity in Ukraine and abroad	*PR-24*
C-12	To analyze use of prescription and OTC drug products and other products of the pharmaceutical assorment	*PR-14, 17*
C-13	To carry out a constant monitoring of proper storage of medicines and other products in healthcare facilities in accordance with the physical and chemical properties and the rules of Good Storage Practice (GSP)	*PR- 30,32*
C-14	To choose the optimal technological process of manufacturing drugs in different dosage forms	*PR-26, 32*
C-15	To choose the optimal technological process for the manufacture of industrial drugs	*PR-27, 31, 32*
AR-1	To be responsible for making decisions in difficult conditions	*PR-2, 6*
AR-2	To be responsible for professional development, ability to further professional training with a high level of autonomy	*PR-5,7*
AR-3	To be responsible for a healthy lifestyle and timely use of self-regulation methods	*PR-3*
AR-4	To be responsible for the choice and tactics of communication	*PR-8, 9, 12*
AR-5	To be responsible for fluent knowledge of the native language, and the development of professional knowledge	*PR-8, 10*
AR-6	To be responsible for the development of professional knowledge and skills	*PR-12*
AR-7	To be responsible for the timely gaining of modern knowledge	*PR-4,6*
AR-8	To be responsible for the quality performance of the work	*PR-9,12,17,31*
AR-9	To be responsible for the quality performance of the tasks	*PR-1, 22, 24*
AR-10	To be responsible for civil position and activity	*PR-3, 5*
AR-11	To be responsible for the quality and timely use of normative documents in the professional activities	*PR-24*
AR-12		*PR-14, 17*

AR-13	Be responsible for the analysis of the use of prescription and over-the-counter drugs and other products of the pharmacy range	*PR- 19, 30, 32*
AR-14	To beresponsible for the proper storage of medicines and other products in healthcare facilities in accordance with the physical-chemical properties and the rules of Good Storage Practice (GSP)	*PR-26, 32*
AR-15	To be responsible for the extemporaneous manufacture of drugs To be responsible for adhering to GMP recommendations	*PR-27, 31, 32*

6. Course format and scope

Discipline format	Full-time	
Type of classes	**Number of hours**	**Number of groups**
lectures (L)	46	
practical classes (P)	188	
seminars	-	
self-reliant work (SRW)	156	

7. Topics and scope of the discipline

Content module 1. Drug technology in pharmacy

Code of the class type	Topic	Scope of study	Code of the learning outcomes
L-1	Technology of drugs as a science and educational discipline. Biopharmaceutical aspects of drug technology. Drugs preparation in pharmacy and manufacturing of drugs according to the requirements of good pharmacy practice (GPP)	Technology of drugs as a science and educational discipline. Tasks of drug technology. Biopharmaceutical aspects of drug technology. Legal documents that regulate compounding and manufacture of drugs.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-2	Dosage forms, their classification. Powders as a dosage form. Rules of technology of powders	Dosage forms, their classification. Characteristics of powders as dosage form, their classification. Requirements of the Pharmacopoeia to powders. Methods of prescribing of powders. Stages of technological process of simple and compound powders. Technology of compound powders with poison and strong active substances. Triturations Technology of	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*

		powders with dyeing and hard-grinded substances. Technology of powders with extrects and liquids	
L-3	Liquid preparations. Technology of liquid preparations by weight in volume method	Characteristics of liquid dosage forms as disperse systems, their classification. Characteristics of the dissolution process, ways to improve solubility. Methods of prescribing and designation of solution's concentrations.General provisions of liquid preparations technology. Technological stages of preparation of liquid preparations.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-4	Concentrated solutions. Technology of liquid preparations in weight in volume method by dissolving dry substances and with using concentrated solutions	Concentrated solutions for burette system. Stages of the technological process of concentrated solutions production. Technology of liquid preparations with using concentrated solutions and by dissolving dry substances	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-5	Non-aqueous solutions, peculiarity of technology. Drops	Characteristics of non-aqueous solutions for cutaneous use, requirements to them. T Technology of non-aqueous solutions. Technology of aqueous solutions. Technology of glycerin and oil solutions. Preparation of solutions in mixed solvents. Technology of drops.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-6	Solutions of macromolecular substances and colloids, properties and peculiarity of technology	Characteristics of macromolecular substances (MMS). The process of dissolving macromolecular substances. Processes that lead to a violation of the stability of solutions of macromolecular substances. Classification, technology and application of macromolecular compounds. Characteristics of colloidal solutions. Solutions of protected colloids.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-7	Heterogeneous dosage forms and their stabilization. Suspensions and emulsions as formulated preparations	Characteristics of liquid dosage forms and dispersive systems, requirements of the Pharmacopoeia. Sedimentation and aggregative stability of heterogeneous liquid dosage forms. Stabilization of heterogeneous liquid drugs. Suspensions as a dosage form. Classification of drugs that form suspensions. Methods of preparation of suspensions and their technology. Emulsions as a dosage form, classification, requirements. Methods for determining the type of emulsions and their technology. Quality control, release and registration	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*

		before release of suspensions and emulsions.	
L-8	Water extracts from plant material. Technology of liquid preparations containing water extracts. Using of extracts in technology of liquid preparations	Characteristics of water extracts, their classification. Theoretical basis of the process of extraction. Factors affecting on the process of extraction Technology of liquid preparations containing water extracts Using of concentrated extracts in technology of liquid preparations	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-9	Semi-solid preparations for cutaneous application. General rules of topical semi-solid preparations' technology. Technology of semi-solid preparations according to the type of dispersive system.	Classification of semi-solid preparations for cutaneous application. Classification and characteristics of bases for semi-solid preparations, their requirements. General rules of topical semi-solid preparations for cutaneous application. Rules for the introduction of drugs into the basics. Technological stages of making ointments in pharmacy. Technology of ointments of different types in pharmacies. Design, quality control and storage of soft medicines.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-10	Rectal and vaginal dosage forms.	Classification of drugs for rectal and vaginal use. The mechanism of absorption of drugs by rectal administration; factors affecting absorption. Bases for suppositories, methods of their production. Packaging and design for dispensing, quality control and storage of suppositories	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-11	Sterile preparations. Aseptic conditions. Providing of quality of parenteral preparations	Drugs that require aseptic manufacturing conditions. Aseptic conditions for preparation of medicines, organizing them in pharmacies and pharmaceutical enterprises. Sterilization methods. Medicinal and excipients in the technology of solutions for parenteral administration. Drugs for parenteral use, classification, requirements. Stabilization of solutions for ***parenteral administration*** Technological scheme of production of solutions for injections in pharmacies.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-12	Intravenous infusions. Calculation of isotonic concentration, isoosmoticity and	Classification and characteristics of intravenous infusions. Requirements for infusions. Calculations of isotonic concentrations. Technology of infusions in conditions of pharmacies. Concentrates for injections and infusions.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*

