MINISTRY OF HEALTH PROTECTION OF UKRAINE
ODESSA NATIONAL MEDICAL UNIVERSITY

Faculty Pharmaceutical .
(faculty name)

Department Pharmaceutical chemistry and drug technology
(name of department)

I APPROVE
Vice-rector for scientific and pedagogical work
_____ Eduard BURYACHKIVSKY
" 01 " September 20 23 _

GUIDELINES
TO THE INDEPENDENT WORK OF STUDENTS OF HIGHER EDUCATION
FROM THE ACADEMIC DISCIPLINE

Faculty, course Pharmaceutical, course III

Academic discipline Drugs technology
(name of academic discipline)

Approved:
Meeting of the Department of Pharmaceutical Chemistry and Drug Technology
Odessa National Medical University

Protocol No. 1 dated August 28 , 2023 .

Head of Department _____ Volodymyr HELMBOLDT
(signature) (First name, last name)

Developers:
Ph.D., Assoc. Tsisak A.O.

Topic " State regulation of the manufacture of drugs in pharmacies. General issues of drug technology..**" – 4 hours.**

1. Relevance of the topic:

The rationale behind the topic. In their daily practice, pharmacists need to work with recipes, normative-technical documentation and reference books. The pharmacist is responsible for leave from pharmacies only properly prepared medical forms, and for this it needs to control the correct prescription and obtaining a prescription. To cope with their responsibilities, the pharmacist will be to represent the structure of the recipe to be able to use DF, other normative-technical documentation. This explains the theoretical and practical need for studying of this subject.

2. Specific objectives:

- training to formulate the basic concepts and terminology of technology of medicinal forms;
- be free to navigate in this topic.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.

	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy.	Contemporary forms of prescription forms. The order of pharmacies.	Distinguish forms №1, №2, №3 prescription forms. Take recipes of various forms and then organize work with them.

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

TECHNOLOGY OF MEDICINE AS A SCIENTIFIC DISCIPLINE

Public health is engaged in a comprehensive review of medicines called drugscience, that is, the science of medicines. It covers a range of scientific sectors and disciplines.

Modern pharmacology at the same time, is divided into two separate sections: pharmacology that studies the action of drugs on the body, and pharmacy.

Word "pharmacy" comes from the ancient Egyptian word "farmaki", which means "the one that gives recovery and security," or from the Greek word "Pharmacon" - drug.

Pharmacy is a complex of Sciences (technology of medicines, pharmaceutical chemistry, pharmacognosy, organization and Economics of pharmacy, management and marketing) that explore issues relating to drugscience, namely:

1. Synthesis and analysis of drugs.
2. The development of new theories and methods of manufacture of dosage forms.
3. The study of natural resources of plant, animal, mineral origin and refining them into drugs.
4. Development of new machines and devices, means of mechanization and modernization of existing industrial and pharmaceutical production.
5. Quality control, storage and dispensing of medicines.
6. A study of the planning, organization and management of pharmaceutical business, management, marketing.

7. Improvement of educational-methodical work of pharmaceutical educational institutions and training of highly qualified personnel.

Modern pharmaceutical science must get ahead of practice, opening up new ways of improving drug provision of population of Ukraine.

The value of pharmacy to protect the health of the population determined by the role drugs played in the modern system of treatment and preventive measures.

IP Pavlov in 1895, noted that the drug is "a universal weapon of the doctor", and attached great importance to their study.

It becomes apparent that the broad use of therapeutic measures (physiotherapy, radiotherapy, hydrotherapy, etc.) in no way reduces the importance of medications, so prevention of many diseases and cure them without the use of drugs is impossible. Indeed, it is difficult to imagine modern surgery without the use of anesthesia,

painkillers or disinfectant drugs. Unthinkable, and a serious struggle with infections without the use of sulfonamides, antibiotics and disinfectants.

However, with the advent of new and effective drugs has increased the need for modern scientific substantiation of methods of production and improvement of technology of medicinal forms with the aim of obtaining stable drugs with optimal therapeutic effect.

Technology of medicine - the science of the theoretical foundations and production processes of processing of drugs in pharmaceutical products (drugs) by giving them a specific medicinal forms on the basis of established physical, chemical, mechanical and other laws.

The word "technology" comes from the Greek techne, the skill, ability and logos-science, study. The literal translation of "technology of drugs" means "the study of the ability to prepare medicines."

By definition encyclopedic dictionary (1982), technology is the totality of methods of processing, manufacture, change of status, properties, form of raw materials or material carried in the process of production. The task of technology as the science - identification of physical, chemical, mechanical and other laws to determine and use in practice the most efficient and economic production processes. The main goal of drug technology as a scientific discipline - to explore scientifically-based, technically advanced methods of conversion of drugs in dosage forms and preparations.

Technology of drugs relies heavily on data General subjects (chemistry, physics, mathematics), life Sciences (physiology, pharmacology, Microbiology and pharmaceutical subjects (pharmacognosy, pharmaceutical chemistry, organization and economy of pharmacy, management and marketing.

Most closely the technology of medicines associated with pharmaceutical disciplines. By definition of Professor AA Ovsky, it is the top pharmacy. Technology of medicine as a separate scientific discipline of pharmaceutical in the course of its development has experienced several different stages. At the initial stage of development, it takes more matters of technology, production of dosage

forms and was called "the course of practical work," "practice prescription", "pharmacy practice", "pharmaceutical formulation", "pharmaceutical propedeutics". Outdated meaningless title "pharmaceutical propedeutics" in 1920 it was proposed to replace the accurate term "technology of medicinal forms", and in 1924 the decision of the First Congress on pharmaceutical education this title was finally secured. Since 1955 it has been called a "technology of drugs". During this period it grew into an independent leading pharmaceutical discipline, which defines the content of the practical activity of a pharmacist.

Established by the time of conditions a fundamentally new system of pharmaceutical education, the significant achievements of pharmaceutical science (developed new ways of producing drugs, new dosage forms), the development of industrial pharmacy has accelerated the process of differentiation technology medicine technology medicine pharmacy and factory production (see chart 1).

Factory (industrial) production is large-scale and is mechanized pharmaceutical companies (plants, factories).

Pharmaceutical manufacturing is engaged in the manufacture of drugs in individual formulations, manufacturing unotron blanks, filling, and is carried out in pharmacies. It features a large assortment of small-batch products. In terms of the pharmacies preparing drugs that are unstable during storage and a complex, with individual dosage.

Pharmacy and factory production are complementary, developed and improved-analyysi in parallel.

Now our discipline is called "chemist's technology of drugs" that most accurately reflects not only the essence of this science, but its complete independence. Sequential study of the course of technology of medicines, pharmacy first, and then a factory shows their close relationship, sequence, and defines the tasks of industrial pharmacy.

In the US, our science is called "theoretical and practical pharmacy" in the England, France, Holland - "herbal pharmacy" and "prescription art".

One of the first textbooks on technology of medicinal forms was the textbooks of AI Eberhard (1929) and SG Kovalev (1930, 1934), PP. F. Shubin (1942, 1948), IA Murav'eva (1961), JK Sander (1967).

A number of textbooks were written in national languages: Azerbaijani - PK Aliyev (1951), Estonian - N. Ya Veiderpass (1964).

In 1962 was published textbook GP Pivnenko "pharmaceutical technology of drugs" (in Ukrainian), which best reflects the course of pharmaceutical technology of drugs based on the achievements of domestic and foreign science.

New technological methods of manufacture of dosage forms in pharmacies was presented at the "Workshop on pharmaceutical technology of drugs" GP Pivnenko (1964, 1972) (in Ukrainian), and then in the "Manual for practical training in chemist's technology of drugs", edited by YA Blagovidova and VM Ivanova (1968), was reprinted several times.

Modern science put before technology of medical forms a row quite new investigational and practical tasks, the decision of that will allow qualitatively to change going both near the questions of creation of medical forms and to medicinal preparation.Basic from them: it is realization of fundamental complex researches in area of technology, biopharmacy and pharmakokinetics of medicinal facilities; it is development of new types of medical forms and improvement of existing; - creation of the prolonged medicinal preparations, and also medical forms, using in pediatric and geriatrics practice; it is a search of new auxiliary substances, expansion of assortment of preservatives and stabilizators for injection medical forms; it is the use of modern packing material;it is expansion of researches on questions mechanization and automation of technological processes productions in pharmacies.By a task to technology of medical forms as educational discipline is: - are studies of students of activity of pharmacist-technologist; - study of theoretical foundations, acquisition of professional skills and skills in the manufacture of pharmaceutical forms, as well as determining the effects of storage conditions and the type of packaging on the stability of medicinal products.The tasks set before the technology of medicinal forms as a branch of pharmacy, can be solved only at the level of scientific research, high qualification of personnel and the integration of science with production.

MAIN TERMS AND CONCEPT OF TECHNOLOGY OF MEDICINES

The term (terminus - lat border, border) is a word or phrase, which is an exact, unambiguous name of a certain notion of a special field of science, technology, etc. Terminology has a direct relation to the essence of this science, the development of which produces a review, streamlining of terms, as well as restriction or complete elimination of synonyms. There are new terms for new concepts, in the old terms a new meaning is added, that is, terminology is subjected to conscious intervention, regulation, ordering, unification and standardization. An arbitrary interpretation of scientific terms is inadmissible. The only "Terminological Dictionary" was put into effect in 1980 and in 1982. It contained the definition of basic concepts in the field of medicinal products and clinical pharmacology. More modern terminology, including the basic terms of the technology of medicinal forms, is given in the Law of Ukraine "On Medicinal Products" (1996) .Terms and their concepts have not only information and legal, but also methodological significance, since a clear definition allows you to properly plan and conduct scientific research .Terminology of medicine technology consists of names of medical forms (tablets, powders, extracts, etc.), designation of technological processes and operations, machines and apparatus. In technological terminology, pharmacological, pharmaco-pharmacological and pharmaco-chemical terms are common in comparison with other pharmaceutical sciences.

A pharmacological agent is a substance or a mixture of substances with established pharmacological activity. After obtaining positive results of clinical examinations and authorization of the authorized person for medical use, it

receives the name of the medicinal product. Medicinal product - a pharmacological agent authorized by the authority of that body of the country for use in order to treat, prevent and diagnose a human or animal disease.Medicines represent a significant group of a variety of substances, differing in appearance, origin and composition. They can be plant and animal origin, organic and inorganic nature, substances individual and complex, have different aggregate state, etc. In order to systematize medicinal products, based on their composition, can be divided into two groups: 1. Medicinal substances.2. Medicinal herbal and animal raw materials (and microbial agents). Medicinal substance is a medicinal product that is an individual chemical compound or biological substance. It can be used for the preparation of dosage forms without pre-treatment. Depending on the specificity of the preparation and the purification method in the production conditions, the medicinal substances are divided into several groups.

STATE REGULATION OF PRODUCTION OF DRUGS

State regulation of the production of medicinal products is a set of requirements, legalized by the relevant documents, to the quality of medicinal products, auxiliary substances and materials, the technological process and medicinal preparations as a finished product. Improper storage of the medicinal product, incorrect preparation or dosage can lead to a reduction or loss of the therapeutic effect, or even before the toxic effect of the medicinal product. However, in contrast to other subjects of consumption, the quality of medicinal products can not be determined by the patient. This especially emphasizes the importance of state regulation of production and quality of medicinal products. The establishment of rules for conducting individual operations, norms of quality and costs of raw materials, requirements for the finished product not only promotes the receipt of high-quality products, but also reduces material losses, which increase especially in violation of the technological regime.The standardization of the production of medicinal products is carried out mainly in four directions: 1. Restrictions on the range of persons authorized to prepare medicines (the right to pharmaceutical work) .2. Rationing of prescriptions of medicinal products.3. Ration of the quality of drugs and adjuvants used for the manufacture of medicinal products.4. Rationing of the conditions and technological process of making medicines.

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THE RIGHT TO MANUFACTURING DRUGS (ON PHARMACEUTICAL WORK)

In the "Fundamentals of the legislation of Ukraine on health care" it is stated that medical and pharmaceutical activities can be carried out only by persons who have received the corresponding professional education and meet the same qualification requirements. The only qualification requirements for persons engaged in certain types of medical and pharmaceutical activity, including in the field of folk and non-traditional medicine, are established by the Ministry of Health of Ukraine.Proceeding from this legislation, the controller-technologist is responsible for checking recipes for the correctness of their prescribing and registration, compatibility and ingredients, single and daily doses of poisonous and potent drugs. The Professor-Technologist manages the work of pharmacists in the manufacture of medicinal products, intra-ocular preparations, controls the implementation of all technological requirements during their preparation. He controls the compliance with the sanitary regime in the production premises and controls the serviceability and accuracy of all weighing instruments in accordance with the requirements of the State Committee of Standards.

NORMAL QUALITY OF MEDICINAL PRODUCTS

The quality of drugs is directly dependent on the quality of raw materials, the method and the conditions for their manufacture. Therefore, while exercising control over their production, the state establishes the same requirements and special quality standards for medicines, auxiliary substances and materials. Thus, the standardization of the quality of medicinal products is the process of establishing and applying standards. The standard is a normative document developed and approved by a recognized body, in which rules, requirements, general characteristics related to different types of activities or their results are established for achieving ordering in a defined area. Standards are based on the

generalized achievements of science , technology, practical experience and aimed at achieving optimal benefits for society. Depending on which standardization organization (international, regional or national) adopts standards, they are respectively divided into international, regional and national. By scope, standards are divided into state (DST), sectoral (OST), republican (PCT) and enterprise standards (STP). For example, the standards that apply to medicinal products are industry standard technical documentation (NTD) and are approved by the Ministry of Health. The order of their development is regulated by OST 42U-1 -92 "Procedure for the development, approval of normative and technical documentation for medicinal products and medicinal raw materials". Standards should periodically be reviewed in the light of modern advances in science and technology. NTD defining the requirements for the quality of medicinal products are subdivided into the following categories: State Pharmacopoeia (DF), Pharmacopoeial Article (FS), Temporary Pharmacopoeia Article (VFS). Pharmacopoeia article (FS) is a normative and technical document that establishes requirements for a medicinal product, its packaging, conditions and termin storage and methods of quality control of medicinal product. First, for each new medicinal product, a temporary pharmacopoeial article (VFS) is approved for a certain period (most often for 3 years). If, after this time, a medicinal product, normalized by this WFS, has justified itself in medical practice and its production becomes stable, then a permanent FS is being developed for it. When preparing it, the WFS makes the necessary clarifications, corrections and additions. If necessary, the WFS may continue. Current FSs are periodically reviewed. WFS and FS of all categories after their approval are registered with the assignment of the mark consisting of the 42U- index, the registration number and the year of approval or revision of the article (the last two digits) .Example: Guttae ophtalmicae «Propomics »FS 42U-34 / 42-113-96 Eye drops« Propomix »instead of VFS 42-2023-90FS and WFS have the following structure: warehouse; description; solubility; authenticity; transparency and colorfastness; the limit of acidity or alkalinity, pH; dry residue; alcohol content, etc.Separate sections can be combined or lowered, and if necessary, other specifics for the given object can be entered. The sections on packaging, marking, transportation and storage periods are mandatory, indicating the relevant DSTs, which regulate packaging materials, sealing agents, marking symbols. In addition, the course of the presentation indicates the NTD, requirements of which must meet the individual components of dosage forms and all the methods used for analysis. At the end of the articles, information is provided on the main pharmacological action of the medicinal product. FS for medicinal products of the highest therapeutic value and widely included in medical practice, as well as high qualitative indicators, are included in the State Pharmacopoeia.The creation of new drugs and the development of NTD, which normalizes their quality, is the only inseparable process that is carried out in a definite sequence. The procedure for the establishment and introduction of medicinal products is established by the order No. 87 of September 4, 1996 (State Committee of

Commerce and Industry of Ukraine, since 2000 - the State Department of quality control, safety and production of medicines and medical products). New medicinal substances and medicines created from them are developed in scientific research institutes, laboratories and departments of pharmaceutical universities. Upon completion of the pilot studies to be carried out at the modern scientific level, the NTD and samples of the finished product (together with the manufacturer) are sent to the Pharmacological Committee of the Ministry of Health of Ukraine (since 2000 - the State Pharmacological Center of Medicinal Products). The Committee issues permission for a clinical trial of new drugs presented, which is usually carried out at once in several medical institutions in the country. When obtaining positive results of clinical examinations, the Pharmacological Committee recommends that the use of the medicinal product and its pharmaceutical form in medical practice be permitted. After admittance to the medical application, registration and approval of the NTD for medicinal products, raw materials, prescriptions for medicinal forms are carried out by the Pharmacopoeia Committee of the Ministry of Health of Ukraine. The work of both committees on admission and rationing of new medicines is completed by the order of the Ministry of Health of Ukraine on the permission for medical use and industrial production, as well as their inclusion in the State Register of Medicinal Products.Pharmacopoeia. Pharmacopeia is of great importance in pharmaceutical practice. Pharmacopoea comes from two Greek words: pharmacon - medicines and rovei - I do, prepare, that is literally it can be translated as a "guide to the preparation of drugs". Initially, pharmacopoeias were really collections of drugs with a description of how they were cooking. Modern pharmacopoeia is a collection of standards for medicinal products and provides only the basic principles of manufacturing medical forms. State Pharmacopoeia is a collection of compulsory medical-pharmacies-national standards and regulations that regulate qualitymedicines. Pharmacopoeia has a legislative character, obligatory for all medical, including veterinary establishments and enterprises of the country, which manufacture, store, control and use medicinal products.The first Russian Pharmacopoeia was published in 1866, the second edition - in 1871, Ill - in 1880, IV in 1891, V in 1902, and VI in 1910.In pharmacies of these years, due to the rapid growth of the chemical industry, chemical drugs are largely reflected, which has even led to the underestimation and oblivion of a number of herbal medicinal products. They reflect successes in the field of analytical chemistry, which allowed the transition from organoleptic tests to more advanced methods of analysis. In 1925 the State Pharmacopoeia, the seventh edition was issued. Then there were additional copies of this edition, issued in 1929, 1934 and 1942.In 1946, the VIII edition of the State Pharmacopoeia was issued, and in 1952 it was an additional edition of this edition, which made a number of corrections and additions. In the same year, the first supplement to the State Pharmacopoeia VIII was issued. In 1961 the State Pharmacopoeia IX edition (DF IX) containing 781 drugs was issued. This pharmacopoeia included new, effective medicines made from domestic raw

materials and excluded outdated. In 1968 the X edition of the State Pharmacopoeia (DF X) came out. The progress of domestic science allowed to expand and improve pharmacopoeia with normative documents a little. The latest advances in physics, chemistry, and biology have allowed us to develop a number of more advanced methods of treating contraceptives. There was a large number of new antibiotics, synthetic and highly effective herbal medicines. More advanced methods of producing dosage forms in pharmacy and in factory conditions are developed. All this was reflected in DF X. All of these pharmacopoeias were issued in one volume, which included private and general pharmacopoeial articles for medicinal substances and medicinal forms, as well as medicinal plant raw materials, and general articles describing the physical, physico-chemical and biological methods of drug analysis. Includes information about reagents and indicators. The annexes provided a number of help tables. After the release of DF X, the system for the development and approval of pharmacopoeial articles for medicinal products was changed. In connection with this, there was a need to issue the State Pharmacopoeia XI Edition (DF XI) on a new basis. Unlike previous editions, the DF XI was supposed to be issued in several parts, consisting of separate volumes, having a serial number number. However, in the current historical conditions (the collapse of the USSR), only two volumes were published. In the first volume of the DF XI "General Methods of Analysis" (published in 1987), 9 articles were first introduced on contemporary methods of analysis, such as: "Gas chromatography", "Methods of phase solubility", "Electrophoresis", "Fluorescent chromatography" and othersOf the presented physico-chemical methods of analysis for technology, the most important is the article "solubility", which is slightly different from the typical DF X: the soluble substances are defined as moderately soluble, refined solubility technique. In the section "Methods of analysis of medicinal plant material" included 7 general articles, which determine the main diagnostic features for the morphological groups of raw materials. The section "Sampling of packaged products" is included for the first time. Issue 2 DF XI (issued in 1989) includes "General methods of analysis, biological control methods", "Methods of quality control of medical immunobiological drugs" and "Medicinal herbal raw materials" .The first section includes mainly general articles on dosage forms, of which the first presented: "Suspensions", "Aerosols", "Studies on microbiological number." Other articles are supplemented and redone in the light of modern achievements. For example, in the article "Sterilization", for the first time introduced methods for sterilization by filtration of the diaphragm and deep filters, as well as radiation; the article "Injection" introduces the definition of infusion, toxicity and pyrogenicity tests; In the article "Mash" a microscopic method for determining the solid phase dispersion in suspension media was introduced; In the article "Suppositories" an index of "dissolution" was introduced for suppositories prepared on the hydrophilic bases.Of particular interest and importance for technology are general articles on dosage forms, methods of their manufacture, requirements for them and indicators

of quality assessment. They also contain excipients that the pharmacist can use if they are not indicated in the recipe (solvents, bases for ointments and suppositories, etc., stabilizers for injectable solutions, emulsifiers for emulsions, etc..), Often with an indication of their number. The recommendations for the introduction of medicinal substances into the pharmaceutical form, the degree of dispersion, the sequence of technological operations, etc., are given. Special attention is directed to the requirements proposed for the medicinal form: precision of dosing, permissible deviations in mass or volume, transparency for solutions, sterility for injectable solutions and TP, which is very important for the technological process and the assessment of the quality of the dosage forms. In some cases, when the quality of the dosage form can not be standardized, the process of its manufacture is standardized in the pharmacopoeia. For example, in the article "Infusions and decoctions", the quality of which is difficult to assess in pharmacy conditions, specific instructions are given on their technology: the conditions for the extraction of medicinal raw materials, the standardity of raw materials and their dispersion, etc., are established.In the section " The project of the first part of the State Pharmacological Center (prepared for the V National Congress of Pharmacists of Ukraine, 1999) is written in Ukrainian and Russian. General and private articles of the PFU project consist of two parts: the European (which is the literal translation of the relevant article of the European Pharmacopoeia) and the national one, which does not contradict the European and complement its national peculiarities. The draft of the first part of the SPF includes 30 general articles: 7 articles on dosage forms, 9 - on pharmacoecological tests and 14 - on methods of analysis. The article "Residual amounts of organic solvents" has been in force in Ukraine since February 1, 1998. Specialists from all the well-known pharmaceutical centers of Ukraine (Pharmacopoeia Committee, NCTSC, NFAU, etc.) Participated in the preparation of the State Pharmacopoeia project. DFU is the first pharmacopoeia of Ukraine. At present, almost all countries of the world have state pharmacopoeias. They are issued by governmental bodies and reflect the achievements of the pharmaceutical science of this country. So, published Pharmacopoeia of Germany. Czechoslovakia, Scandinavian countries, etc. The leading pharmacies are Great Britain (1980), USA (1985), Japan (1982). In 1951, p. The World Health Organization (WHO) of the United Nations issued the first volume of the International Pharmacopoeia (English), then went Volume II and supplemented it in 1959. They were published in English, French and Spanish. In 1967, the second edition of the International Pharmacopoeia, a collection of non-legislative specifications, came into being. They are offered as reference material so that national specifications can be developed on the same basis in any country. The articles of the 2nd edition of the supplement were prepared through cooperation with the members of the WHO Expert Advisory Council on International Pharmacopoeia, as well as with a large number of specialists from different countries. In 1969, the second edition of the International Pharmacopoeia was first published in Russian. In 1979 the I volume of the International

Pharmacopoeia III was published (MF III), and in 1981, p. - II volume, which in 1983 was released in Russian. The main objective of the MF is to ensure that pharmacopoeial medicines and pharmaceutical forms made from them are of equal quality in all countries that have accepted the International Pharmacopoeia for guidance. Manuals (from the Latin manualis - manual, that is, the manual) are collections of prescriptions of medical forms not included in the acting pharmacopoeia. Quite often in mana-lakh is given the short technology of the described medicinal preparations. Manuals have the character of official, semi-official and unofficial publications, since they can be issued by both public (professional) organizations and individual scholars. The first Soviet "Pharmaceutical Manual" was published in 1949. It contains the most commonly used complex drugs information under certain conditional names, often associated with the names of doctors who first proposed these prescriptions. These include, for example, prescriptions for Bekhterev's medicine, Zelenin's drops, and many others. A total of 405 prescriptions, expressed in rational dosage forms and in their composition, contain available ingredients, mainly of domestic origin. The second part of the manual is a list of 70 prescriptions, the components of which were physically or chemically incompatible with each other, as well as prescriptions, in the manufacture of which there were some features ("complicated" recipes) .Similar manuals are issued in other countries, including "Pharmaceutical Formulas", issued in 1944 in England; in its one volume more than 10,000 records. Among the contemporary unofficial publications is published in 1999 under the editorship of the Academy. OI Tikhonova "Handbook of Extemporal Recipe. Alopathy and homeopathy." In it for the first time more than 2,000 registers of extemporal formulation of medicinal products according to diseases are generalized and systematized. The manual also includes the labeling of homeopathic remedies. In 2000, the second edition of this book "Extemporal Recipe (Technology, Application)" came out. Issue 1 "Liquid dosage forms" includes 123 prescriptions describing their technology. The prescriptions are systematized on medicinal forms and dispersion classification. Among foreign publications, the Formulaire de Magistrale du Syndicat (FMS, 1992) is a compilation of prescription drugs, compiled by the commission of French pharmacists, which ensures its publication and distribution. Interesting structure of this compilation: the prescriptions of medicines are classified into sections by dosage forms, and in each section of the prescription drug forms are classified as diseases. The collection includes a memorial to doctors on the rules for prescribing prescriptions with the obligatory indication of the title of the collection. Formules Magistrales (ARIS, 1994 p.) - issued by the association of independent pharmacists from Charleroi-Ville. The collection contains prescriptions of the most commonly prescribed prescription drugs, with their cost. The authors draw the attention of doctors prescribing drugs to doses that can be changed in each particular case. The guide includes information about new drug release rules.The publication of official and unofficial collections of main (extemporal) prescriptions gives a lot to both the

pharmacist and doctors. In such sources, you can find a lot of successful combinations of drugs.

Good pharmacy practice is a guarantor of the quality of medical supplies. One of the constituent elements of NAP is compliance with the conditions and technological process of the production of extemporal drugs. Production and quality control of medicines are interdependent. Therefore, the relevant requirements for them are dealt with in one section.Rationing conditions for the manufacture of medicinal products includes:

> observance of the complex of sanitary-hygienic measures (microclimate, illumination, air pollution, equipment, etc.), which is thoroughly studied in the course of hygiene;

> compliance with the sanitary regime, and in the manufacture of a number of medical forms - the conditions of asepsis;

> observance of the rules of work with poisonous, narcotic and substances equated with them;

> safety precautions. The rules that regulate the conditions for the manufacture of medicinal products in pharmacies are established by the relevant state authorities (orders of the Ministry of Health of Ukraine No. 139 dated 14.06.93 p., No. 44 of March 16, 1993 p.) .In the process of production, sources of pollution of medicinal products may be impurities that come from the apparatus during synthesis, due to imperfect methods of purification (impurities of heavy metals, lead and, which is very dangerous, arsenic). In the initial vegetative raw materials, there are also impurities of mineral and organic origin, which in one degree or another are reflected in the purity of the extract. Relevant impurities in quantities above the permissible standards can cause toxic effects on the human body or affect the stability of medicinal products. Sources of microbial contamination (microbiological contamination) of non-sterile medicinal products can be: medicinal and auxiliary substances, packing and poaching materials, and also the possibility of infection of medicinal preparations in the process of manufacturing from working personnel, equipment, etc. is not excluded.

Medicines are most often contaminated by saprophytes, widely distributed in the environment: soil, water, air, on plants, etc. Unlike pathogenic microorganisms, many saprophytes have a large set of enzymes and can disperse a variety of substances. In particular, yeast and filamentous fungi are capable of destroying glycosides and alkaloids, ascorbic acid, glucose, vitamins, and others. Many microorganisms inactivate antibiotics, break down proteins, lipids, cause the decomposition of galenic preparations. Microbial lesions are the basis for ointments, their components and ready-made ointments. Thus penicillins, actinomycetes easily break down paraffin, mineral oils, vaseline, beeswax and others. In all cases, factors such as the concentration of medicinal substances, humidity, ambient temperature, as well as the nature and degree of primary colonization, etc., influence the intensity of the destruction of medicinal products. The products of destruction of medicinal substances can also serve as a nutrient

medium for microorganisms.Currently, in many countries, including ours, due to the danger of microbial contamination, temporary maximum permissible norms of non-pathogenic microorganisms in non-sterile medicinal products included in DF XI have been developed.Pharmacy workers should observe the requirements of the sanitary-anti-epidemic regime of pharmacy and personal hygiene of pharmacists (Order of the Ministry of Health of Ukraine No. 139 dated June 14, 1993) for the preservation of high quality medicinal products, their physical and chemical stability and apirogenicity.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми

навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.

- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Україри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- Компендиум: лекарственные препараты. − [Електроний ресурс]. – Режим доступу: http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

number	Main tasks	Directions	Responses
1.	State regulation of the manufacture of drugs in pharmacies.	General issues of drug technology.	1,2,3,4,5
2.	fundamental complex researches in the field of technology, biopharmacy and pharmacokinetics of medicinal products; types of medical forms ; -prolonged drugs, as well as dosage forms, which are deposited; - search of new auxiliary	General issues of drug technology	1,2,3,4,5

	substances, expansion of assortment of preservatives and stabilizers; - modern packaging material;		

8. Materials for self-control.

8.1. Questions for self-control.

1. Identify the components of the recipe according to the algorithm of its structure.
2. To indicate the peculiarities of registration of recipes containing poisonous, narcotic, psychotropic substances, as well as hypnotics, antipsychotics and tranquilizers in the clause No. 16 of the Order of the Ministry of Health of Ukraine No. 117 dated June 30, 1994.
3. Specify the terms of the recipes if the list includes substances in the general list.
4. Determine for the table doses higher single and daily doses of atropine sulfate and papaverine hydrochloride for adults.
5. What should a pharmacist do in the event of an incorrectly prescribed prescription in the pharmacy?
6. Technology of medical forms as a science, its tasks and directions of development.
7. Basic terms and concepts in the technology of drugs: medicines, active substances (substances), excipients, finished medicinal products, pharmaceutical form, State Pharmacopoeia (DF), pharmacopoeial article (FS), temporary pharmacopeial article (TPS), technical conditions (TU), state standards (DSTU), International Pharmacopoeia, State Register of Medicinal Products of Ukraine, quality of medicinal product, expiry date of medicinal products.
8. What orders regulate the conditions of preparation, storage and release of drugs from pharmacies?
9. What are the main directions of state regulation of the production of medicines in Ukraine?
10. What documents regulate the quality of medicines?

8.2. Test tasks for self-control.

1.The pharmaceutical enterprise is developing new products. In which section of the technological regulations describes the appearance and physico-chemical properties of the finished product:

A. * Characteristics of the final product of production
B. Information materials
C. Characteristics of raw materials, materials and intermediates
D. Statement of the technological process
E. Characteristics of auxiliary raw materials and materials

2. Which normative and technical document sets out the requirements for the quality of medicinal means or medicinal plant raw materials, approved for a limited period.

A * Temporary Pharmacopeial Article (TFS)

B Technological industrial regulation (TPR)
C Pharmacopeia article (FS)
D State Standard (GOST)
E Industry standard (GSTU)

3. The normative document, which establishes the requirements for specific products and services, and regulating the relationship between the supplier and the consumer. How long does it take?

A * Specifications;
B Standard;
C Technical regulations;
D Technological regulations;
E Methodological guidelines

3. Point, which issiues pharmacy doesn`t explore.

A. Consumer demand
B. **Synthesis and analysis of drugs.**
C. **The development of new theories and methods of manufacture of dosage forms.**
D. **The study of natural resources of plant, animal, mineral origin and refining them into drugs.**
E. **Quality control, storage and dispensing of medicines.**

4. What is a pharmacological agent?

A. is a substance or a mixture of substances with established pharmacological activity.
B. adjuvant
C. surface shell
D. a drug substance that promotes the cleavage in the body

5. Choose the solid dosage form.

A. Pills
B. Ointment
C. Potion
D. Aerosol
E. Patch

6. Choose the liquid dosage form.

A. solution
B. ointment
C. potion
D. aerosol
E. patch

7. What factor does not affect the quality of the finished product?

A. Location of the enterprise
B. raw materials
C. production technology
D. production equipment

8. What scientific discipline is closely connect with medicine technology?

A. *Pharmacology
B. organization and economy of pharmacy
C. pharmacognosises
D. management and marketing

9. What factor can not be attributed to the functions of auxiliary substances?

A. Strengthening the action of active substances
B. Masking of taste and smell
C. Filling the dosage form to the desired weight
D. Disintegration in a specific part of the gastrointestinal tract
E. Giving the attractive appearance

8.3. Control materials for the inmate of the busy stage:

Test:

1. The pilot-technologist received a prescription for the preparation of a dosage form for a child aged 5 years with the content of a potent substance. Which of the principles should be guided by when checking the dose of the drug?
A. Differentiate the dose depending on the age or weight of the child
B. Take 1/2 doses of an adult
C. Take 1/4 of the adult dose
D. Take 1/12 adult dose
E. Take 3/4 doses of an adult
2. A substance or a mixture of substances authorized by an authorized body for use in the treatment, prevention and diagnosis of a disease of a person or an animal.
A. Medicinal product
B. Medicinal form
C. Medicinal product
D. Medicinal raw materials
E. Pharmacologic means
3. Define the term "medicinal substance":
A. a medicinal product that is an individual chemical compound or biological substance
B. Substance or mixture of substances with established pharmacological activity
C. A unique medical condition suitable for use
D. medicinal product in the form of a certain dosage form
E. natural substances in the unprocessed form, which require application of one or another processing or purification
4. Define the term "medicinal product":
A. Medicinal product in the form of a certain dosage form
B. Substance or mixture of substances with established pharmacological activity
C. A pharmacological agent authorized by the authorized body for use in the treatment, prevention and diagnosis of a human or animal disease

D. Medicinal product, which is an individual chemical compound or biological substance
E. A state-of-the-art condition for the medicinal product or medicinal plant material in which the desired therapeutic effect is achieved
5. Biofarmation is a science that studies
A. dependence of therapeutic action of medicinal preparations on an organism from various factors
B. processes for the processing of medicinal products into medicinal products, by providing them with a certain dosage form
C. Changes in the quality of drugs during the shelf life
D. bioavailability of medicinal substances depending on the routes of administration
E. technology of manufacturing of medicinal preparations from natural raw materials
6. Polymorphism is
A. the ability of one and the same substance to form different crystals in shape
B. one of the physical states of the drug substance
C. the ability of a substance to form various chemical compounds
D. the ability to administer a drug in different dosage forms
E. the process of formation of new compounds during the term of storage
7. Medicines prepared according to standard prescriptions by the pharmaceutical industry in large quantities are
A. officinal preparations
B. Triggers
C. Extemporal drugs
D. Manuscripts
E. Normative drugs
8. The mainstay of prescription drugs is
A. prescriptions prescribed by a doctor to a particular patient
B. standard prescriptions, repeatedly checked and included in the prescription reference books
C. prescriptions contained in the State Pharmacopoeia
D. prescriptions, the manufacture of drugs that are carried out as quickly as possible
E. prescriptions for medicinal preparations of industrial production
9. Part of the prescription, which contains information about a health care institution, is called
A. Inscriptio
B. Invocatio
C. praescriptio
D. Subscription
E. Signature
10. How many types of prescription forms exist in Ukraine?

A. 2
B. 1
C. 3
D. 4
E. 5
11.When making liquid dosage forms for Extent of dosing liquid ingredients following:
A Tincture of valerian
B Dimexidum
C methyl salicylate
D-400 Polyethylene
E Perhiidrol
12. In the technology of dosage forms, the following ingredients are always dosed by weight
A Perhidrol
B ammonia-anise Drops
C Solution citral 1 \% alcohol
D Belladonna Tincture
E elixir Chest
13. A pharmacist prepares 200.0 oil emulsion. Add a weight that can be used for weighing 20.0 peach oil:
A Balance pharmaceutical scales
B torsion balance
C VR-1
Dr. weighing
E. BP-5
14. A pharmacist must weigh drug candidates - glucose. What amount of glucose can weigh scales on hand?
A 0,02
B 0.01
C 0.03
D 0.04
E 0,05
15. When dosing a small amount of liquid used droplometer. Specify the number of drops per 1 ml of purified water under standard droplometer.
A 20
B 50
C 30
D 40
E 10
16. Patient dosing medicine tablespoon. Specify the number of milliliters of liquid in it:
A. 15

B 25
C 10
D 20
E 5
17. A pharmacist prepares powders with papaverine hydrochloride. Enter manual weight weighing 0.05 g ingredients:
A . BP 1.0
B. BP 5.0
C. BP 20.0
D BP 10.0
E. BP 2.0

T**opic "** Manufacturing in the conditions of pharmacies of simple and complex powders with medicinal substances, differing in prescribed quantity, bulk density and structure of particles. Production of complex powders with poisonous and potent substances.**" – 5 hours.**

1. Relevance of the topic:

Powders have been used since ancient times and are among the first drugs that began to provide a certain form. Despite the expiry date of application, powders have not lost their significance and now, because medicines used in the form of powders have certain positive properties. Powders are fairly common drugs, and in the general formulation of pharmacies they occupy about 30% in relation to other drugs. Powders - one of the oldest dosage forms, which until now is widely used in medical practice. The therapeutic effect of this dosage form largely depends on the choice of optimal technology based on the physico-chemical properties of the drugs and their amounts. Therefore, the study of classification, the basic and specific rules of manufacturing is of great importance for the assimilation of the theoretical foundations of the technology of powders of any composition.

2. Specific objectives:

-learn how to prepare simple and complex powders with drugs, different physical and chemical properties, quantity, assess their quality;
- learn how to prepare complex powders with toxic and potent substances and triturations.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid	Solubility of solids and	Carry out fractional distillation.

	chemistry. 4. Latin language 5. Pharmacy technology of drugs	liquids in liquids. Raoul's law. Extraction. Buffer solutions. Basics of grammar. Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	. Be able to write Latin names of drugs and medicines. Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy.	Contemporary forms of prescription forms. The order of pharmacies.	Distinguish forms №1, №2, №3 prescription forms. Take recipes of various forms and then organize work with them.