	ion composition of infusions.		
L-13	Ophthalmic preparations. Aseptic preparation of drug products without thermal sterilization	Eye drops, requirements to them. Technology of eye drops. Packaging and quality control of eye drops. Eye lotions Powders for eye drops and lotions. Eye semi-solid preparations. Ophthalmic inserts. Antibiotics, characteristics, requirements, classification. Technology of drugs with antibiotics	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
P-1	Basic terms in technology of drugs. Legal documents that regulate compounding and manufacture of drugs in Ukraine.	Technology of drugs as a science and academic discipline, its objectives at the present stage, the direction of development. Basic terms of technology of drugs (active pharmaceutical ingredient, excipient, drug, dosage form, etc.). Classification of dosage forms: by the aggregation state, method of use, route of administration. The basic principles of good pharmacy practice (GPP). Regulations and reference books that govern the conditions of preparation, storage and dispensing of medicines from pharmacies. Limitation of the range of persons entitled to pharmaceutical activity in accordance with the legislation. Officinal prescriptions and extemporaneous drugs. Writing prescriptions in accordance with the regulations of Ministry of Health care of Ukraine. Doses and their classification. Pharmacopoeia, its structure and rules that should be used at searching for information. Quality control of active substances, excipients and drugs. The standardization of the conditions of preparation and technological process.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, , AR-7, AR-8, AR-9, AR-13, AR-14*
P-2	Dosing in pharmacy practice. Technology of simple and compound powders	Types of scales used in pharmacy practice. Structure prescription and hand (manual) balances. Metrological characteristics of scales: stability, accuracy, sensitivity, consistency shows. Calibration of scales. Determination of relative error of weighting. Rules of weighing of solid, liquid and viscous substances on manual and prescription scales. Care for scales and standard weights. Measuring devices. Dosing of liquids in volume. Dosing of liquid in drops. Standard dropper. Calibration of nonstandard dropper by weight and volume. Characteristics of powders as dosage form, their classification. Requirements of the Pharmacopoeia to powders. Methods of prescribing of	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		powders. Stages of technological process of simple and compound powders.	
P-3	Technology of simple and compound powders with medicinal substances that difference physico-chemical properties and amount. Technology of compound powders with dyeing, colored, hard-grinded substances and liquids	Rules of preparation of compound powders with substances, prescribed in equal and different quantities. Factors affecting on order of mixing ingredients in the technology of compound powders. The equipment used for grinding, mixing and dosing powders. Rules of selection of packaging material according to the physico-chemical properties of the ingredients of powder. Dosage of powders. Biopharmaceutical aspects of powders. Classification of dyeing and colored substances. List of dyeing substances, their storage in pharmacies. Features of technology of powders with dyeing substances and sanitary conditions of their preparation. Features of packing of powders with dyeing and colored substances. Characteristics of solid gelatin capsules for packaging powders. Characteristics of the extracts used in powders and their classification. Preparation of solutions of soft extracts conditions and shelf life of their storage. Features of technology of compound powders with dry and soft extracts, and solutions of soft extracts. List of hard-grinded (poor powdered) substances. Features of technology of powders with hard-grinded (poor powdered) substances and sanitary conditions of their preparation. The reasons for the use of auxiliary liquids for improving grinding of hard-grinded (poor powdered) substances. Rules of adding of liquids and odorous (aromatic) substances into the powders. Features of packing of powders with volatile and odorous substances. Quality control a design for dispensing of powders with dyeing, colored, hard-grinded substances and liquids in accordance with the requirements of the Pharmacopoeia of Ukraine and other normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-4	Technology of compound powders with poisonous, narcotic (psychotropic) and strong active substances. Triturations.	Rules of prescribing of poisonous, narcotic (psychotropic) and strong active substances, their storage and dispensing from pharmacies in accordance with the requirements of normative documents. Checking of single and daily doses of poisonous and strong active substances in powders. The list of narcotic substances and norms of their one-time dispensing. Features	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		of preparing of compound powders with poisonous, narcotic and strong active substances, prescribed in quantities less than 0.05. Trituration, their characteristics, classification, preparation, storage and use for the preparation of powders. Quality control, rules of design for dispensing and storage of dosage forms in accordance with the requirements of the Pharmacopoeia and other normative documents.	
P-5	Technology of liquid preparations by weight in volume metho	Characteristics of liquid dosage forms as disperse systems, their classification. Methods of prescribing and designation of solution's concentrations. Preparation of solutions that contain up to 3% and more than 3% of dry medicinal substances. Adding of syrups, flavored water, galenic and novogalenic medicines and others to the solutions. Checking of doses of poisonous and strong active substances in liquids. Quality control, design for dispensing and storage of liquid dosage forms in accordance with the requirements of normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-6	Technology of concentrated solutions. Technology of liquid preparations in weight in volume concentration with using concentrated solutions	Calculation of the amount of substances and water for preparation of concentrated solutions by different ways: using the measuring ware; with consideration of the volume increase coefficient; with consideration of density of the solution. Rules for the preparation of concentrated solutions for burette system. Quality control of concentrated solutions, their storage. Structure of burette system, rules of care and use of it. Rules of preparing of liquid preparations using concentrated solutions in accordance with the normative documents. Adding of syrups, flavored water, galenic and novogalenic medicines and others to the solutions. Evaluation of quality, design for dispensing and storage of liquid dosage forms in accordance with the requirements of normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-7	Peculiar cases of aqueous solutions technology. Technology of aqueous solutions of standard Pharmacopoeial liquids	Types of difficult cases of aqueous solutions preparations that most often meet in pharmacies: slowly and difficult dissolving or insolubility of substances in prescribed solvent; decomposition of substances, that are easily oxidized; decrease of solubility in compatible presence. Special technological techniques, that allow to prepare solutions of these substances: prior grinding of substances and use of hot solvent; use of	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		freshly prepared purified water and appropriate excipients, using of complexation at preparing of solutions; separate dissolution. Nomenclature of standard pharmacopoeial liquids; their concentration, chemical and conditional name. The rules for calculating quantity of water i pharmacopoeial liquids depending on the method of prescribing in the prescription. Rules of preparation of solutions with pharmacopoeial liquids. Rules of safety at working with acids and alkalis. Evaluation of quality, design for dispensing and storage of solutions according to the requirements of the normative documents.	
P-8	Technology of non-aqueous solutions. Dilutions of Ethanol. Technology of drops	Characteristics of non-aqueous solvents (ethanol, vegetable oils, liquid paraffin, glycerol, chloroform, dimexide, macrogol 400 and others), requirements to them. Calculations at dilution of ethanol using the formula of dilution and alkoholometric tables. Preparation of solutions on volatile and nonvolatile solvents. Rules of safety at working with flammable and explosive solvents. Characteristics drops as dosage form, their classification according to the method of administration. Checking of doses of poisonous and strong active substances in drops. Rules of preparation of drops by using of concentrated solutions and by dissolving solid substances. Preparation of drops on non-aqueous solvents. The formation of eutectic mixtures. Evaluation of quality, design for dispensing and storage of non-aqueous solutions and drops according to the requirements of normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-9	Technology of macromolecular substances solutions and colloidal solutions	Characteristic of macromolecular compounds, their classification and application in pharmacy. Influence of structure of macromolecular compounds on the process of dissolution of limited and unlimited swelling substances. Features of preparation of solution of pepsin, gelatin, starch, methylcellulose, sodium carboxymethylcellulose and vegetable extracts. Characteristic and properties of colloidal solutions. Technology of solutions of protected colloids (Collargolum, Protargolum, Ichtamolum). Rules of adding of substances to the solutions of macromolecular compounds and colloidal	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		solutions. Quality control and storage of macromolecular substances solutions and colloidal solutions, design for dispensing and storage in accordance with the requirements of the normative documents.	
P-10	Technology of suspensions	Characteristics of suspensions as a dosage form and dispersive system; requirements to them. Cases of formation of suspensions. Factors affecting stability of heterogeneous systems. Dispersive method of preparation of suspensions with hydrophilic (swelling and non-swelling) medicinal substances. Characteristic of stabilizers and mechanism of their action. Features of technology of suspensions with hydrophobic substances with strong and less hydrophobic properties. Condensation method of preparation of suspensions. Opalescent and muddy mixtures. Assessment of quality of suspensions, design for dispensing and storage of suspensions in accordance with the requirements of the normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-11	Technology of emulsions	Characteristics of emulsion as a dosage form and dispersive systems, their classification. Requirements of the Pharmacopoeia to the emulsion. Types of emulsion, methods of their determination. Characteristics of emulsifying agents, classification and mechanism of their action. General rules and methods of preparing of emulsions. Calculation of the quantity of emulsifier, water and oil. Stages of technological process of preparation of emulsions. Introduction of medicinal substances with different physico-chemical properties into emulsions. Evaluation of quality, storage and design for dispensing of emulsions in accordance with the requirements of the normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-12	Technology of water extracts from medicinal plant materials	Characteristics of infusions and decoctions as dosage forms and dispersive systems. Methods of prescribing of infusions and decoctions. Theoretical basis of the process of extraction of medicinal plant materials. Factors affecting on the process of extraction (ratio between quantity of raw material and extraction solvent, histological structure and degree of grinding of raw plant material, material of device for infusion, temperature, duration of infusion and cooling, pH, chemical composition, etc.). Rules of preparation of infusions and	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		decoctions from medicinal plants. The equipment used for the preparation of infusions and decoctions. Features of preparing of water extracts from Althea, medicinal plant materials that contain essential oils, tanning substances, anthracene derivatives, saponins, alkaloids, cardiac glycosides etc. Evaluation of quality, storage of water extracts and design for dispensing in accordance with the requirements of the normative documents. Calculation of excipients for an optimal pH of extraction. Copyright prescribing of some water extracts (Deryahina mixture, Kvatera mixtura, Ravkina mixture and others). Evaluation of quality, storage of water extracts and design for dispensing in accordance with the requirements of the normative documents.	
P-13	Technology of liquid preparations with using extracts	Characteristics of standardized concentrated extracts for the preparation of infusions and decoctions, their nomenclature. Advantages of their use in technology of water extracts. Rules of preparation of water extracts with standardized concentrated extracts and introduction of other medicinal substances into water extracts. Evaluation of quality, storage of water extracts and design for dispensing in accordance with the requirements of the normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-14	Technology of single-phase semi-solid preparations	Characteristics of ointments as dosage form, their classification (according to the medical purposes, place of application, texture and physico-chemical properties of ingredients). Requirements of Pharmacopoeia to ointments. Requirements to ointment bases, their classification. List of ointment bases, principles of their selection. Characteristic of hydrophobic and hydrophilic bases. Characteristic of gels as dosage form. Classification of gels and gelling egents. The main technological stages and rules of preparation of gels. Quality assessment, packaging, design for dispensing and storage of singlephase semi-solid preparations in accordance with the requirements of normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-15	Technology of double-phase semi-solid preparations	Characteristics of suspension ointments and their technology depending on the percentage content of medicinal substances. Official prescriptions of suspension ointments. Features of introduction of Resorcinol and Zinc sulfate into	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14;*