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Powders - one of the most ancient medical forms used in medical practice in 2500-3000 years BC and has not lost its value until now. An analysis of the extemporal formulation has shown that in the form of powders various drugs of organic and inorganic nature, dense substances and liquids in quantities that do not affect their viability are prescribed.

The technology of powders is quite simple to execute. However, the knowledge gained under the basic rules of preparing powders, serve as a basis for studying more complex dosage forms: suspensions, ointments, suppositories, pills for both pharmacy and factory production.

Powders - a solid dosage form for internal and external application, consisting of one or several chopped powders and has the property of flowing.

The advantages of powders as a pharmaceutical form can be attributed:

- ease of preparation, accuracy of dosing;
- versatility of the composition (in the form of powders it is possible to combine different composition and properties of medicinal substances);
- convenient storage and transportation.

Disadvantages of powders:

- slower therapeutic action compared with liquid dosage forms;

- poor storage capacity due to a large specific surface (easily lose or absorb water, oxidize, etc.);

- an inconvenience of taking odorous, colorful and substances having an unpleasant taste;

- subacute effect on the mucous membrane of the gastrointestinal tract.

During the internal use, the powders have a constant contact with the mucous membranes, starting with the oral cavity and esophagus, which causes the manifestation of allergic reactions and irritating effect.

Some disadvantages of powders can be eliminated, which is done in practice. For example, volatile and coloring substances are released in capsules. For medicinal substances that cause irritation of the mucous membrane (eufilin, acetylsalicylic acid, sodium bromide, etc.), as well as for substances that undergo metabolic transformation in the stomach to form inactive or undesirable products, enteric soluble colonies (in the form of tablets or capsules). Thus, the coating of sulfadimezin and sulfapiridazine with acetylphthalylcellulose (AFC) can reduce the process of their acetylation in the stomach and increase the content of the active form of dasgs in the blood by 15-20%.

Unfortunately, the industry produces a limited number of pills with intestinal coating (lyophil, solizim, bonaphtoone, naphthamon, and furadonin), and in one dosage. Distribution of them at the dose is inadmissible because of violation of the intestinal coating. Therefore, in the conditions of pharmacies there is a need for obtaining intestinal soluble forms. For this, powders are placed in the capsule (see the description of the medical capsules on page 177).

CLASSIFICATION AND METHODS FOR POWDERING

Classification of powders.

Depending on the composition, the powders are divided into simple (Pulveres simplices), consisting of one ingredient, and complex (Pulveres compositi), consisting of several ingredients (sometimes up to 10).

Depending on the nature of the dosage, the powders are classified into dosed (that is, divided into separate doses - Pulveres divisi) and undoped (ie, unbranched - Pulveres indivisi).

Depending on the method of application, there are powders for the internal (Pulveres ad usum internum), or oral (Pulveres peroralia), and external (Pulveres ad usum externum) applications.

Powders for internal (oral) application are a pharmaceutical form consisting of solid free dry particles of different degree of crushing. Powders for internal use include most extemporal powders in a dosage range of 0.1 to 1.0 g per serving. They should have a relatively high degree of dispersion, which provides rapid dissolution of the substance in juices of the gastrointestinal tract, and high adsorption capacity.

Powders for external use include: powders used to treat wounds and various lesions of the skin or mucous membranes; powders for injections, used for infusion

into the body cavity (nose, ear, nasopharynx, etc.); toothpicks; nail powders; powders for prepareing solutions for rinses, napkins, washings, etc .; powders to fight insects - duets.

The main requirements for powders: fluffiness; uniform distribution of substances in the total mass of the complex powder; homogeneity of mixing; precision of dosing; stability.

Depending on the medical purpose and the method of application, the powders must have a certain particle size. If there are no guidelines in separate articles, the powders for internal use should be shredded to 0.16 mm (DF XI).

Powders intended for use as suction and inhalation, as well as duets, should be chopped to particles of 0.1 mm in order to achieve a maximum increase in the total surface of these powders.

Dental powders also require fine grinding, because the content of large solid particles in them can damage the enamel of the teeth.

Inhaled powders, on the contrary, in order to avoid getting into the larynx and bronchi, can be shredded to an average particle size of 0.2 mm. When inhaled, such a powder should only enter the upper respiratory tract, but not in bronchi and alveoli.

Powders for the preparation of various solutions at home, as a rule, are released from pharmacies without further grinding (potassium permanganate, boric acid, sodium bicarbonate).

Powder - fine powder, intended for application on the skin with therapeutic or prophylactic purpose. Powders used for wounding, damaged skin or mucous membranes, as well as powders for infants should be prepared in aseptic conditions, and if they can withstand the effects of high temperatures - be sterilized. This is due to the fact that many of the ingredients that are part of the powder (for example, white clay, talc, etc.) may contain pathogenic microorganisms.

TECHNOLOGICAL STAGES OF PREPARATION OF POWDERS

For greater consistency and convenience, consideration of the technological stages, the preparation of powders, can be divided into two stages:

- Transformation of crude substances into the powdered state and obtaining a homogeneous mixture consisting of particles of more or less the same size. To do this, use the following technological steps: grinding, sifting (in the conditions of the pharmacy are used rarely) and mixing.
- Receiving from a powder mixture of separate corresponding doses. Stages: pre-packing, packing and design.

The necessity of performing certain technological steps in the preparation of powders depends on the composition of the prescription, their medical purpose and the physical and chemical properties of the drugs (aggregate state, density, color, odor, etc.).

Pulveratio is important for powders. As a rule, fine-grained substances have a greater therapeutic effect. The finer the drug, the faster and more fully it can be absorbed, and insoluble substances are better adsorbed by the mucous membranes and provide a better therapeutic effect. Grinding is also important for optimal mixing and precise dosage. When crushed, the size of the particles of drug substances is leveled, after which they are easy and well mixed and do not straighten out when dosed.

Shredding is a process of reducing the size of solids particles using different gadgets.

The choice of the method of grinding depends on the nature of the material to be crushed, and on the required fineness of the resulting powder. The grinding is achieved by means of various mechanical efforts:

a - crushing; b - split; in - strike; g-abrasion; D - cutting (Figure 89).

In the used grinding techniques, these efforts are usually combined. Thus, for example, grinding in a mortar is characterized by a combination of abrasion with crushing ducts, and grinding in a disk mill "excelsior" is associated with breaking and sti-tion, etc. For grinding solids it is better to combine a blow from the crush-(crystalline salts); for viscous materials - rubbing with breaking; for brittle materials - splitting and rubbing.

The shredding processes are associated with significant energy consumption for the formation of new overheads, overcoming the forces of grip between particles (overcoming the internal friction during the course of their deformation during the destruction), overcoming external friction between the materials to be crushed and the working parts of the equipment.

The theory of crushing was first proposed by Rittinger. It is based on the hypothesis that the grinding operation is directly proportional to the distribution surface, or otherwise, is inversely proportional to squares of linear dimensions (this is the so-called superficial theory of grinding). Later, Kick's theory belongs to the fact that the work spent in chopping is directly proportional to the volume or mass of the body (volume theory of grinding). Both of these theories complement each other and can be applied: Rittinger's theory - for fine grinding, mainly rubbing; Kick's theory - for rough crushing, mainly crushing and impacting. However, both theories do not fully reflect all the phenomena that occur during fragmentation.

At mechanical grinding simultaneously there are two processes: the separation of particles under the action of applied force and the aggregation of small particles under the action of forces of mutual attraction.

When the processes of separation and aggregation of particles acquire the same speed, that is, they are in equilibrium, further grinding of substances does not make sense, therefore, the optimal time of grinding is established. It is not the same for different substances and when crushed in a mortar is about 2-3 minutes. With further crushing, the powder becomes loose, sometimes it is moisturized by absorption from the air of moisture, gases, particles can be bonded to larger

aggregates or adsorption (adherence) of the powder to the walls of the mortar, that is, there is a decrease in the free energy surface.

Thus, as a result of grinding, powders are formed, which consist of particles of defined sizes, differing in degree of shredding.

The degree of grinding - this is the ratio of the average initial size of a piece of material to its average size in the width after shredding.

If a larger degree of shredding is required than achieved at the time of stabilization, it is necessary to saturate the free surface energy of small particles, which involves the use of special techniques:

- crushing of powders in the presence of excipients (eg, milk sugar);
- grinding with the addition of volatile liquids (95% ethanol, ether).

When grinding in a mortar several ingredients at once, they are ground separately from each other, so it is more rational to grind the mixture of substances than each of them separately, except for heavy-duty medicinal substances, where it is necessary to add auxiliary liquids (Table 8).

Smooth solvents are also used when rubbing especially poisonous dasgs (for example, mercuric dichloride, arsenic anhydride) to reduce dust formation. It should be borne in mind that mercury oxycinnate explodes in the event of a strong rupture, so rub it carefully.

Grinding of viscous substances is performed in the presence of milk sugar, which is carried in a ratio of 1: 1 to the taken basic substance.

Medicinal substances such as phyton, zinc oxide, magnesium oxide, mercuric amidocloride, quinine salt, acetylsalicylic acid, magnesium carbonate and others, when triturated, are densely adhered to the walls of the mortar and are compressed, so they are recommended to rub carefully, without much effort. If necessary, sugar before grinding can be dried at a temperature of 40-60 ° C and rubbed in a heated mat, because even with insignificant humidity sugar breaks and adheres to the walls of the mortar.

Insoluble in water: sulfur, butadiene, terpinhydrate - very electrified when rubbed, causing spraying, especially when trying to collect them with a celluloid plate. Therefore, these substances, to avoid losses, should be rubbed simultaneously with the prescribed water-soluble substances or fluids.

In pharmacy conditions, mortars or different apparatuses are used for grinding solids (often in combination with mixing): runners, disintegrators, shotguns, hammers, drum mills, etc., allowing to mechanize the process of making powders.

Stumps (Mortaria) are manufactured in various shapes and sizes (Figures 90, 91, 92). They are made of different materials: porcelain, glass, steel, copper, brass, agate.

Porcelain refers to soft materials of high hardness, resistant to moderate loads to abrasion, so it is most suitable for the manufacture of pharmaceutical stupas. Industry manufactures mortars of various sizes. Depending on the volume of work, there are seven room numbers (Table 9).

The powder (pistilla), by which the crushed medicinal substances that are found in the mortar, must correspond to the size of the mortar. The inside surface of the mortar and the head of the blender must not be glazed, as the blender will slip. The surface of the head of the shredder should have as much contact with the surface of the mortar as possible, otherwise the shredded particles will be delayed in the bends not accessible to the shredder. As the roughness of the mortar surfaces of the piece is smoothed, the size of the pop decreases, resulting in deterioration of the mortar's properties as a grinding apparatus. When crushing poisonous substances and those that irritate the mucous membranes, it is necessary to use special mortar with lids (covers) or cover the mortar with paper, cover the face with a gauze mask with a cotton layer and wear protective glasses.

When grinding, it is necessary to take into account the maximum loading of the mortar, which, according to V. D. Kozmin, should not exceed 1/20 volume, in order to ensure optimal grinding of medicinal substances. When crushing the substances in the mortar, the crusher is rotated with a hand brush without the involvement of the shoulder and elbow joints. The stove is held in the left hand, tightly pressed to the table.

When crushing a small amount of medicinal substances is lost in the pores of the mortar. Fill the pores of the mortar with the rubbing substance first. The number of losses is determined by the structure of the substance, and in order to establish the sequence of their addition, it is necessary to know the amount of losses of medicinal substances in the mortar (determined experimentally, see Table 10).

For other sizes, the value of the loss calculated for the mortar number 1 is multiplied by the coefficient of the working surface, which shows how many times the loss of substance increases with the size of the mortar compared with losses when using mortar number 1.

Depending on the characteristics of solids, their losses due to "rubbing" can fluctuate within a fairly wide range. For example, in mortar number 1 glucose losses do not exceed 7 mg, while for bismuth of nitrate basic they make up 42 mg. Using the table of losses, it is easy to decide on which ingredient it is necessary to start prepareing the complex powder.

If there is no auxiliary substance (sugar) in the formulation, the grinding should begin with the substance that is discharged in greater quantities and the least amount is lost in the pores of the mortar.

Sowing (*curbatio*). The crushed medicinal products must be sieved through the sieve.

The purpose of this operation is to obtain a product with the same size of casting that solves the sieve analysis.

Sowing is regulated by a special article DF XI "Determination of Powder and Sieve Shredding".

Sieves are metal, made by stamping a metal sheet, and fabrics made of silk (StSt 4403-77), kapron (CSt 17-46-82) and metal (StSt 214-83) threads.

Distinguish open screens, representing empty cylinders, made of metal or wood, the bottom of which is stretched by a suitable fabric with a certain size of the holes, and closed, consisting of the actual screen, the receiver, in which the sifted material arrives, and the covers protecting it is from cutting (Figure 93.94).

When carelessly used in silk-made screens, the location of the yarns may be changed, resulting in a powder of different particle sizes.

The silk screen number indicates the number of openings per inch.

The number of the metal wire mesh corresponds to the size of the holes in the mill in millimeters.

The number of breakdown sieves with round holes corresponds to the diameter of the hole in millimeters, multiplied by ten.

The sieve number with the longitudinal holes corresponds to the width of the hole in millimeters, multiplied by ten. It must be assumed that the shredded material does not interact with the material of the screen and does not change its composition.

The sifting result directly depends on the pressure under which the powder passes, on the size of the sieve openings, as well as on the duration and force with which the sifting is carried out. Therefore, when sifting it is necessary to take into account the influence of these factors and to carry out this process not very quickly, thoroughly mixing the powder.

In order to obtain powders free of smaller particles, they resort to the method of "double sifting", which consists in the fact that the smaller powder is released by sifting through the next thicker sieve.

When sifting, it is convenient to use a vibration sieve (Figure 95).

In the conditions of the pharmacy during the preparation of powders, the drugs directly in the mortar bring to the desired size of the particles, which is determined visually, without the help of sieves.

Mixtio is a process in which homogeneity is achieved, that is, the same ratio of component particles in any part of the resulting mixture.

The displacement process is the main operation in the preparation of complex powders. With insufficiently thorough mixing of the ingredients, the individual doses of the powder, obtained with its subsequent dosage, may contain different amounts of medicinal substances. It can adversely affect the medical effect of the drug, and when using potent and toxic substances even - to lead to poisoning.

The method and procedure for mixing the powders depends on the weight ratio of the registered ingredients and their physical and chemical properties (aggregate state, wet wiping, etc.). Depending on the above factors, very important practical provisions have been developed which should be observed when mixing the powders. The main ones are:

Medicinal substances of complex powder are discharged in equal or approximately equal quantities (the ratio in mass does not exceed 1: 5).

In this case, there are two possible mixing options.

1. If the physicochemical properties of medicinal substances are approximately the same, then they are mixed, taking into account the amount of losses when crushed in a mortar.

2. If the physicochemical properties of the medicinal substances are different, then the mixing and grinding begin with a coarse-grained substance, and then it is added to the fine-crystalline substance.

Amorphous substances (talc, magnesium oxide, starch, etc.) are mixed with the powder mass without further grinding.

Volume mass - is the mass (weight) of 1 cubic centimeter of matter in air-dry powdered state in conditions of free filling in any capacity.

Volumetric mass characterizes the degree of dispersibility of medicinal substances. The smaller the bulk mass of the substance, the more the substance is prone to spraying. In tabl. 11 shows the densities and volumetric masses of some medicinal substances. Dispersibility of substances is also due to the size of the forces of adhesion between the particles and to a large extent depends on the moisture content of powder ingredients.

Pharmaceutical substances of complex powder are discharged in different quantities (ratio in weight more than 1: 5). In this case, the order of prepareing powder is available: the first crushed medicinal product, which is included in a larger number and has less losses in the pores of the mortar. Then, the crushed powder is poured into the capsule, filling in a mortar a small amount (approximately as much as the next ingredient). Mixing begins with the ingredient prescribed in the smallest amount, gradually adding other substances in the order of growth of the prescribed quantities, given the crystalline structure and the scattering of medicinal substances.

Pharmaceuticals of complex powder (in multicomponent prescriptions) can be dispensed both at the same time and in equal amounts, and in different quantities. In this case, it is necessary to follow all the above-mentioned provisions, without violating the main right-hand mixing: from smaller to larger.

Dosage (Divisio) is a division of powder mass into separate dose levels.

The accuracy of the dosage depends on the correctness and sensitivity of the weights, the correct weighing, the homogeneity of the powder mixture.

In pharmacy practice, the dosage of powders is usually done using hand-held pharmacy scales (see Chapter 9), which is a labor-intensive process and requires certain skills. In order to accelerate this operation, other devices described in Section 10, whose construction principle is based on the dosage of powders, both in volume and mass, are currently proposed. Dosage by weight is more accurate than dosage by volume. Therefore, poisonous and potent medicinal substances should not be dosed in volume.

In accordance with the requirements of DF XI deviation in the mass of powders should not exceed the following values:

Weight of powder, g	Permissible deviations,%
to 0.1	± 15

0.11-0.30	+10
0.31-1.00	± 5
more than 1,0	± 3

Packaging of powders and medical capsules. For packaging of powders, depending on their physical and chemical properties, various packaging materials are used: writing, paraffin and waxed paper, parchment and subheading, cellophane, polyethylene film, cardboard, etc.

Each individual dose of powder is poured into pre-laid rows of paper capsules, which are taken from the number of registered powders, and then wrapped. Filled capsules make up three (five) for convenience of account and put in a paper package or box.

Capsules of glued paper (simple capsules) are used for packaging nonhygroscopic and non-volatile substances; from waxed and paraffined paper - for the packaging of hygroscopic substances, as well as substances that change under the influence of oxygen, carbon dioxide, which easily weathered. Waxes and paraffin capsules are not suitable for the packaging of powders soluble in wax or paraffin (essential oils, camphor, menthol, phenylsalicylate, etc.). Camphor and menthol form an eutectic alloy with wax.

Parchment capsules are used to pack volatile and soluble waxes and paraffin substances (menthol, thymol, camphor, etc.). Cellophane capsules are used in the same cases as parchment. Parchment and cellophane slightly pass the vapor and gases, at the same time they are greaseproof.

In recent years, it has been practicable to release powders in special packages of polyethylene film. However, not all substances can be released in this package because of its gas permeability (eg iodine, camphor).

Undiluted powders are released in paper bags, cardboard and plastic boxes. Powders containing a significant amount of crystallization water that are easily weathered, such as sodium tetraborate, sodium sulfate, magnesium sulfate, etc., are placed in parchment paper or parchment paper before placing them in a package or carton. Powders containing easily decomposed substances (potassium permanganate, etc.) are released in glass jars (or tubes) enclosed with a plug.

It is desirable to dispose of the powder in a special package with an additional inner lid, which has small spray holes.

According to the doctor's instructions, powders can be released in special medical capsules.