		dermatological ointments. Pastes, their preparing. Characteristics of emulsion ointments of various types and their preparing depending on the properties of medicinal substances and excipients. Rules of introduction of protargol, tannin and plant extracts of different consistency into the ointment. Characteristics of creams as dosage forms. Classification of creams and rules for their preparation. Characteristics of emulsifiers for preparing of emulsion ointments. Technology of double-phase gels and liniments. Assessment of quality of double-phase ointments, storage and design for dispensing according to regulatory documents.	*C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-16	Technology of multi-phase semi-solid preparations	Characteristics of combined ointments, creams and liniments, general rules for their preparation. Stages of technological process of preparing multi-phase semi-solid preparations considering physical and chemical properties of medical substances. Methods of quality control of combined ointments, creams and liniments, their storage and design for dispensing in accordance with the requirements of normative documents. Ways of improvement of technology of extemporal semi-solid preparations.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14;Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-17	Technology of suppositories by rolling method	Characteristics of supppositories as dosage forms and dispersive systems. Classification of suppositories. Requirements of the Pharmacopoeia to rectal and vaginal suppositories. Methods of prescribing of suppositories; checking of doses of poisonous and strong active substances in rectal suppositories. Basics for suppositories, requirements to them. Features of prescribing of sticks and calculation of basis for them. Characteristics of technological stages of preparation of suppositories by rolling method (deflation). Rules of introduction of medicinal substances with different physicochemical properties into the base; features of introduction of Protargol , Collargol, Tannin, dry and soft extracts. Methods of quality estimation of suppositories, packaging and design for dispensing, storage in accordance required by regulations.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

P-18	Technology of moulded suppositories and pessaries	Composition and properties of officinal suppository bases used for the method of pouring of suppositories. Calculation of quantity of suppository bases for preparing of suppositories by pouring method. Coefficient of replacement. Characteristics of technological stages of preparation of suppositories by pouring method. Rules of introductions of medicinal substances with different physico-chemical properties into the suppository base by pouring method. Comparative evaluation of methods of suppositories preparation (rolling, pouring, compressing). Quality assessment of suppositories, packaging and design for dispensing and storage according to the requirements of normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-19	Organization of aseptic conditions in pharmacy. Receiving water for injection	Aseptic conditions for preparation of medicines. Characteristics of dosage forms for injections, requirements of Pharmacopoeia and their implementation in pharmacies. Characteristics of the solvents used for the preparation of dosage forms for injections. Obtaining, storage and quality control of water for injections according to the requirements of Pharmacopoeia. Requirements to the medicinal substsnces and packaging materials used for preparing solutions for injections. Sterilization methods and equipment used for this purpose.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-20	Technology of solutions for injections without stabilization and with stabilization	Technological stages of preparation solutions for injections. Features of preparing of sodium hydrocarbonate solution for injections. Filtration of solutions for injection and test on absence of impurities. Reasons of degradation of medicinal substances in solutions for injections. Characteristics of stabilizers used in technology of solutions for injections; their classification. Principles of selection of stabilizers and calculation of their quantity in accordance with regulations. Stabilization of solutions of medicinal substances subjected to hydrolysis. Features of technology of solutions of glucose and procaine. Stabilization of solutions with substances that are easily oxidized. Antioxidants and their classification. Features of technology of Ascorbic acid solutions for injections. Sterilization methods and equipment used for this purpose. Evaluation of the quality of	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*

		solutions for injection according to the requirements of normative documents, design dispensing and shelf life.	
P-21	Technology of isotonic solutions for parenteral administration	Value of ositonisation of solutions for injections. Methods of calculation of isotonic concentrations using isotonic equivalent by sodium chloride, the Raoult's law (cryoscopic method), Vant-Hoff law and Mendeleev-Clapeyron equation. Principles of selection of isotonic agents. General technological methods of preparation of isotonic solutions. Quality assessment of isotonic solutions according to the requirements of normative documents, design for dispensing and shelf life.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-22	Technology of infusion solutions	Classification of solutions for infusions according to their medical purpose and composition. Physiological solutions. Nomenclature of the most frequently used plasma substitute and antishock solutions. Features of technology of infusions depending on the composition of active ingredients. Calculation of isoosmoticity and ion composition of infusions. Evaluation of the quality of solutions for infusions according to the requirements of Pharmacopoeia and other regulatory documents, closing, design for dispensing and shelf life.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-23	Technology of eye drops and lotions	Characteristics of dosage forms used for the treatment of eye diseases (drops, lotions, washes, ointments, etc.), requirements of Pharmacopoeia to them. Isotoning of eye drops, lotions and washes. Prolonging of action of eye drops. Features of technologies of eye drops depending on the physicochemical properties of drugs. Rules of preparation of lotions and washes. Assessment of quality of eye liquid dosage forms, closing, design for dispensing and shelf life according to the requirements of Pharmacopoeia and other normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-24	Technology of eye semi-solid preparations and dosage forms containing antibiotics	Characteristics of semi-solid preparations used for the treatment of eye diseases, requirements of Pharmacopoeia. Characteristics of bases used for preparing of eye ointments. Technology of eye ointments and features of introduction of zinc sulfate and resorcinol into bases. Characteristics of the dosage forms with	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14,*