Medical capsules (Capsulae) - a dosage form, consisting of a medicinal product, enclosed in a shell. Gelatin capsules were first proposed in France in the XIX century. Nowadays they are very widely used in Western Europe, America, where they are filled with medicines. They are intended for the protection of drugs from the influence of the environment, masking unpleasant taste and smell, to prevent the action of drugs on the teeth, the mucous membrane of the mouth or

stomach. Capsules are usually prescribed for ingestion. However, there are capsules for subcutaneous administration, for administration to the rectum.

The capsule shell is made of gelatin or other substances, the plasticity of which is ensured by the addition of such substances as glycerol and sorbitol. The shell may include adjuvants such as surfactants, non-transparent fillers, preservatives, sweeteners, dyes authorized for medical purposes, and flavors. The surface of the capsules may be marked.

Solid, liquid or viscous medicinal substances may be released in capsules. In pharmacy practice, the most commonly used capsules are prescribed medicines such as ethacrytidine lactate, resorcinol and others. The contents of the capsules may consist of one or more active substances and such excipients as solvents, diluents, humectants and diluents, or without the excipients. The contents of the capsule should not destroy the shell.

However, the shell under the influence of digestive juices should collapse and release the contents of the capsule.

There are four types of capsules: Capsulae durae operculatae, Capsulae molles, Capsulae enterosolubiles, and capsules with modified release (Capsulae retard seu Capsulae cum liberatione modificata).

For release of powdered substances, only solid gelatin capsules are used, which are empty cylinders with rounded bottoms, which enter tightly into one.

The capsule is manufactured by the factory method, eight rooms - from 000 (the largest size) to five (the smallest size). They contain 0.1 to 1.5 g of powdered substances, respectively. The most commonly used capsules number 2-5, because capsules of larger sizes are difficult to swallow.

The capacity of gelatin capsules, given in Table 12, depends on the degree of compression of the powder, the bulk density, and so on.

Filling the capsules with powders: first, weighed doses are laid out on open paper capsules, then each dose by means of frequent pressing on a powder smaller in diameter by a cylinder (bottom) is filled until the whole amount of powder enters.

For poorly stuffed medicinal substances, a small amount of alcohol is allowed to pre-moisten. In the extreme case, the powder gently poured into the bottom of the capsule.

After that, close it with another cylinder (lid). If the lid jumps, then with the help of a fleece the edges of the edges slightly moisten with water. Now use special devices to fill gelatin capsules.

In accordance with the requirements of DF XI, gelatine capsules should be transparent and with stirring for 10 minutes with 20 times the amount of water heated to 35-40 ° C, should give a transparent liquid, which has no foreign smell and taste.

Soft capsules in the form of spherical, oval or oblong receptacles are intended primarily for the release of liquid drugs (eg, castor oil oil). The soft capsule shell may be firm or elastic depending on the content of the plasticizers.

Intestinal capsules are capsules with variable release, ie, their purpose is to resist gastric juice and release active substance or substances in intestinal juice. They can be made by applying, on hard or soft capsules, acid-resistant coatings.

Voids (intestine soluble capsules) or by filling capsules with granules or particles coated with an acid-resistant coating.

Appearance of powders. Powders, prepared in pharmacies, make up the main label "Powders". If necessary, stick a warning label: "Store in a dry, cool place protected from light".

Powders containing medicinal substances in list A must be prepared in accordance with the special rules established by the Ministry of Health of Ukraine.

ASSESSMENT OF QUALITY AND IMPROVEMENT OF POWDER TECHNOLOGIES

The assessment of the quality of the powders includes questioning, physical, organoleptic, chemical (selective) control and control during the release.

In assessing the quality of powders, first of all, the analysis of documentation (recipe, control panel), testing of compatibility of drugs, checking of doses of medicinal substances of lists A and B and norms for the release of narcotic drugs is carried out. Check the color, taste, and smell of the properties of the input medicinal substances. Determine the variation in the mass of individual doses to allowable standards that meet the requirement of the general article DF XI. Homogeneity is checked after pressing the head of the blender to the mass of the powder (at a distance of 25 cm from the eye there should be no visible individual particles, sequins). Sourdough is checked by pouring powder from one capsule to another, while there should be no laceration. Check the design of powders - the conformity of lable, packaging.

In order to increase labor productivity, ensure the high quality of medicinal products and provide rapid medical care, it is necessary to improve all technological stages of powders:

- development and introduction of available means of small mechanization in the stages of shredding, mixing and dosing of powders;
- use of semi-finished products for increasing labor productivity;
- introduction of auxiliary powders to overcome the incompatibility of drugs;
- improvement of packaging to increase the shelf life of medicines and provide local action of drugs (polyethylene films, capsules);
- implementation of theoretically grounded approach to the choice of technology (adherence to the rules of mixing powders, etc.).

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.

- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П.

Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.

- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua

- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Powders as dosage form	Define powders as a dosage form. Regulations prescribing powders	1, 2, 3, 4, 5
2.	Technology of preparing powders	What are the main technological stages of manufacture of complex powders	1, 2, 3, 4, 5
3.	Terms packaging powders	What Closing materials and their selection rules	1, 2, 3, 4, 5
4.	Evaluation of the quality powders	What are the main indicators of the quality powders	1, 2, 3, 4, 5
5	Regulations prescribing toxic, narcotic and potent drugs	Regulatory and technical documents regulating the rules of toxic and potent drugs	1, 2, 3, 4, 5
6	The technology complex powders with toxic, narcotic and highly-active medicinal substances	The main technological stages of preparation of powders with toxic and potent drugs	1, 2, 3, 4, 5
7	Triturations.	What types of technology and tryturatsiy	1, 2, 3, 4, 5

8. Materials for self-control.

8.1. Questions for self-control.

1. Definition of a powder dosage form, their classification and requirements.
2. Method of prescription recipes with powders.
3. The degree of grinding drugs in powders, depending on the medical application.
4. Technological stage of preparation of simple and complex powders.
5. Factors affecting the order of mixing drugs in the fresh snow.

6. Preparation of complex powders, which include drugs that differ in density, bulk weight, particle structure.
7. Preparation of powders with drugs, prescribed in equal and different amounts.
8. The main equipment used for chopping, mixing and dispensing of powders.
9. The rules of selection of the packaging material according to the physicochemical properties of incoming ingredients and their dosage.
10. Evaluation of the quality powders according to the requirements of technical standards (flowability, uniform mixing degree of dispersion, precision dispensing, packaging, design to delivery, storage).

8.2. Test tasks for self-control.

1. The pharmacy made easy dosage powder. What technological stage you do not need in their manufacture.

A. Mixing
B. Shredding
C. Dosage
D. Packaging
E. clearance to leave

2. Pharmacy got the prescription for preparation of powder for external use which includes hard-to-grind material. Which of these liquids can be used by pharmacist in the dispersion of the substance?

A. Ether medical
B. Purified Water
C. Water for Injection
D. Dimexidum
E. isopropyl alcohol

3. Determine what type of powder is included, which quickly react on the presence of water with the release of carbon dioxide:

A. Powder "effervescent"
B. soluble powders
C. oral administration Powders
D. Nasal Powders
E. powders for outdoor use

4. Pharmacy got a recipe:

Rp .: Rutini 0,01
Calcii gluconatis 0,10
Sacchari 0,15R'a M. f. pulv.
D. td N 10R'a S. 1 now. 3 times a day.
Select spellings technology
A. to mellow sugar pour off of the capsule, then add crushing, rutin, calcium gluconate, sugar capsules
B. to mellow sugar, then add the crushing, rutin, calcium gluconate

C. grind calcium gluconate, pour off of the capsule, add rutin, sugar, and calcium gluconate capsules
D. grind calcium gluconate, routines and add sugar, mix
E. to mellow routines with alcohol, add calcium gluconate, then sugar, mix

5. A pharmacist prepares medicine by the prescription:

Rp .: Thiamini chloride
Acidi ascorbinici ana 0,05
Glucosi 0,15R'a M. f. pulv.
D. td N 10S. 1 now. 2 times a day. As a pharmacist preparing the drug?
A. grind glucose, thiamine chloride added acid and ascorbic carefully stamped
B. grind glucose pour off of the capsule, said chloride thiamine, ascorbic acid, mixed, added with glucose capsules
C. grind glucose pour off it into a capsule in a mortar, grind liberated thiamine chloride with alcohol added ascorbic acid, glucose from the capsule, carefully mixed
D. grind thiamine chloride with alcohol added ascorbic acid, glucose, and then carefully mixed
E. grind ascorbic acid, thiamine chloride is added, then glucose and carefully stamped

6. What drug did not crush alone?

A. Sulfur
B. bismuth nitrate basic
C. glucose
D. rutin
E. Calcium glycerophosphate

7. What is the recommended maximum loading mortar with crushed dry matter:

A. 1 / 20th volume of mortar
B. 1/10 volume of mortar
C. 1/5 volume of mortar
D. 1/2 volume of mortar
E. 1/100 volume of mortar

8. A pharmacist prepares powder and starch. How should he pack this?

A. in a glass jar
B. in plastic wrap
C. in waxed capsules
D. in parchment capsules
E. in simple capsule

9. Pharmacist preparing complex powder grinds two substances simultaneously in a mortar. How should the different masses of these substances?

A. No more than 5 times
B. Not less than 5 times

C. No more than 10 times
D. Not less than 10 times
E. No more than 20 times

10. How should be packed complex sugar-dosed powder?

A. In waxed capsules
B. In parchment capsules
C. In gelatin capsules
D. In paper capsules
E. In glass jars

8.3. Control materials for the inmate of the busy stage:

Test:

1. The pharmacist is preparing triturations scopolamine hydrobromide. What component should be used to prepare triturations in addition to toxic substances?

A. Lactose
B. sucrose
C. Glucose
D. Starch
E. Talc

2. Pharmacist is preparing triturations toxic and potent substances. In what proportions they can be prepared?

A. 1: 10 and 1: 100
B. Only 1:10
C. 1 1000
D. 1: 500
E. Only 1 100

3. Pharmacist got prescription, which is registered scopolamine hydrobromide 0.0002 to 1 g powder. How many of triturations 1: 100 should be taken to prepare 10g of powder?

A. 0,2
B. 0,04
C. 4,0
D. 0,4
E. 2,0

4. Pharmacist compounded 10.0 triturations atropine sulfate (1: 100). Specify how much atropine sulfate filler and pharmacist he had taken:

A. 0,1 and 9,9
B. 1.0 and 9.0

0.01 and 9.99 C.
0.01 and 0.9 D.
E. 0,1 and 99,9

5. Triturations drugs used in cases where the weight of toxic or potent substances in prescription is:
A. Less than 0.05 *
B. Over 0.05
C. or less equals 0.1
D. Less than 0.5
E. Less than 0.1

6. Pharmacist-technologist prepared 20.0 triturations (1:10). How many toxic substances and excipient he took:
A. 2,0 and 18,0
B. 0,20 and 19,8
C. 0.02 and 19.98
D. 0,2 and 20,0
E. 1,0 and 19,0

7. Pharmacist prepared the substance by prescription. How many triturations platifillin hydrotartrate (1:10) he took:
Rp .: Platyphyllini hydrotartratis 0,003
Sacchari 0,25
Misce fiat pulvis
Da tales doses №10
S. 1 powder 3 times day
A. 0,3
B. 0,03
C. 3,0
D. 2,53
E. 0,28

8. Calculate the weight of one powder:
Rp .: Atropini sulfatis 0,0005
Phenobarbitali 0,02
Sacchari 0,3
Misce fiat pulvis
Da tales doses №10
Signa. 1 powder 3 times a day
A. 0,32
B. 0,28
C. 0,30

D. 0,25
E. 0,27

9. A pharmacist compounded 10 powders containing atropine sulfate in an amount of 0.00005 per dose. What triturations he had used?
A. * 1: 100
B. 1:10
C. 1 1000
D. 1:50
E. 1:20

10. The pharmacist should prepare triturations atropine sulfate. Which adjuvant he have to use for the preparation of triturations?
A. lactose
B. sucrose
C. Glucose
D. Starch
E. Talc

Topic 3 " Manufacturing of complex powders with colorful, fragrant and difficult to break down substances. Manufacturing of complex powders with extracts and semi-finished products.**" – 5 hours.**

1. Relevance of the topic:
Complex powders with coloring, aromatic and hard-to-grind medicinal substances require special technology, which is caused by physical and chemical properties of the ingredients. Getting the skills of preparing difficult powders on the basis of physical and chemical properties of drugs, use of gelatin capsules mask the unpleasant taste and odor to their packaging makes it possible not only to improve the quality of powders but also to increase productivity in the pharmacy and this explain need to study the subject.

2. Specific objectives:

- to learn how to prepare a complex of fragrant powders, coloring drugs and hard-to-grind materials. Assess the quality and arrange to leave;
- to learn how to prepare simple and complex powders with extracts and semi-finished products, calculate quantity, evaluate their quality and make up for release.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
		Basics of grammar.	Be able to write Latin

	4. Latin language 5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	names of drugs and medicines. Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs	Contemporary forms of prescription forms. The order of pharmacies. General technology complex powders The general principles of selection of excipients Mixing technology	Distinguish forms №1, №2, №3 prescription forms. Take recipes of various forms and then organize work with them. Pick Excipients in powders and evaluate their quality Prepare complex solid dosage forms
III	***Intersubjective integration*** Plant collections	mixing Technology	Prepare complex solid dosage forms

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

POWDERS OF COLORFUL DRUGS.

According to the Order of the Ministry of Health of Ukraine No. 44 dated March 16, 1993 (Annex 8), the group of colored drugs includes substances, as well as their solutions, mixtures, etc., leaving the colored tray on containers, closing devices, equipment and others. Items that are not washed off by ordinary sanitary-hygienic treatment. These medicinal substances include: ethacridine lactate (rivanol), diamond green, indigo carmine for injection, potassium permanganate, methylene blue, riboflavin (vitamin B2), furatsillin, acrylic, and others. Color medications should be stored in a special closet in tightly closed containers, individually by name.

The group of colored medicinal substances include substances that do not leave a colored trace on the container, sealing materials. They are preserved of course and powders with such substances are prepared according to the general rules for the preparation of complex powders. These medicinal substances include: quinolol, dermatol, protargol, collargol, and others.

The preparation of powders with coloring agents should be carried out in a separate mattress, in a separate workplace or on a table covered with a white sheet of paper. When weighing we use separate scales. Powders are prepared using the "three-layer" method (a colorant is placed between two layers of the uncoloured substance before mixing).

POWDERS WITH HEAVY-CRUSHED, FRAGRANT AND LETHAL DRUGS.

In the composition of complex powders, heavy-crushed medicinal substances (camphor, menthol, iodine, thymol, phenylsalicylate, sodium tetraborate, salicylic acid, streptocide) are often prescribed, which are appropriate to be crushed in the presence of alcohol or ether.

The composition of the powders may include odorous drugs (both volatile and practically non-lethal), which are also stored separately in a special closet in a hermetically sealed container that is impermeable to odor. To fragrant medicinal substances include; iodoform, camphor, menthol, xeroform, thymol, phenol, and others. (see annex 7 to the order number 44 of the Ministry of Health of Ukraine dated March 16, 1993). When working, they should be weighed on individual scales, which are immediately wiped with cotton wool, moistened with alcohol or a mixture of alcohol with ether. Fragrant medicinal substances are added in the last resort.

QUALITY CONTROL

The assessment of the quality of the powders includes questioning, physical, organoleptic, chemical (selective) control and control during the holiday.

In assessing the quality of powders, first of all, the analysis of documentation (recipe, control panel), testing of compatibility of drugs, checking of doses of potent and poisonous drugs and the rules of drug release. Check the color, taste and smell of the properties of the incoming drugs. Determine the deviation in the mass of individual doses of permissible standards. Homogeneity is checked after pressing the head of the blender to a mass of powder (at a distance of 25 cm from the eye, there should be no visible individual particles, sequins). Looseness is checked by pouring powder from one capsule to another, while it should not be lacerated. Check the design of powders - the correspondence of labels, packaging.

POWDERS WITH DRY AND DENSE EXTRACTS.

The preparation of complex powders with extracts, which are concentrated extracts from the medicinal plant material, depends on the properties of the extract used and its consistency. In the technology of powders, the extract of belladonna is very common. SF contains two preparations of the extract of belladonna: a thick, containing 1.5% of alkaloids, and a dry, containing 0.75% of alkaloids, ie 2 parts of dry extract is equal to 1 part of the thick extract (1: 2).

Dry extract

In the absence of a dry extract for the convenience of work in pharmacies, a solution of the extract extract - Extractum Belladonnae solutum (1: 2), which is

prepared by the name is allowed to be used: 100.0 g of the thick extract is dissolved in a mixture of 60.0 g of water, 10.0 g of 90 % ethanol and 30.0 g of glycerol. Water is the main solvent, glycerin plays the role of peptize. It protects colloidal solutions and solutions of macromolecular compounds formed during the dissolution of the extract, from coagulation, aging. Ethyl alcohol improves the dissolution of the extract and also acts as a preservative. When stored the solution of the extract is less stable than the original thick extract. Therefore, the solution is allowed to prepare for no more than 15 days.

Dense extracts

Dense extracts are not very convenient for practical use. At their dosage there are significant losses. It is convenient to use a solution of belladonna extract if the powder mixture contains substances with high adsorption capacity and poorly soluble in water (magnesium oxide, magnesium carbonate, starch, phenylsalicylate, etc.). Otherwise wet bundles are formed which are laced and difficult to disperse. Powders containing extracts due to their hygroscopicity are released in waxy or paraffinic capsules.

SEMI-FINISHED POWDERS.

Semi-finished products are special intra-pharmacy blanks of powder mixtures of two or more medicinal substances made in the same ratios as the most frequently occurring prescriptions. When prepareing medicines to the appropriate half-finished products add one or another ingredient according to the prescription form.

The use of semi-finished products, which are technically processed by semi-finished products, significantly reduces the time spent on the preparation of complex powders and contributes to improving their quality and expediting the release of drugs from the pharmacy.

In the form of semi-finished preparations only those medicinal preparations that are most often repeated in prescriptions of pharmacies and are rational (in terms of their compatibility) combinations of medicinal substances which do not change at storage for a certain time are prepared. Periodically prefabs are reviewed. For each half-finished product, the conditions and the admissible maximum storage period must be established.

In order to protect the semi-finished products from flaking, they should be filled in the stems to the top fully possible. When stored in a pharmacy they must be periodically mixed in a mortar.

The assessment of the quality of the powders includes questioning, physical, organoleptic, chemical (selective) control and control during the holiday.

In assessing the quality of powders, first of all, the analysis of documentation (recipe, control panel), testing of compatibility of drugs, checking of doses of potent and poisonous drugs and the norm of drug-drug release is carried out. Check the color, taste and smell of the properties of the incoming drugs. Determine the deviation in the mass of individual doses of permissible standards. Homogeneity is

checked after pressing the head of the blender to a mass of powder (at a distance of 25 cm from the eye, there should be no visible individual particles, sequins). Browsiness is checked by pouring powder from one capsule to another, while it should not be lacerated. Check the design of powders and the correspondence of labels, packaging.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В.

Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.

- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:

- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Features of preparing powders with coloring substances	Provide a list of useful substances. Specify rules for dealing with them and ways to prepare powders.	1, 3, 4 (p. 198), 5 (pp. 69-70).
2.	Features of preparing powders of aromatic substances	Provide a list of odorous substances. Specify rules for dealing with them and prepare powders.	1, 3, 4 (p. 199), 5 (p. 70).
3.	Terms of preparing powdered extracts	What types of extracts. Add features to work with extracts.	1, 4 (pp. 199-201), 5 (pp. 71-72), 6 (35-36).
4.	Containers and packaging material for fragrant powders, coloring substances and extracts	What packaging, packaging material and rules for the use of fragrant powders, coloring agents, extracts	1, 4 (187-190), 5 (pp. 65-66), 6 (41).

5	Preparation of powders with semi	What are the main range of semi-finished products for making powders	1, 4 (202-203), 7
6	Evaluation of the quality powders	Add documentation that normalize quality powders and key quality indicators	1, 3, 4 (203-205), 5 (p. 66)

8. Materials for self-control.

8.1. Questions for self-control.

1. Determination of colouring and stained drugs. List of colouring, colored, fragrant drugs and their storage accordance with MOH Ukraine number 44 of 16/03/93 p.
2. Technology features of powders with coloring agents. Requirements for their production in accordance with orders of the MOH Ukraine 15.05.06 number 275 on p. 626 and the number of 15.12.2004.
3. List of odorous and volatile drugs, the rules of preparation and packaging of powders of these substances.
4. List of drugs. Use of auxiliary liquids in the preparation of these powders.
5. Selection of tare packing material depending on the physicochemical properties of drugs.
6. Characteristics of hard gelatin capsules, DF requirements for them. Use of cases for packing powders.
7. Characteristics of extracts and their classification.
8. Preparation of solutions extracts and dense storage.
9. Rules preparing difficult powders with dry, thick dense solution extracts and extracts.
10. Evaluation of the quality and design of the coloring powders, fragrant, volatile, hard-to-grind drugs and extracts as required documentation.
11. Biopharmaceutical aspects of the technology of solid dosage forms.
12. Technological stages of preparation of simple and complex powders with extracts and semi-finished products.

8.2. Test tasks for self-control.

1. A pharmacist prepared solution of 20.0 g of thick extract of belladonna (1: 2). Specify how much alcohol he had taken:

A. 1.0
6.0 B.
10.0 C.
D. 12,0
E. 2,0

2. Pharmacist compounded powders. Which auxiliary liquid he has used as a grinding ingredient:

A. Fenilsalitsylat
B. Sodium bicarbonate
C. furatsillin
D. Novocaine
E. Dibazol

3. Pharmacy got prescription for compounding powders, which include odorous substances. Indicate which of the following matters relating to odorous substances:

A. Camphor
B. Fenilsalitsylat
C. Ethacridine lactate
D. streptocide
E. Bismuth nitrate core

4. The pharmacist received a prescription for powders with an extract of belladonna. Specify the amount of dry extract of belladonna should be used in powder technology:

Rp: Extr.Belladonnae 0,01
Papaverini hydrochloridi 0,02
sacchari 0,2
M.f. pulv.
Dtd№10
S. 1 powder 3 times a day

A. 0.20
B. 0,50
C. 0,46
D. 0,10
E. 0,15

5. The task is to prepare powders for prescription:

Rp: Camphorae 0,1
Glucosi 0,25
M.f. pulv.
Dtd N 10
S. 1 powder 3 times a day.

Choose the best technology option:

A. Glucose wipe mortar, pour on the capsule crushed, in the presence of alcohol camphor, mix
B. In a mortar weigh camphor, add the glucose, mix
C. overwrite glucose mortar, pour in a capsule, crushed camphor, mix
D. Camphor placed between layers of glucose mix
E. Grind in a mortar glucose with alcohol, add camphor, mix

6. The pharmacist needs to prepare powders that contain menthol. How should he achieve the required degree of crushing menthol?

A. grind with alcohol or ether

B. pound with glycerin or chloroform
C. pound with purified water
D. pound with other components of the recipe
E. Carefully grind with sugar

7. A pharmacist prepared powders comprising streptocide. Specify the correct way of adding the streptotside:

A. rubs primarily with alcohol
B. Add as triturations
C. Use Method "three layers"
Add at the end D. and mixed to homogeneity
E. Add primarily by grinding with glycerin

8. A pharmacist prepared the powders by the prescription that contains an extract of belladonna 0,015 per dose, and took dry extract in ten doses:

A. 0.3
B. 0,15
C. 1,5
D. 0,2
E. 0,015

9. A pharmacist prepared from powder substance in a separate mortar on a separate workplace, using the "three layers" method .Specify a matter which is characterized by the technology?

A. Methylene blue
B. Sulfur
C. Glucose
D. protargolum
E. Copper sulfate

10. To hard-to-grind substances include:

A. Iodine, menthol, streptotsid, sodium tetraborate
B. camphor, menthol, boric acid, fenilsalitsylat
C. Menthol, streptocide, boric acid, magnesium oxide
D. streptocide, iodine, sodium tetraborate, riboflavin
E. Fenilsalitsylat, camphor, methylene blue, thymol

8.3. Control materials for the inmate of the busy stage:

Test:

1. The pharmacist received a prescription for powders with an extract of belladonna. Specify the amount of dry extract of belladonna should be used in powder technology:

Rp: Extr.Belladonnae 0,01
Papaverini hydrochloridi 0,02
sacchari 0,2
M.f. pulv.

Dtd№10
S. 1 powder 3 times a day
A. 0.20
B. 0,50
C. 0,46
D. 0,10
E. 0,15

2. A pharmacist prepares powders with hard-to-grind material. Specify with what substance should be ground a volatile liquid?
A. Camphor
B. Magnesium oxide
C. Zinc sulfate
D. Copper sulfate
E. Glucose

3. Pharmacist compounded powders which include camphor. What capsule should be taken for their packaging?
A. Butter
B. Paper
C. Paper
D. Paraffin
E. cellophane

4. Pharmacist compounded by prescription medication. Choose the best option Technology:
Rp .: Magnesii oxydi
Natrii hydrocarbonatis ana 0,2
M. f. 70ulv.
D. td №12
S. 1 powder 3 times a day.
A. grind sodium bicarbonate added magnesium oxide, mixed.
B. grind magnesium oxide, sodium bicarbonate is added, mixed.
C. grind sodium bicarbonate with alcohol added magnesium oxide, mixed.
D. grind of magnesium oxide, sodium bicarbonate added, then the balance of magnesium oxide, mixed.
E. grind magnesium oxide with alcohol added sodium bicarbonate, confused.

5. Pharmacist compounded by prescription medication,
Rp .: Papaverini hydrochloridi 0,01
Sachari 0,25
Mf pulv.
Dtd №10
S. 1 powder 3 times a day. Expect a lot of other powder
A. 0,26
B. 0,23
C. 0,22

D. 0,28
E. 0,25

6. When prepareing powders in conditions of pharmacies into account physical and chemical properties of individual ingredients. Please indicate which drug is mixed with a powder without further crushing weight:

A. Starch
B. Camphor
C. Menthol
D. salicylic acid
E. streptocide

7. Pharmacy got prescription for compounding powders, which include odorous substances. Indicate which of the following matters relating to odorous substances:

A. Camphor
B. Fenilsalitsylat
C. Ethacridine lactate
D. streptocide
E. Bismuth nitrate core

8. The drug received a prescription for powders with an extract of belladonna. Specify the amount of dry extract of belladonna should be used in powder technology:

Rp: Extr.Belladonnae 0,01
Papaverini hydrochloridi 0,02
sacchari 0,2
M.f. pulv.
Dtd№10
S. 1 powder 3 times a day

A. 0.20
B. 0,50
C. 0,46
D. 0,10
E. 0,15

9. Necessary to prepare powders for prescription:

Rp: Camphorae 0,1
Glucosi 0,25
M.f. pulv.
Dtd N 10
S. 1 powder 3 times a day.

Choose the best option technology:

A. Glucose wipe mortar, pour on the capsule crushed, in the presence of alcohol camphor, mix
B. In a mortar weigh camphor, add the glucose, mix
C. overwrite glucose mortar, pour in a capsule, crushed camphor, mix

D. Camphor placed between layers of glucose mix
E. Grind in a mortar glucose with alcohol, add camphor, mix

10. The pharmacist needs to prepare powders that contain menthol. In what way a pharmacist must achieve the required degree of crushing menthol?

A. grind with alcohol or ether
B. pound with glycerin or chloroform
C. pound with purified water
D. pound with other components of the recipe
E. Carefully grind with sugar

Topic 4 "Manufacturing of pharmaceutical production collection. Herbal teas.**" – 4 hours.**

1. Relevance of the topic:
Herbal mixtures are the oldest dosage form. Mentions of medicinal plants are found in Egyptian papyri, ancient Arabic and Greek literature. The Herbal mixtures have retained their significance to this day due to their inherent advantages: the presence of active substances in the raw material in its native form, ease of manufacture, cheapness. Herbal mixtures have long been a dosage form of pharmacy.

2. Specific objectives:

- to learn to prepare Herbal mixtures from medicinal plant raw materials, evaluate their quality and design for storage and use.;
- to learn characteristics of vegetable raw materials, its classification.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
		Technology of preparation of various dosage	Choose the best option of technology and according to

	5. Pharmacy technology of drugs	forms. Rules for the introduction of drugs and excipients in the dosage form.	it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs	Contemporary forms of prescription forms. The order of pharmacies. General technology complex powders The general principles of selection of excipients Mixing technology	Distinguish forms №1, №2, №3 prescription forms. Take recipes of various forms and then organize work with them. Pick Excipients in powders and evaluate their quality Prepare complex solid dosage forms
III	***Intersubjective integration*** Plant collections	mixing Technology	Prepare complex solid dosage forms

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Characteristics of Herbal mixtures. The Herbal mixtures are a mixture of several types of crushed, less often whole, medicinal plant materials, sometimes with the addition of salts of essential oils, and used as medicines.

In the form of Herbal mixtures, drugs are used for both internal and external use and are intended to treat a wide variety of diseases. Moreover, the composition of the Herbal mixtures, like other drugs, is not constant, therefore they are used either in a simplified form or in the form of complex mixtures.

The **advantages** of Herbal mixtures as a dosage form include the following:

— the presence of active ingredients in raw materials in their natural original form;
— simplicity of their preparation;
— availability of raw materials.

However, Herbal mixtures also have significant **disadvantages**. The main one is that these are not fully prepared preparations, and the patient is forced to process them before use. In addition, Herbal mixtures belong to difficult-to-dose drugs, and most often they are dosed by the patient himself with a spoon. In this regard, poisonous and potent agents are not introduced into the collection.

Classification of Herbal mixtures. Herbal mixtures are classified by:

- dosage,
- composition,
- medical purpose
- method of application.

According to dosing, Herbal mixtures can be not-dosed (*species indivisi*) and dosed (*species divisi*).

In terms of composition, Herbal mixtures can be simple, consisting of one type of medicinal plant material, and complex, consisting of several plants and other medicines.

Based on medical purposes, they divide into emollient remedies (*species ad cataplasmata*), remedies for the preparation of infusions (teas) and decoctions (*species ad in fusa el decocta*), smoking Herbal mixtures (*species fumales, cigarettae*).

Depending on the method of application, Herbal mixtures are distinguished for internal (*species ad usum internum*) and for external use (*species ad usum externum*). Tea or decoctions is prepared from the first. This type of Herbal mixtures is the most common and is usually used in cases where it is necessary to systematically use drugs, for example, in the form of a laxative, appetizing, etc.

This group includes the following Herbal mixtures:

choleretic (*species chologonae*),
breasty - No. 1, 2, 3, 4 (*species pectoralis*),
laxatives - No. 1, 2, 3 (*species foxons*),
diaphoretic - No. 1, 2, 3 (*species diaphoreticae*),
diuretics - No. 1, 2, 3 (*species diureticae*),
vitaminic - No. 1, 2 (*species ritominicoe)*,
calming (*species nervinae*),
carminative (*species carminativa*).

Charges for external use are less common and are used mainly for gargling (*species ad garga rismata*).

METHODS OF PRESCRIBING Herbal mixtures

Not-dosed Herbal mixtures are prescribed, taking into account the weight quantities of each ingredient in the recipe based on the entire amount of the Herbal mixtures. Plant raw materials are usually listed in the recipe in the order of their pharmacological activity (main, auxiliary, corrective, etc.). Salts and essential oils are indicated at the end of the recipe. The recipe details the method of preparation and use of the drug.

The dosage Herbal mixtures are prescribed by indicating the weighted amounts of each ingredient per single dose of Herbal mixtures and indicated the number of doses. Dosed Herbal mixtures are rarely prescribed.

PREPARATION OF Herbal mixtures

Herbal mixtures technology consists of the following stages:

- grinding and sieving plant material;

- mixing of crushed plant materials;
- adding salts, essential oils and other medicines prescribed in the Herbal mixtures;
- packing, packaging and registration for dispensing.

Shredding. The raw materials used for the preparation of the Herbal mixtures must comply with the requirements of the regulatory and technical documentation.

When grinding plant materials, a certain amount of very fine particles (so-called dust) are formed. Therefore, all parts and types of plants after grinding must be cleaned of dust. Dust separation is easily accomplished by sieving the crushed particles through a 0.2 mm sieve.

Mixing. In pharmacy Herbal mixtures, the mixing of plant materials, crushed and sifted out of dust, is carried out on a sheet of paper, in a wide mortar or porcelain cup using a spatula, celluloid plate. First mix the plant materials prescribed in smaller amounts, and then gradually add the plant materials prescribed larger amounts and mix until a uniform mixture is obtained.

Introduction of salts. Salts cannot be added to the Herbal mixtures by direct mixing with plant raw materials, since due to the significant difference in the density of the components, the mixture delaminates.

It is necessary to fix the salt on the plant material, only in this case a homogeneous collection can be obtained. Salt can be added in two ways: as a solution or dry.

In cases where the recipe includes soluble salts (in small quantities), an aqueous or alcoholic saturated solution is prepared from them, by which is sprayed with the Herbal mixtures using a spray bottle, followed by drying until the solvent is completely removed.

Drying is an absolutely obligatory operation. Because moist plant material is very easily subject to enzymatic and microbiological deterioration. The drying temperature, as a rule, should not exceed 60 °C in order to avoid denaturation of the components of plant materials. The end of drying is determined by weighing the Herbal mixtures (the weight after drying should be equal to the total weight of plant materials and salt).

The completeness of drying is controlled by periodic weighing of the Herbal mixtures. The ready-made Herbal mixtures is packed and issued for dispensing.

Hygroscopic materials or those that are easily damaged by moisture are added after the prepared mixture is treated with a salt solution and dried.

Introduction of essential oils and alcohol-soluble substances (menthol, camphor).

Camphor, menthol and similar substances, as well as essential oils are included in the Herbal mixtures, as a rule, in small quantities. Therefore, a uniform distribution in the Herbal mixtures mass of these substances can be achieved only

by introducing them in the form of a solution in 90% ethyl alcohol in a ratio of 1: 10.

In this case, the Herbal mixtures are laid out in a thin layer on a glass plate, the plant material is sprayed with the resulting solution from a spray bottle, after which the Herbal mixtures is dried in the open air until the alcohol is removed with frequent stirring of the Herbal mixtures.

Dosed Herbal mixtures. Medicinal plants of the general list and potent medicinal plants are prescribed in the form of dosed Herbal mixtures.

The preparation of dosed Herbal mixtures is distinguished by the following feature: each separate dose of the Herbal mixtures (quantity per 1 dose) is prepared and dispensed in a separate package (capsule).

QUALITY CONTROL, STORAGE AND DISPENSING OF Herbal mixtures

Assessment of the quality of Herbal mixtures. In Herbal mixtures, smell and taste are determined (in aqueous extract). To determine the authenticity of the Herbal mixtures, an analytical sample weighing 10.0 g is taken from the average sample. The sample is placed on a clean smooth surface and the components are determined by their appearance, examining them with the naked eye and using a magnifying glass (10x). All investigated partes must have diagnostic signs corresponding to the types of raw materials included in the Herbal mixtures.

For the Herbal mixtures determine: the content of active substances (determination methods are specified in the relevant documentation); humidity; the content of total ash and ash insoluble in a 10% solution of hydrochloric acid; fineness and content of impurities.

Storage. For the storage of medicinal plant materials, a dry, light and well-ventilated room is required. Because moisture and dust are factors that stimulate the development of mites. Most of them are found on berries, seeds, and some herbs (adonis). Treatment of the infected plant material with ether steam and drying at a temperature of 50 C for 2 hours destroys ticks, larvae and eggs. Herbal mixtures are stored in closed boxes, and those that contain odorous raw materials - in tin boxes.

To scare away insects, it is recommended to put a jar with cotton soaked in chloroform in the boxes.

Dispensing of Herbal mixtures. The Herbal mixtures are released in cardboard boxes lined with parchment paper, or in a double paper bag of 50, 100, 150 and 200 g.

If the Herbal mixtures contain volatile substances, it is dispensing in cellophane or parchment paper.

The label indicates the composition of the Herbal mixtures and the method of use.

A promising release method is compressed dues (briquettes) for a single dose or likes slabs with notches for separate doses. Briquetting provides:

- more correct dosing;

- improving the storage conditions of the Herbal mixtures (the smaller surface of the plant raw material determines, respectively, the lower hygroscopicity of the collection, the oxidizability of the active substances, etc.);
- briquettes are convenient for transportation.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.

- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За

ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Україри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua

- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characterization solid dosage forms.	Define the concept of Herbal mixtures.	1, 2, 3, 4 ,5
2.	Preparation of Herbal mixtures	What are the main technological stages of preparation of Herbal mixtures	1, 2, 3, 4 ,5
3.	Quality rating Herbal mixtures	What documentation that normalize quality Herbal mixtures	1, 2, 3, 4 ,5

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of Herbal mixtures as a dosage form
2. Classification of Herbal mixtures
3. Regulatory and technical documentation governing the requirements for the manufacture of Herbal mixtures
4. Technological features of preparation of dosed and not-dosed Herbal mixtures
5. The main technological stages of Herbal mixtures

6. Rules for the introduction of salts in the Herbal mixtures
7. Rules for the introduction of essential oils in the Herbal mixtures
8. Storage conditions of medicinal plant raw materials
9. Quality control of Herbal mixtures
10. Packing and labeling of Herbal mixtures

8.2. Test tasks for self-control.

1. For the prevention of influenza should recommend medicinal plant raw materials rich in ascorbic acid. Indicate which plant material the pharmacist may recommend in this case:
    a. Fructus Aroniae
    b. Fructus Rhamni catharticae
    c. Fructus Crarategi
    d. Fructus Ribes nigri
    e. Fructus Myrtilli
2. Columns with corn receivers, which contain vitamins, fatty acids, essential oils, saponins and other substances, are used as:
    a. Diuretic and cholagogue
    b. Expectorant and antitussive
    c. Bactericidal and astringent
    d. Sedative and anticonvulsant
    e. Cardiotonic and antiarrhythmic agent
3. Rhizomes and roots of Rhodiola rosea are used to obtain a liquid extract. The quality of raw materials is regulated by the content:
    a. Salidroside
    b. Panaxoside
    c. Salicin
    d. Eleutherochid
    e. Echinacoside
4. Cranberry leaves, which contain arbutin, are used as a diuretic and antiseptic in urolithiasis. In their absence, we can recommend:
    a. Folia Padi
    b. Folia Uvae Ursi
    c. Folia Myrtilli
    d. Folia Urticae
    e. Folia Menthae
5. In the treatment of urolithiasis drug rhizomes and roots of madder dye may stain urine and sweat in red, due to the following class of active substances of this raw material:
    a. *Flavonoids
    b. Alkaloids
    c. Tannins
    d. Terpenoids

e. Anthracene derivatives

6. It is known that the herd is used as a diuretic and diaphoretic. It is a pharmacopoeial type

a. Bidens tripartita
b. Bidens cernua
c. Bidens radiata
d. Bidens frondosa
e. Bidens orientalis

7. The main active ingredient of barberry leaves is berberine. What class of biologically active substances does it belong to?

a. Alkaloids
b. Flavonoids
c. Coumarins
d. Tannins
e. Essential oils

8. Which of the following plants contains tropane alkaloids that are part of the drug "Asthmatin"?

a. Blackness black
b. Uterine horns
c. Plantain is large
d. Peppermint
e. Celandine is large

9. Replace the patient's missing in the pharmacy glaucine hydrochloride with another generic herbal preparation of similar action:

a. Broncholitin
b. Mukaltin
c. Codeine phosphate
d. Cough tablets
e. Galantamine hydrobromide

10. For the manufacture of the plant galenic drug "Pertusin", which has expectorant properties, use the herb extract:

a. Thymus serpyllum
b. Bursa pastoris
c. Hypericum perforatum
d. Erysimum diffusi
e. Polygonum avicularis

8.3. Control materials for the inmate of the busy stage:

Test:

1. Tests of different levels

1. When analyzing the essential oil, it was found that it contains anethole. From which medicinal plant was this oil obtained:

a. Anisum vulgare

b. Coriandrum sativum
c. Valeriana officinalis
d. Allium sativum
e. Allium cepa

2. Indicate which of the following types of medicinal plant raw materials can be part of the drug collection of hemostatic action?
a. grass buckthorn
b. grass herds
c. dried flowers grass
d. celandine herb
e. violet grass

3. Yellow grass (Herba Glaucii flavi) is used to obtain drugs with antitussive effect. What alkaloid is isolated from it.
a. Glaucine
b. Gindarin
c. Codeine
d. Thermopsin
e. Atropine

4. For the treatment of the upper respiratory tract use plant materials that contain mucus. The source of this class of compounds is:
a. Radix Althaeae
b. Radix Inulae
c. Radix Ipecacuanhae
d. Radix Rhodiolae
e. Radix Belladonnae

5. Rauwolfia roots contain reserpine, which has an antihypertensive and sedative effect. Reserpine is a representative of the group:
a. alkaloids
b. saponins
c. flavonoids
d. anthracene derivatives
e. cardioglycosides

Topic 5 “ Manufacturing of concentrated solutions.**” – 5 hours.**

1. Relevance of the topic:
Concentrated solutions are used in pharmacies in the manufacture of liquid dosage forms by mass-volume method. The use of such solutions greatly increases the productivity, efficiency and quality of the assistant's work, therefore knowledge of the correct technology of concentrated solutions and the ability to count the amount of ingredients correctly is essential for their quality preparation.

2. Specific objectives:

- to learn how to prepare concentrated solutions of medicinal substances for the burette system, evaluate their quality and make them for storage and use;
- to learn how to prepare concentrated solutions of medicinal substances for the burette system, evaluate their quality and make them for storage and use.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
		Technology of preparation of various dosage	Choose the best option of technology and according to

	5. Pharmacy technology of drugs	forms. Rules for the introduction of drugs and excipients in the dosage form.	it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy.	Total liquid dosage form technology for internal use	Make payments dosage, excipients and purified water
	Tech industrial production of drugs	Technology solutions for internal use	Technological stage production solutions for internal use
	Biopharmacy	Technological process of preparation of solutions for internal use.	Prepare solutions for internal use, taking into account physical and chemical properties of the ingredients.
III	***Intersubjective integration*** Injection solutions and eye drops	Preparation of solutions mass-volume method	Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Liquid dosage forms occupy a significant place in the formulation of pharmacies and make up 60% or more of the total number of all medications prepared in pharmacies.

By its nature, all liquid dosage forms are free comprehensive, dispersed systems in which the drugs (the phase) are evenly distributed in a liquid dispersion medium. Medicinal substances in liquid dosage forms may be in various aggregate states: solid, liquid and gaseous.

Depending on the degree of shredding of the dispersed phase (the medicinal substance) and the nature of its connections with the dispersion medium (solvent), the following physico-chemical systems are distinguished: real solutions of low- and high-molecular compounds, colloidal solutions (ash), suspensions and emulsions. Individual dosage forms may also be combined disperse systems - the combination of the main types of disperse systems (infusions and decoctions, extracts, etc.).

In the study of various liquid dosage forms, we will characterize them as the corresponding disperse systems that differ in their physical and chemical properties. By using certain technological techniques (dissolution, peptization, suspension or emulsification), the constituent medicinal substance (solid, liquid and gaseous) can be reduced to a greater or lesser degree of dispersion from ions and molecules to coarse particles that are noticeable under a microscope or naked eye. This is important for the detection of the therapeutic effects of the drug substance on the body, which has been repeatedly confirmed by biopharmaceutical research.

Solutions are a group of liquid dosage forms that are characterized by a large variety of composition and methods of application.

Solutions are a homogeneous dispersion system consisting of at least two or more components, in which the molecules of the dissolved substance are evenly distributed between the solvent molecules.

Real solutions cover two categories of disperse systems: ion-disperse systems and molecular-disperse systems.

Ion-disperse systems include solutions in which the particle size of the disperse phase is about 0.1 nm. The dissolved substance is in the form of individual hydrated ions. This group includes solutions of electrolytes, for example: sodium chloride, sodium sulfate, and others.

Molecular-disperse systems include solutions in which the size of particles of the disperse phase is less than 1 nm. In the process of dissolution, the substance decomposes into separate independent molecules. If aggregates of particles are formed, then the composition of such complexes is limited to a small number of molecules (2-3). This group mainly includes non-electrolytes (sugar, glucose, hexamethylenetetramine and the like).

Real solutions are characterized by a high strength bond between the dissolved substance and the solvent.

These are fairly stable, single-phase, homogeneous, dispersed systems that do not divide even with long-term preservation. They are transparent, well diffused and dialized and can be filtered.

Stability of solutions is of great importance in practical terms as it makes it possible to prepare various solutions into the stock that is to prepare concentrated solutions of medicinal substances when using the burette system.

In pharmacy practice the percentage of true solutions accounts for up to 30% of the overall pharmacy recipe.

Liquid dosage forms are a form of delivery of drugs that are obtained by mixing or dissolving active substances in water, alcohol, oils and other solvents as well as by extracting active substances from plant material.

Depending on the degree of shredding of the dispersed phase and the nature of its connection with the dispersion medium (solvent), the following physical and chemical systems are distinguished: true solutions of low and high molecular compounds, colloidal solutions (ash), suspensions and emulsions.

PREPARATION OF CONCENTRATED SOLUTIONS.

Concentrated solutions are prepared by mass-volume method using the measuring dishes. You can also calculate the amount of water you need by using the volume increase factors or the density of the solution.

For example, you need to cook 1 liter of 20% (1: 5) solution of potassium bromide.

1. Preparation of the solution in a measuring dish.

In a sterile measuring flask of 1 liter capacity, a 200-grams of potassium bromide weighed down through a funnel and dissolved in a small amount of freshly boiled (chilled) purified water. Then water is added to the label. The solution is filtered into a material glass of dark glass with a stopper, checked for identity, purity and quantitative content, labeled with a denomination of the name and concentration of the solution, its preparation, serial numbers and analysis.

2. Preparation of the solution using CIV.

If we take into account the increase in volume equal to 0,27 ml / g for potassium bromide, then the volume occupied by 200,0 g of potassium bromide is 54 ml (200,0 · 0,27), then the water for the preparation of the solution need 946 ml (1000 ml - 54 ml). In this case the use of measuring dishes is not required. 946 ml of freshly boiled (cooled) purified water are measured in the stand and dissolved in it 200.0 g of potassium bromide.

3. Preparation of the solution taking into account its density.

The density of the 20% solution of potassium bromide is 1,144 which means that 1 liter of this solution should have a mass of 1144.0 g (according to the formula P = V · d, where P is the mass of the solution, V is the volume and d is the density) . Since in this solution of potassium bromide is taken by weight, the water should be 1144,0 - 200,0 = 944,0 p. The volume of the solution at that will be 1 liter and its mass - 1144.0 p.

944 ml of freshly boiled water purified and 200.0 g of potassium bromide are dissolved in the stand. If it is not possible to measure the required amount of water it is weighed into a pre-planted stand. After dissolution, filter as above.

Medicinal substances (crystalline hydrates) are weighed against the actual moisture content.

1. If the solution was stronger than necessary, it must be diluted with water to the desired concentration, the amount of which is calculated by the formula:

$$X = A * \frac{C-B}{B}$$

where X is the amount of water needed to dilute the prepared solution, ml

A - volume of the prepared solution, ml

B - concentration of solution required,%

C - actual concentration of solution,%

2. If the solution appeared to be less than necessary, it should be strengthened by the addition of a medicinal substance, the amount of which is calculated by the formula:

$$X = \frac{A*(B-C)}{100*d-B}$$

X is the amount of water needed to dilute the prepared solution, ml
A is volume of the prepared solution, ml
B is concentration of solution required,%
C is actual concentration of solution,%
d is the density of the solution required concentration, g/cm^3.

Technological stages of preparation of liquid drugs forms

All liquid dosage forms are prepared by mass-volume method (Order of the Ministry of Health of Ukraine No. 197 dated September 7, 09, p.) which provides the required mass of medicinal substance in a given volume of solution. By mass, usually prepare solutions in which as a solvent used liquids with high density, viscous, volatile as well as emulsions and some medicinal forms by author's proprietary. By volume prepare solutions of ethyl alcohol of different strengths, solutions of standard pharmacopoeias liquids. In the mass-bulk method, the soluble substance is taken by weight and the solvent is added to obtain the required volume of solution.

If the solvent in the recipe is not specified then aqueous solutions are prepared. The word "water" refers to purified water if there are no special instructions.

The process of preparation of liquid dosage forms consists of the following stages: preparatory work (selection of appropriate dishes and plugs to it); weighing and measuring medicines and solvents; mixing or dissolving, extracting, dispersing or emulsifying complex components of a medicinal product; strain or filter; evaluation of the quality and registration of the medicinal product before departure.

Depending on the dosage form, the solubility of the medicinal substances and the type of solvent one or another technological step is used.

Selection of dishes (bottles) and stoppers. The vial and cork are picked up in advance taking into account the volume of the liquid dosage forms being prepared and the properties of their components.

The bottle should be clean and dried. The lid should be screwed to the neck freely to the stop and not rotated. If liquid medicinal products contain photosensitive substances they are placed in a vial of orange glass.

Weighing and measuring. When weighing and measuring medicinal substances are guided by the basic rules of dosage.

Mixing, dissolving, extracting, dispersing, emulsifying. All these technological processes for liquid dosage forms serve as the basis for the formation

of a disperse system. The presence or absence of a dispersed phase in these processes depends on the solubility of drugs in water or other solvents.

When preparing liquid dosage forms, dissolving dry medicinal substances should be guided by the following rules:

- the first is always measured in the stand (a pot with a wide throat) calculated amount of purified water, which dissolves dry medicinal substances: first poisonous; and potent, then - a general list, taking into account their solubility and other physical and chemical properties. This sequence of solution preparation is needed to prevent or eliminate the processes of interaction of drugs that occur most rapidly in solutions with high concentration;

- large-crystalline medicinal substances (copper sulfate, alum, potassium permanganate, etc.) to accelerate the dissolution process, first, in a mortar with a small amount of solvent;

- heat-resistant substances that slowly dissolve (sodium tetraborate, boric acid, mercuric dichloride, riboflavin, ethacridine lactate, etc.) in a hot solvent or when heated;

- to accelerate the dissolution process, shake or mix the solution with a glass rod.

When preparing liquid dosage forms by mixing or increasing the liquid components, the following rules should be followed:

- mixing of liquids is carried out in order of increasing their quantity;

- fragrant waters, tinctures, liquid extracts, alcoholic solutions, flavor and sugar syrups and other liquids are added to the aqueous solution in the last place in the bottle for delivery in the following order: water non-fat and non-liquid liquids; alcohol solutions in the order of increasing the concentration of alcohol; odorous and volatile liquids;

- liquid medicinal products containing essential oils (ammonia-anise drops, thoracic elixir, citral solution, etc.) are added to the mixture by mixing with sugar syrup (if it is available in the formulation) or with an equal amount of the mixture;

- tinctures, emulsion-aniseed drops and other volatile liquids should not be added to warm solutions;

- medicines with increased viscosity (ihtiol, dense extracts, etc.) are pre-mixed in a mortar with a part of the solvent and after increasing another are transferred to the vial for delivery.

Cooling (colatio) and filtration (filtratio). These processes are used in pharmacy practice for the separation of the liquid phase from all suspended particles (mechanical impurities) which fall into liquid dosage forms when contaminated with solvents and dissolved substances from devices and utensils in the form of fibers, dust and the like. Filtration and filtration are carried out with the help of funnels made of different materials of different capacities and types.

The process is used for the separation of large particle for which the liquid is passed through a lump of cotton wool or several layers of gauze, less often canvas, silk, capron and other fabrics.

The process is run through a cotton swab, pre-washed with water purified to remove small fibers. The purity of the drug in this case will depend on the density of the lump of cotton wool, enclosed in the mouth of the funnel. Excess hardness of a cotton swab is undesirable as the rate of stratification slows down.

Mucus, emulsions, infusions and broths are filtered through a double layer of gauze or cloth.

A very important issue when preparing liquid dosage forms by mass-volume method is to determine the total volume which is calculated by summing up all volumes of liquid ingredients (according to the order of the Ministry of Health of Ukraine No. 197 dated September 7, 1993). The total volume includes: solvent, water and alcohol solutions of medicinal substances, tinctures, liquid extracts and all other prescribed liquids, which are prescribed in recipes in ml.

When preparing mixtures of concentrated solutions, the following rules are followed:

- first of all, in the bottle for purification, measure the water purified, then concentrated solutions of poisonous and potent substances and then concentrated solutions of medicinal substances of the general list in the order they are prescribed in the recipe;

- the medicines are not filtered and prepared immediately in the bottle for release.

Taking into account all these requirements, the mixture is prepared according to the above prescription form: 160 ml of purified water is measured in 160 ml of purified water, then 40 ml of a 5% solution of sodium bicarbonate, 10 ml of sugar syrup and lastly 6 ml of tincture of valerian are measured here.

The vial is sealed and drawn up for leave.

In the absence of concentrated solutions, the mixture is prepared taking into account the percentage of dry medicinal substances in the total volume of the solution.

1. If the liquid dosage form consists of dry medicinal substances in a total amount of up to 3%, the concentrated solutions are absent then they are dissolved in a measured quantity of prescribed water or other liquid without taking into account the CCD.

2. Liquid dosage forms containing dry substances in a total amount of 3% or more are prepared using concentrated solutions or in measuring vessels or the volume of water required for the dissolution of dry substances, determined by calculation, taking into account the CCD.

3. If in the prescription the medicinal substances are discharged in dry form separately in quantities less than 3% and in the amount in excess of 3%, then in calculating water it is necessary to take into account the volume occupied by each of the medicinal substances.

4. Liquid dosage forms, in which the solvent does not use purified water and fragrant waters or other liquids (pertussin, water extracts from vegetable raw materials, polyethylene oxide-400, ethyl alcohol, etc.) are prepared without the use

of concentrated solutions of medicinal substances and accounting CCD when dissolving substances.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.

- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За

ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Україри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua

- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characterization solutions as dispersed systems.	Define the concept of solution. Describe the main ways of expressing concentration of solutions	1, 2, 3, 4 ,5
2.	Purified water	Describe the main methods of obtaining purified water. What documentation that normalize quality purified water	1, 2, 3, 4 ,5
3.	Preparation of concentrated solutions	What are the main technological stages of preparation of concentrated solutions	1, 2, 3, 4 ,5
	Quality rating concentrated solutions	What documentation that normalize quality concentrated solutions	1, 2, 3, 4 ,5

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics solutions as disperse systems, their classification.

2. Methods for obtaining purified water; equipment that is used for this purpose, how it works.
3. Quality of water purified by SPU, and MOH Ukraine number 626 of 15.12.2004.
4. Concentrated solutions of their appointment, terms of preparation in pharmacies according to the instructions in order MOH Ukraine number 197 of 09/07/93 p.
5. Calculation of number of drugs and water to prepare concentrated solutions of different ways:
- using dimensional dishes;
- using the lift volume;
- taking into account the density of the solution.
6. Control of concentrated solutions, correct concentration, storage conditions. Accounting prepared concentrated solutions.
7. The device burette installation, maintenance and rules for its use.

8.2. Test tasks for self-control.

1. For a complete chemical analysis of purified water is sent to the analytical lab once:
A. Quarter
B. Moon
C. Week
D. Year
E. Six months

2. The volume of purified water, taken for the manufacture of 200 ml of 20% magnesium sulfate concentration (LCE = 0.5 ml / g), is:
A. 180 ml
B. 200 ml
C. 185.5 ml
D. 190 ml
E. 195 ml

3. Calculate how much potassium bromide (LCE 0.27 ml / g) and purified water should be taken to prepare 500 ml of 20% solution of potassium bromide:
A. 100.0 potassium bromide and 472 ml of purified water
B. 100,0 potassium bromide and 500 ml of purified water
C. 200,0 potassium bromide and 300 ml of purified water
D. 200,0 potassium bromide and 944 ml of purified water
E. 110.0 potassium bromide and 500 ml of purified water

4. Pharmacist-technologist prepared concentrated solution of sodium bromide. Specify that his actions after the preparation of the solution:
A. Gave pharmacist-analyst for the full chemical analysis
B. posted written passport control
C. designed to leave
D. placed in stagnal

E. filtered solution

5. A pharmacist prepared 1000 ml of a 10% solution of calcium gluconate. Specify how much material and water it took to prepare (LCE calcium gluconate = 0.5)

A. 100.0 and 950 ml
B. 50,0 and 950 ml
C. 100,0 and 900 ml
D. 200,0 and 850 ml
E. 200,0 and 800 ml

6. Pharmacist-technologist prepared concentrated solution and delivered for analysis. Determine what would be his actions after receiving a positive test result:

A. filtered solution
B. Filter solution
C. moved into the material stagnal
D. designed for use
E. dismissed

7. Concentrated solutions are prepared in a pharmacy in mass and volume concentration. Specify what is meant by the designation of concentration of the solution 1:10?