		antibiotics; requirements that apply to them and factors affecting their stability. Features of technology of solid and liquid dosage forms with antibiotics (lotions, washes, rinses, drops and powders). Technology of ointments and suppositories with antibiotics; characteristics of basis for their preparation. Assessment of quality of semi-solid eye preparations and dosage forms with antibiotics, design for dispensing and shelf life according to the requirements of Pharmacopoeia and other normative documents.	*AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-25	Technology of preparations for newborns	Features of technology of preparations for newborns. Dosage forms for newborns. Nomenclature of preparations for newborns. Assessment of quality of medicinal products for newborns, design for dispensing and shelf life according to the requirements of Pharmacopoeia and other normative documents.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-26	Difficult prescriptions. Drug interactions in dosage forms	Difficult prescriptions and ways to overcoming problems of preparing (with indication of cases in different dosage forms). Cases of incorrect writing of prescriptions coming to pharmacies (overdoses, no stamps, incorrect medical supplies, etc.). The responsibilities of the pharmacist to the wrong prescriptions. Definition of "incompatibility". Classification of incompatible combinations of components in the formulations. Reasons of physical and physico-chemical incompatibility (examples). Classification of chemical incompatibility according to the types of reactions. Characteristics of pharmacological incompatibilities (examples).	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
P-27	Modern nomenclature of extemporaneous preparations. The need in preservation of extemporal compounding in pharmacies	Modern nomenclatures of preparations prepared in pharmacies. The advantages of extemporaneous preparations. Factors that influence the production of medicines in pharmacies. Problems for pharmacies at the production of drugs. The need in preservation of extemporal compounding in pharmacies.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-14; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13; Ab-14; C-1, C-3, C-7, C-9, C-11, C-13, C-14, AR-1, AR-7, AR-8, AR-9, AR-13, AR-14*
SRW -1	Preparation to practical classes – theoretical preparation and working with the recommended prescriptions		*Kn-1, Kn-2, Kn-5, Kn-6, Kn-9; Kn-13; Kn-14;*

		Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14; C-1, C-3, C-7, C-9, C-13, C-14; AR-1, AR-7, AR-9, AR-13, AR-14
SRW -2	Prescription, its definition. Prescription structure. Structure of tare and hand scales, care for scales and weights. Instruments and equipment for dosin	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9*
SRW -3	Requirements for sanitary conditions and pharmaceutical procedure in a pharmacy in the preparation of medical substances. Requirements for storage conditions in pharmacies of various groups of medical substances	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-13*
SRW -4	Packaging material in medicine technology and its effects on quality of dosage form	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -5	Purified water before distillation. Water distillers, features of their construction. Demineralization of water, equipment. Features of technology of some liquid medicinal products by author's prescriptions	*Kn-1, Kn-2, Kn-6Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -6	Requirements of Pharmacopoeia to nasal and ear preparations	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -7	Soliubilization and emulsification of medicinal substances. Solubilizers and emulsifiers as excipients in technology of drugs	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*

SRW -8	Herbal collections	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -9	Characteristic of bases for topical semi-solid preparations (hydrocarbons, fats, silicones, gels of proteins, polysaccharides, cellulose derivatives, macrogols and others.), their biopharmaceutical investigations. Characteristic of emulsifier. Calculation of the amount of surface active agents needed for preparing ointments and creams	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -10	Characteristic of bases for suppositories, their biopharmaceutical investigations and principles of choice depending on the method of preparation of suppositories Technology of suppositories by compressing method. Suppository press machines	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -11	Aquadislillators, their types and principles of work. Non-aqueous solvent for parenteral preparations. Types of containers for parenteral preparations, requirements to them, and pretreatment	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -12	Materials and apparatus for filtration and packaging of parenteral preparations. Control of parenteral preparations on mechanical comtamination	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -13	Methods of introduction of parenteral preparations. Types of injections. Rate of therapeutical effect according to the method of administration. Methods of control of parenteral preparations: tests on sterility, pyrogens, bacterial endotoxins and toxicy properties.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -14	Formulated preparations for the children of different age	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14;*

		C-1, C-3, C-7, C-9, C-14, C-15; *AR-1, AR-7, AR-8, AR-9, AR-14*
SRW -15	Phisical, chemical and pharmacological drug interactions in dosage forms	*Kn-1, Kn-2, Kn-6* *Kn-7, Kn-9;* *Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-14;* *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-8, AR-9, AR-14*

Content module 2. Industrial technology of drugs

Code of the class type	Topic	Scope of study	Code of the learning outcomes
L-1	Common principles of the organization of pharmaceutical manufacture. Normative and technical documents. Solid dosage forms: powders, species, granules, dragee. Characteristics, production methods, quality control	Common principles pf the organization of pharmaceutical manufacture. Regulatory documents governing the composition of drugs, the quality of starting materials and finished drugs; technology, conditions of production and storage of drugs. Pharmaceutical development. Solid dosage forms. Classification. Characteristics. Pharmacopoeial requirements. Stages of the technological process of production, quality control	*Kn-1, Kn-2, Kn-6* *Kn-7, Kn-9, Kn-11;* *Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11* *AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-2	Tablets. Classification, characteristics. Production methods, quality control	Tablets, characteristics, pharmacopoeial requirements, classification. Excipients. Theoretical aspects of tableting. Methods of tablet production. Types of granulation. Manufacturing stages. Apparatus. Quality control of tablets. Covering tablets Trituration tablets. New types of tablets	*Kn-1, Kn-2, Kn-6* *Kn-7, Kn-9, Kn-11;* *Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11* *AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-3	Capsules, microcapsules. Classification, characteristics. Production methods, quality control	Capsules. Characteristics. Manufacturing methods of soft and solid gelcapsules, filling capsules with medicinal substances. Quality control. Tubatins. Microcapsules. Microencapsulation methods. Apparatus. Dosage forms of microcapsules. Quality control.	*Kn-1, Kn-2, Kn-6* *Kn-7, Kn-9, Kn-11;* *Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11* *AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-4	Liquid preparations. Classification, characteristics. Features of liquid preparations	Characteristics of liquid preparations as disperse systems, classification. Production methods of solutions. Filtration, classification of filters. Syrups. Aromatic waters. Characteristics. Classification. Production methods and purification.	*Kn-1, Kn-2, Kn-6* *Kn-7, Kn-9, Kn-11;* *Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11*