A. 1.0 g of substance and solvent to obtain 10 ml
B. 10.0 g substance and 1 ml of solvent
C. 1.0 g and 10 g of substance solution
D. 1,0 g substance and 10 mL of solvent
E. 1,0 g of substance and 9 ml of solvent

8. Pharmacy received the prescription for solution in the ratio-tion of the active substance and solvent 1: 5000. Where in the concentration corresponding to this ratio:

A. 0.02%
B. 5,0%
C. 0,5%
D. 0,1%
E. 0,05%

9. The number of purified water is calculated using the coefficient of volume increase, if the concentration of the solution is:

A. 3%
B. 2%
C. 0,5%
D. 0,3%
E. 2,5%

10. To prepare 250 ml of 50.0 pharmacist used potassium iodide. What is the concentration of the resulting solution?

A. 20%

B. 50%
C. 25%
D. 10%
E. 15%

8.3. Control materials for the inmate of the busy stage:
Test:
1. A pharmacist prepares a concentrated solution of glucose 40% 1000 ml. What amount of glucose with 10% humidity he should take?
A.444.4
B. 440.0
C. 400,0
D. 404,0
E. 404.4
2. A pharmacist prepared 2000 ml of concentrated sodium benzoate 10%. However, the analysis showed that the solution has a concentration of 11.5%. What you need to add in water to bring the concentrated solution to normal?
A. 300 ml
B. 15 ml
C. 20 ml
D. 115 ml
E. 30 ml
3. In the analysis of 800 ml concentrated solution of magnesium sulfate 25% revealed that the solution has a concentration of 26%. Pharmacist calculated amount of water for dilution. What is it?
A. 32 ml
B. 80 ml
C. 16 ml
D. 8 ml
E. 20 ml
4. Calculate the amount of sodium salicylate and purified water to prepare 5000 ml of concentrated sodium salicylate 10%. (Density of 10% sodium salicylate = 1.0301 g / ml).
A. 500.0 sodium salicylate, and 4650.5 ml of purified water
B. 500,0 sodium salicylate and 4500 ml of purified water
C. 500,0 sodium salicylate and 5000 ml of purified water
D. 50,0 sodium salicylate and 4950 ml of water
E. 50,0 sodium salicylate and 4700 ml of water
5. A pharmacist prepared 1000 ml concentrated solution of chloral hydrate 20% and gave the analyst. The analysis showed that the concentration of the solution is 19.5%. What amount of solids to add to stronger solution to normal? Density 20% solution of chloral hydrate = 1.0860 g / ml
A. 5.64 g

B. 5.0 g
C. 3.5 g
D. 50.5 g
E. 5,4 g

6. What is the shelf life of treated water in closed containers?

A. * 3 days
B. 1 day
C. 5 days
D. 7 days
E. 14 days

7. What does the following entry:
Solutionis Calcii chloridi ex 40,0 - 500 ml?

A. Calcium chloride - 40.0, purified water to 500 ml
B. Calcium chloride - 40.0 purified water - 500 ml
C. Calcium chloride - 40.0, purified water - 460 ml
D. Calcium chloride - 40.0, purified water - 540 ml
E. Calcium chloride - 40.0, purified water - 440 ml

8. In the analysis of 1500 ml of 20% solution of sodium benzoate, caffeine was found that its concentration is 18%. Calculate the amount of caffeine sodium benzoate to be added to correct the concentration of the solution. Density 20% solution of sodium benzoate, caffeine equal to 1.0730 g / ml.

A. 34.4
30,0 B.
C. 68,8
D. 15.5
E. 3,2

9. What is the tolerance concentration of 10% concentrated sodium benzoate?

A. ± 2%
B. ± 1%
C. ± 0,5%
D. ± 3%
E. ± 5%

10. What is tolerance concentration of 40% concentrated solution of glucose?

A. ± 1%
B. ± 2%
C. ± 0,5%
D. ± 3%
E. ± 5%

Topic 6 "Production of liquid dosage forms by mass-volume method by dissolving dry medicinal substances and use of concentrated solutions**" – 5 hours.**

1. Relevance of the topic:
Concentrated solutions are used in pharmacies in the manufacture of liquid dosage forms by mass-volume method. The use of such solutions greatly increases the productivity, efficiency and quality of the assistant's work. The knowledge of the correct technology of concentrated solutions and the ability to count the number of ingredients correctly is essential for their quality preparation.

2. Specific objectives:

- to learn how to prepare concentrated solutions of medicinal substances for the burette system, evaluate their quality and make them for storage and use;
- to learn how to prepare concentrated solutions of medicinal substances for the burette system, evaluate their quality and make them for storage and use.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
		Technology of preparation	Choose the best option of

	5. Pharmacy technology of drugs	of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines***		
	1. Organization and economics of pharmacy.	Total liquid dosage form technology for internal use	Make payments dosage, excipients and purified water
	Tech industrial production of drugs	Technology solutions for internal use	Technological stage production solutions for internal use
	Biopharmacy	Technological process of preparation of solutions for internal use.	Prepare solutions for internal use, taking into account physical and chemical properties of the ingredients.
III	***Intersubjective integration***		
	Injection solutions and eye drops	Preparation of solutions mass-volume method	Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

TECHNOLOGICAL STAGES OF PREPARATION OF LIQUID DOSAGE FORMS.

All liquid dosage forms are prepared by mass-volume method (Order of the Ministry of Health of Ukraine No. 197 dated September 7, 09, p.). This provides the required mass of medicinal substance in a given volume of solution. By mass, usually prepare solutions in which as a solvent used liquids with high density, viscous, volatile as well as emulsions and some medicinal forms by author's proprietary. By volume prepare solutions of ethyl alcohol of different strengths, solutions of standard pharmacopoeias liquids. In the mass-bulk method, the soluble substance is taken by weight and the solvent is added to obtain the required volume of solution.

If the solvent in the recipe is not specified then aqueous solutions are prepared. By the word "water" if there are no special instructions refer to purified water.

The process of preparation of liquid dosage forms consists of the following stages: preparatory work (selection of appropriate dishes and plugs to it); weighing and measuring medicines and solvents; mixing or dissolving, extracting, dispersing or emulsifying complex components of a medicinal product; strain or filter; evaluation of the quality and registration of the medicinal product before departure.

Depending on the dosage form, the solubility of the medicinal substances and the type of solvent one or another technological step is used.

Selection of dishes (bottles) and stoppers. The vial and cork are picked up in advance taking into account the volume of the liquid dosage forms being prepared and the properties of their components.

The bottle should be clean and dried. The lid should be screwed to the neck freely to the stop and not rotated. If liquid medicinal products contain photosensitive substances, they are placed in a vial of orange glass.

Weighing and measuring. When weighing and measuring medicinal substances are guided by the basic rules of dosage.

Mixing, dissolving, extracting, dispersing, emulsifying. All these technological processes for liquid dosage forms serve as the basis for the formation of a disperse system. The presence or absence of a dispersed phase in these processes depends on the solubility of drugs in water or other solvents.

When preparing liquid dosage forms, dissolving dry medicinal substances should be guided by the following rules:

- The first is always measured in the stand (a pot with a wide throat) calculated amount of purified water, in which dissolve dry medicinal substances: first poisonous then goes a general list, taking into account their solubility and other physical and chemical properties. This sequence of solution preparation is needed to prevent or eliminate the processes of interaction of drugs that occur most rapidly in solutions with high concentration;

- large-crystalline medicinal substances (copper sulfate, gallium, potassium permanganate, etc.) to accelerate the dissolution process, first, in a mortar with a small amount of solvent;

- heat-resistant substances that slowly dissolve (sodium tetraborate, boric acid, mercuric dichloride, riboflavin, ethacridine lactate, etc.), dissolve in a hot solvent or when heated;

- to accelerate the dissolution process, shake or mix the solution with a glass rod.

When preparing liquid dosage forms by mixing or increasing the liquid components, the following rules should be followed:

- mixing of liquids is carried out in order of increasing their quantity;

- fragrant waters, tinctures, liquid extracts, alcoholic solutions, flavor and sugar syrups and other liquids are added to the aqueous solution in the last place in the bottle for delivery in the following order: water non-fat and non-liquid liquids; alcohol solutions in the order of increasing the concentration of alcohol; odorous and volatile liquids;

- liquid medicinal products containing essential oils (ammonia-anise drops, thoracic elixir, citral solution, etc.) are added to the mixture by mixing with sugar syrup (if it is available in the formulation) or with an equal amount of the mixture;

- tinctures, emulsion-aniseed drops and other volatile liquids should not be added to warm solutions;

- medicines with increased viscosity (ihtiol, dense extracts, etc.) are pre-mixed in a mortar with a part of the solvent and after increasing another are transferred to the vial for delivery.

Cooling (*colatio*) and filtration (*filtratio*). These processes are used in pharmacy practice for the separation of the liquid phase from all suspended particles (mechanical impurities) which fall into liquid dosage forms when contaminated with solvents and dissolved substances from devices and utensils in the form of fibers, dust and the other. Filtration is carried out with the help of funnels made of different materials of different capacities and types.

The process is used for the separation of large particles, for which the liquid is passed through a lump of cotton wool or several layers of gauze, less often canvas, silk, capron and other fabrics.

The process is run through a cotton swab, pre-washed with water purified to remove small fibers. The purity of the drug in this case will depend on the density of the lump of cotton wool, enclosed in the mouth of the funnel. Excess hardness of a cotton swab is undesirable, since the rate of stratification is slowed down.

Mucus, emulsions, infusions and broths are filtered through a double layer of gauze or cloth.

A very important issue when preparing liquid dosage forms by mass-volume method is to determine the total volume which is calculated by summing up all volumes of liquid ingredients (according to the order of the Ministry of Health of Ukraine No. 197 dated September 7, 1993). The total volume includes: solvent, water and alcohol solutions of medicinal substances, tinctures, liquid extracts and all other prescribed liquids, which are prescribed in recipes in ml.

If it is necessary to establish the volume of liquid dosage forms, which include viscous, volatile, and also liquids with a higher density, take into account their density. The number of dry substances in the determination of the total volume is not taken into account. When determining the total volume, it is necessary to consider the method of prescribing the solvent.

When preparing mixtures of concentrated solutions, the following rules are followed:

- first of all, in the bottle for purification, measure the water purified, then concentrated solutions of poisonous and potent substances and then concentrated solutions of medicinal substances of the general list in the order they are prescribed in the recipe;

- the medicines are not filtered and prepared immediately in the bottle for release.

Taking into account all these requirements the mixture is prepared according to the above prescription form: 160 ml of purified water is measured in 160 ml of purified water, then 40 ml of a 5% solution of sodium bicarbonate, 10 ml of sugar syrup and lastly 6 ml of tincture of valerian are measured here.

The vial is sealed and drawn up for release.

In the absence of concentrated solutions, the mixture is prepared taking into account the percentage of dry medicinal substances in the total volume of the solution.

1. If the liquid dosage form consists of dry medicinal substances in a total amount of up to 3%, the concentrated solutions are absent then they are dissolved in the measured quantity of prescribed water or other liquid without taking into account the CVI.

2. Liquid dosage forms containing dry substances in a total amount of 3% or more are prepared using concentrated solutions or in measuring vessels or the volume of water required for the dissolution of dry substances, determined by calculation, taking into account the CCD.

THE MIXTURE IS PREPARED USING CONCENTRATED SOLUTIONS.

Calcium chloride is a strongly hygroscopic substance that spills in air to the consistency of a syrupy solution. Using crystalline calcium with chloride is uncomfortable (crystals are wet and dirty, while weighing there is no certainty in the exact dosage, since the unknown content in this salt of hygroscopic water). In order to avoid damage to the drug and inaccurate dosing of calcium chloride from it, prepare a concentrated solution of 50 or 20%, which is used for the preparation of liquid medicinal products. The solution is stable and well preserved for a long time.

1. If in the prescription the medicinal substances are discharged in dry form separately in quantities less than 3% and in the amount in excess of 3%, then in calculating water it is necessary to take into account the volume occupied by each of the medicinal substances.

2. Liquid dosage forms in which the solvent does not use purified water and fragrant waters or other liquids (pertussin, water extracts from vegetable raw materials, polyethylene oxide-400, ethyl alcohol, etc.) are prepared without the use of concentrated solutions of medicinal substances and accounting CCD when dissolving substances.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016

- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.

- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П.

Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.

- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua

- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characterization solutions as dispersed systems.	Define the concept of solution. Describe the main ways of expressing concentration of solutions	1, 2, 3, 4 ,5
2.	Purified water	Describe the main methods of obtaining purified water. What documentation that normalize quality purified water	1, 2, 3, 4 ,5

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics solutions as disperse systems, their classification.
2. Methods for obtaining purified water; equipment that is used for this purpose, how it works.
3. Quality of water purified by SPU, and MOH Ukraine number 626 of 15.12.2004.
4. Concentrated solutions of their appointment, terms of preparation in pharmacies according to the instructions in order MOH Ukraine number 197 of 09/07/93 p.
5. The device burette installation, maintenance and rules for its use.

8.2. Test tasks for self-control.

1. For a complete chemical analysis of purified water is sent to the analytical lab once:

A. Quarter
B. Moon
C. Week
D. Year
E. Six months

2. The volume of purified water, taken for the manufacture of 200 ml of 20% magnesium sulfate concentration (LCE = 0.5 ml / g), is:
A. 180 ml
B. 200 ml
C. 185.5 ml
D. 190 ml
E. 195 ml
3. Calculate how much potassium bromide (LCE 0.27 ml / g) and purified water should be taken to prepare 500 ml of 20% solution of potassium bromide:
A. 100.0 potassium bromide and 472 ml of purified water
B. 100,0 potassium bromide and 500 ml of purified water
C. 200,0 potassium bromide and 300 ml of purified water
D. 200,0 potassium bromide and 944 ml of purified water
E. 110.0 potassium bromide and 500 ml of purified water
4. Pharmacist-technologist prepared concentrated solution of sodium bromide. Specify that his actions after the preparation of the solution:
A. Gave pharmacist-analyst for the full chemical analysis
B. posted written passport control
C. designed to leave
D. placed in stagnal
E. filtered solution
5. A pharmacist prepared 1000 ml of a 10% solution of calcium gluconate. Specify how much material and water it took to prepare (LCE calcium gluconate = 0.5)
A. 100.0 and 950 ml
B. 50,0 and 950 ml
C. 100,0 and 900 ml
D. 200,0 and 850 ml
E. 200,0 and 800 ml
6. Pharmacist-technologist prepared concentrated solution and delivered for analysis. Determine what would be his actions after receiving a positive test result:
A. filtered solution
B. Filter solution
C. moved into the material stagnal
D. designed for use
E. dismissed
7. Concentrated solutions are prepared in a pharmacy in mass and volume concentration. Specify what is meant by the designation of concentration of the solution 1:10?
A. 1.0 g of substance and solvent to obtain 10 ml
B. 10.0 g substance and 1 ml of solvent

C. 1.0 g and 10 g of substance solution
D. 1,0 g substance and 10 mL of solvent
E. 1,0 g of substance and 9 ml of solvent

8. Pharmacy received the prescription for solution in the ratio-tion of the active substance and solvent 1: 5000. Where in the concentration corresponding to this ratio:

A. 0.02%
B. 5,0%
C. 0,5%
D. 0,1%
E. 0,05%

9. The number of purified water is calculated using the coefficient of volume increase, if the concentration of the solution is:

A. 3%
B. 2%
C. 0,5%
D. 0,3%
E. 2,5%

10. To prepare 250 ml of 50.0 pharmacist used potassium iodide. What is the concentration of the resulting solution?

A. 20%
B. 50%
C. 25%
D. 10%
E. 15%

8.3. Control materials for the inmate of the busy stage:

Test:

1. A pharmacist prepares a concentrated solution of glucose 40% 1000 ml. What amount of glucose with 10% humidity he should take?

A.444.4
B. 440.0
C. 400,0
D. 404,0
E. 404.4

2. A pharmacist prepared 2000 ml of concentrated sodium benzoate 10%. However, the analysis showed that the solution has a concentration of 11.5%. What you need to add in water to bring the concentrated solution to normal?

A. 300 ml
B. 15 ml
C. 20 ml
D. 115 ml
E. 30 ml

3. In the analysis of 800 ml concentrated solution of magnesium sulfate 25% revealed that the solution has a concentration of 26%. Pharmacist calculated amount of water for dilution. What is it?
A. 32 ml
B. 80 ml
C. 16 ml
D. 8 ml
E. 20 ml
4. Calculate the amount of sodium salicylate and purified water to prepare 5000 ml of concentrated sodium salicylate 10%. (Density of 10% sodium salicylate = 1.0301 g / ml).
A. 500.0 sodium salicylate, and 4650.5 ml of purified water
B. 500,0 sodium salicylate and 4500 ml of purified water
C. 500,0 sodium salicylate and 5000 ml of purified water
D. 50,0 sodium salicylate and 4950 ml of water
E. 50,0 sodium salicylate and 4700 ml of water
5. A pharmacist prepared 1000 ml concentrated solution of chloral hydrate 20% and gave the analyst. The analysis showed that the concentration of the solution is 19.5%. What amount of solids to add to stronger solution to normal? Density 20% solution of chloral hydrate = 1.0860 g / ml
A. 5.64 g
B. 5.0 g
C. 3.5 g
D. 50.5 g
E. 5,4 g
6. What is the shelf life of treated water in closed containers?
A. * 3 days
B. 1 day
C. 5 days
D. 7 days
E. 14 days
7. What does the following entry:
Solutionis Calcii chloridi ex 40,0 - 500 ml?
A. Calcium chloride - 40.0, purified water to 500 ml
B. Calcium chloride - 40.0 purified water - 500 ml
C. Calcium chloride - 40.0, purified water - 460 ml
D. Calcium chloride - 40.0, purified water - 540 ml
E. Calcium chloride - 40.0, purified water - 440 ml
8. In the analysis of 1500 ml of 20% solution of sodium benzoate, caffeine was found that its concentration is 18%. Calculate the amount of caffeine sodium benzoate to be added to correct the concentration of the solution. Density 20% solution of sodium benzoate, caffeine equal to 1.0730 g / ml.
A. 34.4

30,0 B.
C. 68,8
D. 15.5
E. 3,2

9. What is the tolerance concentration of 10% concentrated sodium benzoate?

A. ± 2%
B. ± 1%
C. ± 0,5%
D. ± 3%
E. ± 5%

10. What is tolerance concentration of 40% concentrated solution of glucose?

A. ± 1%
B. ± 2%
C. ± 0,5%
D. ± 3%
E. ± 5%

Topic 7 "Manufacturing of liquid dosage forms by dilution of standard pharmacopoeial liquids. Non-aqueous solutions**" – 5 hours.**

1. Relevance of the topic:
In the pharmacy practice, it is often necessary to prepare medicines by diluting standard pharmacopoeias liquids as well as using non-aqueous solvents (alcohol, glycerol, various vegetable and mineral oils). Therefore, knowledge of the properties and concentrations of pharmacopoeias liquids, the ability to make calculations depending on the method of prescribing them in prescription as well as the features of the technology of liquid dosage forms on non-aqueous solvent that is necessary for the qualitative preparation of medicinal preparations.