	manufacture in industrial conditions, quality control	Apparatus. Quality control. Characteristics of heterogeneous liquid systems, features of manufacture in industrial conditions	*AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-5	Semi-solid preparations for cutaneous application. Manufacturing process, apparatus, quality control	General characteristics and classification of semi-solid preparations for cutaneous application. Classification and characteristics of bases for semi-solid preparations. Stages in the manufacture of semi-solid preparations in industrial conditions. Plasters, characteristics, classification, nomenclature, use. Mustard plasters, characteristics, manufacturing process, packaging.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-6	Parenteral preparations. Requirements of good manufacturing practice to manufacture of sterile preparations. Manufacturing process of solutions for injections in ampoules, quality control. Stabilization of solutions for injections	Basic principles of good manufacturing practice (GMP), requirements for manufacture of sterile preparations. Classification of clean areas, cleanliness grades. Technological process of production of solutions for injections, quality control. Requirements for preparations and containers used for injections. Glass for ampoule production, classes and types. Basic requirements and quality parameters. Stabilization of solutions with easily hydrolyzed and easily oxidized substances	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-7	Manufacturing process of solutions for injections in ampoules that are not subjected to thermal sterilization. Manufacturing features of oil solutions for injections in ampoules. Lyophilized parenteral preparations, infusion solutions	Manufacturing features of solutions with thermolabile substances Basic stages in the manufacturing process. Methods of sterilization. Characteristics of non-aqueous solvents. Manufacturing features of oil solutions. Quality control. Characteristics of lyophilized drugs for parenteral use, infusion solutions	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-8	Extractive preparations. Theoretical aspects for extraction from medicinal plant material. Tinctures.	Theoretical aspects of extraction process. Process intensification of extraction. Characteristic and classification of tinctures and extracts. Production methods. Ratio between raw material and extraction solvent. Technological stages in the manufacturing	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11*

	Extracts. Characteristics, production methods, quality control	process of tinctures and extracts using different methods. Purification methods. Quality control and storage of extracts. Extracts-concentrates. Polifraction extracts. Characteristics. Production methods.	*AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-9	Maximum purified preparations. Preparation from fresh plant material. Characteristics. Manufacturing schemes, purification methods of extracts, nomenclature	Characteristics of maximum purified extractive preparations. Production methods. Basic stages in the manufacturing process. Methods of purification. Quality control. Nomenclature and use of new galenic preparations.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
L-10	Drug preparations from animal material. Hormone preparations. Classification, characteristics, manufacturing schemes, quality control	Manufacturing features of drug preparations from animal material. Classification, characteristics. Technological stages in the manufacturing process, quality control. Current approaches to manufacture of biotechnological preparations. Microbiological synthesis.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-14, C-1, C-3, C-7, C-9, C-11 AR-1, AR-2, AR-5, AR-6, AR-7, AR-8, AR-9, AR-11*
P-1	Comminution, sieving, material balance. Investigation of physical-chemical and technological properties of powders and granular material. Manufacture of powders, quality control	Comminution and sieving of powders. Equipment for Comminution and sieving of powders. materials. Physical-chemical properties of powders. Methods of investigation. Features of powder production in industrial conditions. Stages in manufacturing process of powders in industrial conditions. Equipment for manufacturing and packaging of powders. Material balance	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14, C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-2	Manufacture of tablets by direct compression and compression with previous granulation	Manufacture of tablets by compression method. Stages in manufacturing process of tablets by direct compression and compression with previous granulation Quality control of tablets.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-3	Manufacture of coated tablets, molded tablets and dragee. Quality control	Types of tablet coating. Stages in manufacturing process of coated tablets. Production of tablets with a dry coating. Production of trituration tablets. Quality control of tablets.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15;*

			C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15
P-4	Manufacture of capsules and microcapsules, quality control	Stages in manufacturing process of capsules and microcapsules. Obtaining capsules by immersion and microcapsules of oil solution of vitamin A by simple coacervation in gelatin. Quality control of capsules	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-5	Manufacture of aqueous solutions in industrial conditions, quality control	Aqueous solutions Methods of obtaining solutions. Manufacturing process of aqueous solutions. Equipment used in their production. Manufacture of lead subacetate, aluminum subacetate and calcium hydroxide solutions by chemical method. Quality control of solutions	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-6	Manufacture of syrups and aromatic waters, quality control	Syrups and aromatic waters. Methods of production in industrial conditions. Stages in manufacturing process of syrups and aromatic waters. Equipment used in their production. Obtaining flavoring and medicinal syrups. Quality control of syrups	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-7	Alcoholometry. Determination of ethanol concentration. Strengthening and dilution of aqueous alcoholic solutions. Recovery and rectification of ethanol. Manufacture of alcoholic solutions, quality control	Determination of ethanol concentration. Conversion of volume percentages into mass percentages. Methods for determining the concentration of ethanol.Types and classes of alcohol meters. Determination of anhydrous ethanol in aqueous-alcoholic solutions. Accounting for ethanol. Manufacture of alcoholic solutions. Quality control of alcoholic solutions	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-8	Manufacture of semi-solid preparations for cutaneous application, quality control	Manufacture of semi-solid preparations in industrial conditions. Stages in the manufacture of semi-solid preparations. Equipment used in their production. Make working prescription and material balances. Quality control of semi-solid preparations	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15*

			AR-1, AR-7, AR-8, AR-9, AR-13, AR-15
P-9	Solutions for injections in ampoules: manufacturing process, quality control of finished products	Creating conditions for the production of sterile products. Basic requirements of good manufacturing practice. General characteristics and classification of solutions for injections. Types of primary containers. Requirements for ampoule glass. Glass for ampoule production, classes and types. Methods of washing ampoules. Methods of filling ampoules with solution. Determination of thermal and chemical stability of ampoule glass	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-10	Manufacture of solutions for injections that require special methods of purification	Chemical purity requirements for starting materials used in the preparation of injectable solutions. Purification of solutions of calcium chloride, magnesium sulfate, glucose, gelatin and calcium gluconate from impurities in the absence the initial substances "for injections"	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-11	Manufacture of solutions for injections that require stabilization	Factors of drug degradation in solutions for injections. Methods of stabilization of solutions for injections. Stabilization of solutions with easily hydrolyzed substances. Stabilization of solutions with easily oxidized substances	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-12	Manufacture of solutions for injections with thermolabile substances and oil solutions for injections	Manufacturing features of solutions with thermolabile substances Apparatus for sterile filtration. Nomenclature of solutions for injections, which cannot be heat sterilized. Manufacturing features of oil solutions	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-13	Manufacture of eye preparations, quality control	Characteristic and classification of eye preparations. Main requirements for eye preparations. Eye drops and lotions. Features of preparation. Requirements. Features of preparation of semi-solid eye preparations. Quality control of eye preparations	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-14	Manufacture of tinctures, quality control	Tinctures. Characteristic and classification of tinctures. Production methods. Ratio between raw material and extraction solvent.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15;*

		Make working prescription for manufacturing of certain volume of tinctures. Manufacturing schemes of tinctures by maceration, percolation and extract dissolution. Calculation of percolation rate. Purification methods of tinctures. Quality control	*Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-15	Manufacture of liquid extracts, quality control	Extracts. Characteristics of liquid extracts. Production methods. Ratio between raw material and extraction solvent of liquid extracts. Make working prescription for manufacturing of certain volume of liquid extract. Manufacturing schemes of liquid extracts by different methods. Purification methods of liquid extracts Quality control	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-16	Manufacture of soft and dry extracts, quality control	Production methods of dry and soft extracts. Make working prescription for manufacturing a certain amount of extract. Manufacturing schemes of soft and dry extracts by different methods. Apparatus for extract production. Purification methods of extracts. Quality control	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-17	Manufacture of oil extracts and extracts-concentrates, quality control	Production methods of oil extracts and liquid, dry extracts-concentrates. Make working prescription for manufacturing of certain amount of product. Manufacturing schemes of oil extracts by different methods. Production of Datura oil extract by maceration method. Quality control of oil extracts and liquid, dry extracts-concentrates.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1,AR-7, AR-8, AR-9, AR-13, AR-15*
P-18	Manufacture of new galenic preparations, quality control	Characteristics of maximum purified extractive preparations. Production methods of new galenic preparations. Basic stages in the manufacturing process. Methods of purification. Quality control. Production of adoniside by circulation metod	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-15*
P-19	Manufacture of fresh plant juices and biogenic stimulators	Manufacturing features of preparations from fresh plant material. Production methods of juices and extracts from fresh plant material. Apparatus and manufacturing scheme of juices and extracts from fresh plant material. Purification methods of preparations from fresh plant material. Quality control, nomenclature and use. Biostimulators.	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-14, AR-15*

		Definition, classification, production methods and purification. Quality control, nomenclature and use.	
P-20	Manufacture of pressurized preparations	Pressurized preparations, characteristics classification. Propellants, classification requirements. Types of aerosol containers Types of valve spraying systems. Manufactur and quality control of pressurized preparations	*Kn-1, Kn-2, Kn-6 Kn-7, Kn-9, Kn-11; Kn-13; Kn-15; Ab-1, Ab-2,Ab-4, Ab-7, Ab-9, Ab-13,Ab-15; C-1, C-3, C-7, C-9, C-11, C-13, C-14,C-15 AR-1, AR-7, AR-8, AR-9, AR-13, AR-14, AR-15*
SRW - 1	New excipients in the manufacture of solid preparations		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 2	Characteristics of basic manufacturing processes and apparatus for industrial manufacture of pharmaceutical preparations		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 3	General concepts on machines and apparatus, automatic lines in the industrial manufacture of drug products		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 4	Manufacture of prolonged-release solid preparations. Characteristics of prolongation methods		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 5	New solid dosage forms. Classification. Characteristics		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 6	Nasal preparations. Features of manufacture in industrial conditions		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 7	Ear preparations. Features of manufacture in industrial conditions		*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15;*

		C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15
SRW - 8	Volatile oils. Characteristics. Classification. Methods of receiving and purification	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 9	Preparations for rectal use. Classification. Characteristics, production methods, quality control.	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 10	Preparations for vaginal use. Classification. Characteristics, production methods, quality control	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 11	Transdermal therapeutic systems. Classification. Characteristics	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 12	Sterile emulsions and suspensions. Characteristics, features of manufacture	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 13	Filtration of solutions, Classification and characteristics of filters, operation mechanisms of filters with different construction	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 14	Sterilization methods in the industrial manufacture of parenteral preparations	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 15	Characteristics of containers for solutions for injections	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15; Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; C-1, C-3, C-7, C-9, C-14, C-15; AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 16	Hormone and enzyme preparations. Classification, obtaining, quality control, nomenclature	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15;*

		Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-15; *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 17	New inhalation dosage forms. Classification, characteristics	*Kn-1, Kn-2, Kn-5,Kn-6, Kn-9; Kn-13; Kn-15;* *Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14, Ab-15;* *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 18	Characteristics of liposomal preparations, production methods	*Kn-1, Kn-2, Kn-5,* *Kn-6, Kn-9; Kn-13; Kn-15;* *Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14, Ab-15;* *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 19	Characteristics of pediatric and geriatric preparations	*Kn-1, Kn-2, Kn-5,* *Kn-6, Kn-9; Kn-13; Kn-15;* *Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14, Ab-15;* *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-9, AR-13, AR-15*
SRW - 20	Approaches for advancing dosage forms	*Kn-1, Kn-2, Kn-5,* *Kn-6, Kn-9; Kn-13; Kn-15;* *Ab-1, Ab-2,Ab-6, Ab-7, Ab-9, Ab-12, Ab-14, Ab-15;* *C-1, C-3, C-7, C-9, C-14, C-15;* *AR-1, AR-7, AR-9, AR-13, AR-15*

8. Verification of learning outcomes

The current control

is carried out during practical classes and aims to check the students' assimilation of educational material. Forms of current educational activities assessment should be standardized and include control of theoretical and practical knowledge and skills of students. The final grade for the current educational activity is set on a 4-point (national) scale

Learning outcome code	Code of the classes' type	Method of learning outcomes verification	Enrollment criteria
Kn -1 – Kn-15; *Ab -1– Ab -15;* *C-1 – C -15;* *AR -1– AR -15*	*L-1 – L-23;* *P-1 – P-47;* *SRW -1 – SRW - 36*	Current control is performed in every laboratory classes according to the specific objectives. The form of assessment of current educational activity is standardized and includes control of theoretical and practical training. Control of theoretical training is conducted by performance of tests and practical skills by assessing of quality and completeness of practical tasks and the ability to	On each laboratory classes students respond to the tests according to the topic of laboratory classes; standardized questions, knowledge of which is required to understand the current theme; questions of lectures and self-education related to this topic; demonstrate knowledge and skills according to the theme of laboratory classes.

		interpret the results. On each laboratory classes students respond to the tests according to the topic of laboratory classes; standardized questions, knowledge of which is required to understand the current theme; questions of lectures and self-education related to this topic; demonstrate knowledge and skills according to the theme of laboratory classes. Mark for laboratory classes is determined by the sum of the results of the test control and practical tasks. Self-education is assessed during the current control of theme on laboratory classes. The mastering of the topics studied only on independent work is controlled on final control.	Mark for laboratory classes is determined by the sum of the results of the test control and practical tasks *Evaluation criteria for current control.* The degree of student's knowledge is assessed during every class using a 4-point (national) scale. All types of activities provided by the discipline program are taken into consideration. A student receives a grade for each topic. Then this 4-poin grade is converted into points using a multi-point (200-point) scale. *Excellent* ("5") – student gives correct, logical and full answers on the standardized questions on the topic, including the material from lectures and independent work. Student can solve situational tasks. *Good* ("4") – student gives correct and logical answers on the standardized questions on the topic, including the material from lectures and independent work. Student can solve situational tasks with simple and moderate degree of complexity. *Satisfactory* ("3") – student gives incomplete answers on standardized questions on the topic, required additional questions to complete the answer. Student cannot give a clear and logical answer, makes mistakes. Student has only the required minimum of theoretical knowledge. *Fail* ("2") – student does not know material on the topic, cannot give logical answer, doesnot understand the topic.
Final control			
General evaluation scale	Semester control is carried out in the form of semester credits (semesters V-VIII) and exam (semester VIII) and includes educational material defined by working program and is carried out in the terms established by educational working plan, an individual educational plan of student.		

	Semester credit is a form of final control, which is an estimation of mastering of educational material on subjects per semester exclusively on the basis of the current control. Exam is a form of final control of mastering by the student theoretical and practical material on educational subjects, and is conducted as a control measure.	
Evaluation scales	traditional 4-point scale, multi-point (200-point) scale, ECTS rating scale	
Conditions of admission to the final control	Students are allowed to the exam if they attended all classes provided by the educational program, did all kinds of work, provided by the working program on the discipline and gained at least 72 points for current educational activity	
Type of final control	Methods of final control	Enrollment criteria
Credit	It is necessary to enroll all topics submitted for current control. Grades from the 4-point scale are converted into points on a multi-point (200-point) scale in accordance with the Regulation "Criteria, rules and procedures for evaluating the results of students' learning activities"	*The maximum number of points is 200. The minimum number of points is 120*
Exam evaluation criteria		
Exam	Final control consists of the following stages: Step 1 – a written response on the tests of format A. Student answers on a package of tests. Each package contains 40 tests of format A of the each chapter of the discipline. Step 2 – a written response on the 10 situational tasks of different complexity. Step 3 – evaluation of practical skills. Student conducts calculations, substantiates the technology and whrites a passport of written control on 2 dosage forms according to the recommended prescriptions and solves 2 practical tasks - compiles the equation of the material balance, calculates the yield, losses, factor, makes working recipes taking into account arbitrary norms, specifies the methods of obtaining and indicators of the quality of drugs.	Stage I evaluation criteria – 1 point for each test. The maximum number of points for stage I – 40. Stage I evaluation criteria – 2 point for each test. The maximum number of points for stage II – 20. Stage I evaluation criteria – 5 point for each test. The maximum number of points for stage III – 20. A maximum score that student can achieve for the exam is 80. A minimum score that student can achieve for the exam is not less than 50.

The maximal number of score points which a student can gain for the current educational activity for admission to the exam is 120 points.
The minimal number of score points which a student must gain for current educational activity for the semester for admission to the exam (differential credit) is 72 points.
Calculation of the points number is based on the grades gained by the student on a 4-point (national) scale during the study of the discipline, by calculating arithmetic mean (AM), rounded to two decimal places. The resulting value is converted into points on a multi-point scale as follows:

$$x = \frac{AM \times 120}{5}$$

9. Course policy

The policy of the course is determined by the system of requirements for the student in the study of the discipline " Technology of drugs " and is based on the:
Regulations of the educational activity (https://cutt.ly/3ySk64r);
Regulations of the evaluation criteria (https://cutt.ly/lySlyw0);
Regulations of the academic integrity (https://cutt.ly/EySkNHu)

10. Literature

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11. Equipment, logistics and software of the discipline

Methodical providing:

Computer and multimedia projector, methodical recommendations, test and calculation tasks, laboratory equipment and apparatus.

12. Additional Information

Responsible for the educational process at the department – Associate professor, PhD, ***Yakymiv Olha***, e-mail: olga_yakymiv@ukr.net

The department has a student research group, focused on the development of composition, technology and investigation of drug and cosmetic products

During the lectures and practical classes students must have laboratory coats and hats.

Practical classes are held in the classrooms of the department at the address: 75 Pekarska str., Lviv

Sylabus complier

Vashchenko Kateryna, PhD, associate professor _____

Bilous Svitlana, PhD, DSc, associate professor _____

Kalynyuk Tymofii, DSc, professor _____

Vashchenko Oksana, PhD, associate professor _____

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The Head of the department

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