2. Specific objectives:
- to learn how to prepare non-aqueous solutions and solutions of standard pharmacopoeias liquids, evaluate their quality and make up for release;
- to learn how to prepare a non-aqueous solutions and standard solutions pharmacopoeia liquids, evaluate their quality and arrange to release.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
		Technology of preparation	Choose the best option of

	5. Pharmacy technology of drugs	of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines***		
	1. Organization and economics of pharmacy.	Total liquid dosage form technology for internal use	Make payments dosage, excipients and purified water
	Tech industrial production of drugs	Technology solutions for internal use	Technological stage production solutions for internal use
	Biopharmacy	Technological process of preparation of solutions for internal use.	Prepare solutions for internal use, taking into account physical and chemical properties of the ingredients.
III	***Intersubjective integration***		
	Injection solutions and eye drops	Workflow solution for internal use.	Prepare solutions for internal use, taking into account physical and chemical properties of the ingredients.
		Preparation of solutions mass-volume method	Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Standard pharmacopoeias solutions (liquids) are aqueous solutions (factory-made) of certain medicinal substances at a certain concentration specified in the relevant articles of the DF.

These include solutions of solid, liquid or gaseous substances (potassium acetate solution, hydrochloric acid, ammonia solution, hydrogen peroxide, formalin, etc.). When preparing liquid dosage forms from the listed standard solutions, the provisions of "Instructions for the preparation of pharmaceutical forms with liquid dispersion medium in pharmacies" (Order of the Ministry of Health of Ukraine No. 197 of 09.09.93). These liquids are easily mixed with water and their solutions are prepared directly in the bottle for delivery which first

measure the water and then the calculated amount of liquid. If necessary, the solution is filtered.

Standard pharmacopoeia solutions can be prescribed under two names: conditional and chemical which determines the calculation of their number.

If in the formulation the liquid is prescribed under the conventional name then at calculations the concentration of standard solution is taken as unit (100%).

If the chemical name is given then the calculations are based on the actual content of the substances in standard solutions, using the following formula:

$$X = V^* B / A,$$

where X is the volume of standard liquid, ml;

V is volume of solution to be prepared;

A is the actual concentration of standard liquid to be diluted,%;

B is prescribed concentration of solution,%.

The amount of water in both cases is calculated by the difference between the total volume of the prepared solution and the calculated amount of standard liquid.

A solution of hydrogen peroxide is used as a disinfectant for washing and rinsing with stomatitis, tonsillitis, gynecological diseases, etc.

SPh contains two solutions of hydrogen peroxide: diluted (Solutio Hydrogenii peroxydi diluta) and concentrated - perhydrol (Solutio Hydrogeni iperoxydi concentratas eu Perhydrolum). If in the prescription the doctor prescribed a solution of hydrogen peroxide without indicating its concentration, then release 3% solution.

The solution of acid hydrochloric acid is intended, mainly for internal use in the form of drops and mixtures with insufficient acidity of gastric acid. Given that it is intended for both adults and children, the prescribing and concentration of hydrochloric acid may be different at the same time. Therefore, the calculations associated with the preparation of these solutions require special attention.

In all cases, when the hydrochloric acid is prescribed without concentration indication, release dilute hydrochloric acid (Acidum hydrochloricum dilutum 8.3%).

If a solution of hydrochloric acid (with a denomination of concentration) is prescribed for internal use then it is used to prepare the hydrochloric acid dilute acid (8.3%) taking it in calculations per unit (100%).

However taking into account the volatility of hydrogen chloride in order to improve the accuracy of the prepared solutions it is recommended to use prepare breeding of this acid (intraperitoneally) SolutioAcidi hydrochloric dilution (1:10), which contains 0.83% hydrogen chloride.

The solution of acid hydrochloric acid dilute (1:10) is prepared by diluting the hydrochloric acid (8.3%) with the appropriate amount of water. For example, to

prepare 1 liter of solution, take 900 ml of purified water and add 100 ml of hydrochloric acid (8.3%).

This solution is taken 10 times more against the prescribed amount of acid in the recipe.

Hydrochloric acid (24,8-25,2%) is used in the pharmacy as a reagent, and it is used for external purposes in the preparation of a liquid of Demyanovich (author's copy), in calculations taking it per unit.

NON-AQUEOUS SOLUTIONS

In medical practice, solutions are widely used in non-aqueous solvents (non-aqueous solutions) as lotions, rinses, lubricants, washing, intranasal drops, inhalations.

Depending on the properties of the solvent, non-aqueous solutions are distinguished between volatile, non-volatile and combined solvents.

Volatile liquids used as solvents include ethyl alcohol, chloroform, ether. To non-lethal - glycerin, fatty oils (peach, almond, sunflower), vaseline oil, dimethoxide, PEO-400, etc., the characteristics of which are presented in the section "Solvents". Naturally, the more solvents are used, the more the formulation of this group of solutions is more diverse.

Preparation of solutions on volatile solvents. In this case, it is necessary to consider the possibility of significant losses of the solvent and the corresponding increase in the concentration of the solution due to evaporation in the process of preparation. To avoid these losses, undesirable operations such as heating, filtering or straining are unwanted. In addition, ethyl alcohol, ether with the exception of chloroform is flammable so the dissolution in this case should be done with the safety (far from the fire).

Alcohol, ether and chloroform solutions are prepared directly in release bottles. Vials should be clean and dry as water is poorly mixed with organic solvents (except for alcohol) and changes their solubility.

In the preparation of alcoholic solutions, unlike aqueous in a dry bottle for release put a medicinal substance (if it is volumetric and loose, then use a dry funnel), which is first dissolved and then the solvent because the pouring of the powder through the alcohol-soaked neck of the bottle is difficult.

The process of these solutions is produced, if necessary, through a small dry cotton wool using a funnel covered with a glass. The process of ether solutions is not particularly desirable. The precipitated ether solution should be weighed and the solvent loss should be filled with an increase of the ether. As an volatile solvent, alcohol is most often used in pharmacy practice.

Alcoholic solutions. Ethyl alcohol and its aqueous solutions are used to dissolve many medicinal substances (organic acids, alkaloids, essential oils, iodine, camphor, resorcinol, menthol, hydrogen peroxide, formalin and other substances). Ethyl alcohol can also be used as a disinfectant, with a refreshing and irritating properties, for compresses, etc.

Preparation of alcoholic solutions of medicinal substances is regulated by the "Instruction on the preparation of pharmaceutical forms with liquid dispersion media in pharmacies" (Order of the Ministry of Health of Ukraine No. 197 of 09.09.93).

If the prescription does not indicate the concentration of ethyl alcohol, then use 90%. The exception is 10% iodine solution which is prepared using 95% alcohol based on DF preservatives as well as some solutions according to the approved normative and technical documentation.

Preparation of solutions on non-volatile solvents. Solutions of medicinal substances on non-volatile solvents are prepared by weight since the high viscosity of these solvents results in large losses in the measurement. The mass of such solutions consists of the sum of the quantities of medicinal substances and solvent. Taking into account that dissolution in viscous solvents proceeds slowly it is expedient to carry it out with heating taking into account the properties of medicinal substances. However, in this case the preparation of saturated solutions should be avoided since when cooling such a solution the soluble substance may the precipitate can appear. Solutions on viscous solvents are prepared directly in the vials for release and filtered only in extreme cases and only through the gauze.

Glycerin solutions are widely used as lubrication. In the form of glycerol solutions, prescribe acid boron, sodium tetraborate, iodine, tannin, ihtiol and other substances. Glycerin has a significant viscosity so the preparation of glycerine solutions can occur with heating and without heating which completely depends on the thermostability of the medicines included in the solution. When heated to 40-50^{o} C, the viscosity of glycerin decreases and the dissolution process is accelerated. Sodium tetraborate and boron acid are better dissolved in heated glycerol, when dissolved, they form a glycosyric acid, which gives the solutions acidic reaction. To neutralize glycosyric acid, sodium bicarbonate is often prescribed in combination with boric acid. It should be added carefully in small portions, as the neutralization reaction proceeds violently and spray solution can occur.

Oil solutions. Fatty oils as well as vaseline oil are good solvents for many medicines that are widely used in the form of ear and intranasal drops. In order to accelerate the dissolution light heating should be applied.

If a volatile substance such as menthol camphor is prescribed in an oil solution then in order to eliminate the loss of dissolution, preheated oil is carried out at a temperature not higher than 40°C.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016

- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.

- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.

- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних.

– Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).

- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ

- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characteristics of non-aqueous solvents, requirements to them	What range of non-aqueous solvents. NTD.	1, 2, 3, 4 ,5
2.	The rules on the preparation of solutions of volatile and non-volatile solvents.	Spend dilution calculations on alcohol. What are the main technological solutions preparation stage.	1, 2, 3, 4 ,5
3	The settlement rules pharmacopoeia standard liquids	Place your calculations depending on prescription	1, 2, 3, 4 ,5
4	Quality assessment solutions pharmacopoeia standard liquids and non-aqueous solutions	Add documentation and quality solutions and non-aqueous liquids pharmacopoeia standard	1, 2, 3, 4 ,5

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of non-aqueous solvents, requirements to them.
2. Calculations of dilution of ethyl alcohol using formulas and breeding alcohol metric tables.
3. The rules on the preparation of solutions volatile and non-volatile solvents according to the MOH Ukraine number 197 of 09/07/93.

4. Safety when working with flammable and explosive solvents, acids and alkalis.
5. The nomenclature standard pharmacopoeias liquids, concentration and means prescribing a recipe.
6. Rules for calculating the amount of purified water and standard pharmacopoeias liquids depending on how their prescription by MOH Ukraine number 197 of 09/07/93.
7. Features cooking and storing solutions pharmacopoeias standard liquids.
8. Methods of assessing the quality of non-aqueous solutions and solutions pharmacopoeia standard liquids in accordance with the requirements of technical documentation, packaging, design to delivery, retention policies.

8.2. Test tasks for self-control.

1. From recipe issued 5% formalin solution is 200 ml. Calculate the amount of standard solution of formaldehyde and purified water that is necessary for the preparation of this drug:

A. 10 ml of standard solution of formaldehyde and 190 ml of purified water
B. 10 ml of standard solution of formaldehyde and 200 ml of purified water
C. 27 ml of standard solution of formaldehyde and 173 ml of purified water
D. 5 ml of standard solution of formaldehyde and 195 ml of purified water
E. 25 ml of standard solution of formaldehyde and 175 ml of purified water

2. The process of blending ethyl alcohol and water the phenomenon of contraction. What it is?

A. Decrease the total volume by mixing alcohol and water
B. Increase the total volume by mixing alcohol and water
C. immiscibility of water and alcohol of various concentrations
D. Mutual dissolution alcohol and water
E. Equalization concentration by mixing alcohol and water

3. The recipe was discharged 5% formalin solution 100ml. What amount of 37% formaldehyde pharmacist should take for solution

A. 5 ml
B. 12.5 ml
C. 4,5 ml
D. 10 ml
E. 15 ml

4. The solution of hydrogen peroxide is released from pharmacies in different concentrations. What concentration of solution the patient needs if the recipe was observed concentrations?

A. 3%
B. 30%
C. 20%
D. 10%
E. 2%

5. The patient is prescribed lotion:

Rp .: Sol. Liquoris Burovi 10% 100 ml
Da. Signa. Lotion.
What volume of drilling fluid necessary measure to make this drug?
A. 10 ml
B. 90 ml
C. 20 ml
D. 80 ml
E. 50 ml
6. The patient is prescribed mixture:
Rp .: Sol. Acidi hydrochlorici 2% 100 ml
Da. Signa. 1 tbsp. l. 3 g. Per day with meals
What volume of diluted hydrochloric acid solution (1:10) is necessary to measure its preparation?
A. 20 ml
B. 25 ml
C. 15 ml
D. 2 mL
E. 5ml
7. The patient is prescribed 3% alcohol solution of boric acid. Wherein the concentration of ethanol used for the preparation of the solution required by regulations?
A. 70%
B. 95%
C. 90%
D. 60%
E. 40%
8. A pharmacist prepared oil solution of menthol. Select the correct way to dissolve the drug:
A. Dissolve the butter in a vial
B. ground in a mortar with oil
C. Dissolve oil in a stand
D. ground in a mortar with alcohol, then add oil
E. Dissolve in a porcelain cup with oil
9. necessary to prepare the drug for prescription:
Rp .: Sol. Acidi hydrochlorici 1% 100 ml
Da. Signa. One tablespoon 3 times a day.
Specify the number hydrochloric acid solution (1: 10) and water to prepare:
A. 10 ml and 90 ml
B. 1 ml and 99 ml
C. 20 ml and 80 ml
D. 10 ml and 100 ml
E. 3 ml and 97 ml

10. Pharmacist compounded oil solution. Specify the sequence of process stages
A. Dry Matter placed in a vial and weighed oil
B. In a bottle weighed and added solvent dry matter
C. substance is mixed in a mortar with measured amounts of solvent
D. In a base oil and dissolved substance in a bottle
E. substance is placed in a stand and weighed solvent

8.3. Control materials for the inmate of the busy stage:
Test:
1. The pharmacy must prepare the alcoholic solution of salicylic acid which is not specified concentration of alcohol. Wherein the concentration of alcohol should take?
A. 70%
B. 90%
C. 75%
D. 80%
E. 60%
2. Pharmacist compounded glycerine solution of boric acid. Enter the correct way of putting boric acid.
A. Dissolve vial with warming up
B. Dissolve by grinding in a mortar
C. Dissolve to stand at room temperature
D. rubbed with alcohol in a mortar and mixed with glycerol
E. dissolved in a volumetric flask
3. Pharmacist compounded solution of 100 ml and 1% solution of ammonia. Specify how much 10% solution of ammonia and water should be used?
A. 10 ml and 90 ml
B. 5 ml and 95 ml
C. 15 ml and 85ml
D. 20 ml and 80 ml
E. 5 ml and 100 ml
4. A pharmacist prepares a non-aqueous solution by prescription:
Rp: Natrii tetraboratis 5,0
Glycerini ad 20,0
Misce. Da. Signa. For lubrication.
What technology it needs to choose?
A. In the vial placed sodium tetraborate, weighed hlitseryn, heated
B. Sodium tetraborate grind in a mortar with glycerol
C. In a vial weighed glycerin, sodium tetraborate placed, heated
D. In the stand measured glycerin, sodium tetraborate dissolved
E. In stand weigh glycerin added sodium tetraborate, heated, filtered in a vial

5. Pharmacy got prescription for preparation of an alcohol solution. Specify which ethanol concentration pharmacist must be used in the absence of instructions in the recipe

A. 90%
B. 70%
C. 45%
D. 60%
E. 30%

6. A pharmacist prepared prescription dosage form following:
Rp: Sol. Acidi acetici 3% 100ml
Da. Signa. To cool off.
Specify the number of standard pharmacopeia fluid and water:

A. 10 ml and 90 ml
B. 3 ml and 100 ml
C. 3 ml and 97 ml
D. 15 ml and 85 ml
E. 10 ml and 100 ml

7. pharmacist standard pharmacopeia calculated amount of liquid water and words. Choose the correct answer:
Rp: Sol. Perhydroli 6% 100ml
Da. Signa. To wipe the skin.

A. 6 ml and 94 ml
B. 35 ml and 65 ml
C. 20 ml and 80 ml
D. 60 ml and 40 ml
E. 6 ml and 100 ml

8. Specify the amount of hydrochloric acid solution (1:10) and purified water for solution for words:
Rp: Sol. Acidi hydrochlorici 1% 150ml
Da.Signa. Po1 century. boxes. 3 times a day.

A. 15 ml and 135 ml
B. 10 ml and 150 ml
C. 95 ml and 55 ml
D. 15 ml and 150 ml
E. 10 ml and 100 ml

9. Pharmacist used for solution by following the words 34% formaldehyde solution. Add water and standard pharmacopeia liquid:
Rp: Sol. Formalini 30% 100ml
Da. Signa. To disinfect footwear.

A. 67 ml and 33 ml
B. 20 ml and 80 ml
C. 30 ml and 100 ml
D. 70 ml and 30 ml

E. 60 ml and 40 ml

10. Specify the number of standard pharmacopeia liquid (34%) and water to prepare the drug for prescription:
Rp .: Sol. Kalii acetatis 10% 200ml
Da. Signa. 1 tbsp. boxes. 3 times a day

A. 58.8 ml and 141.2 ml
B. 10 ml and 190 ml
C. 20 ml and 180 ml
D. 22 ml and 178 ml
E. 20,2 ml and 179.8 ml

Topic 8 "Naval solutions. Colloidal solutions**" – 5 hours.**

1. Relevance of the topic:
In recent decades, interest has increased in solutions of high-molecular compounds. This group of medicinal substances has high bioavailability, they are non-toxic, which allows their use in gynecology, ophthalmology, otolaryngology, gastroenterology, in pediatric and geriatric practice. A rational combination of active ingredients, methods of their introduction and preparation allows you to create highly effective drugs. This explains the practical need to study this topic.

2. Specific objectives:
- to learn how to prepare solutions of high-molecular compounds, evaluate their quality and arrange for the release.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;

		form.	
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs Biopharmacy	 General technology of liquid dosage forms for internal use Technology solutions for internal use Theoretical fundamentals and production processes processing medicinal funds in medicinal drugs, their standardization, storage and release.	 Calculate the medicinal, auxiliary substances and purified water Technological stage production solutions for internal use Make calculations medicinal, auxiliary substances and water purified .
III	***Intersubjective integration*** Injection solutions and eye drops	 Preparation of solutions mass-volume method	 Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

SOLUTIONS HIGH MOLECULAR WEIGHT COMPOUNDS

High-molecular compounds are called natural or synthetic substances with a molecular weight of from several thousand (no less than 10-15 thousand) to a million or more.

The properties of an HMC depend on the size and shape of their molecule. Thus, HMCs with spherical molecules (hemoglobin, glycogen, pepsin, trypsin, pancreatin, etc.) usually do not swell when powdered and when dissolved. Solutions of these substances have a low viscosity even at relatively high concentrations and obey the laws of diffusion and osmotic pressure.

HMCs with highly asymmetric linear (branched), pulled molecules (gelatin, cellulose and its derivatives) swell up strongly and dissolve and form highly viscous solutions that do not obey the laws inherent in solutions of low molecular weight substances. Dissolution of HMC with linear molecules is accompanied by

swelling, the latter is the first stage of their dissolution. After this, the HMC dissolves.

It should be borne in mind that the swelling of such a compound does not always end with its dissolution. Very often, after reaching a certain degree of swelling, the process stops. Swelling can be unlimited and limited.

Unlimited swelling ends in dissolution. The compound absorbs the solvent first and then goes into solution at the same temperature.

With limited swelling, the high-molecular compound absorbs the solvent and does not dissolve in it, no matter how long it is in contact. The limited swelling of such a compound always ends with the formation of an elastic gel (jelly). However, limited swelling due to limited dissolution often changes to unlimited as conditions change. So gelatin and agar-agar swell sparingly in cold water, in warm water swell indefinitely, than they use when dissolving these substances.

HMC solutions, if they are in thermodynamic equilibrium, are, like true solutions, aggregatively stable. However, with the introduction of large amounts of electrolytes, HMC is released from the solution. This phenomenon is called salting out. This process is explained by a simple decrease in the solubility of the HMC.

The dehydration of the dissolved compound, and hence its salting out, can also be caused by non-ionized substances, such as alcohol. Concentrated sugar solutions (syrups) also act visually. Sugar and alcohol show a strong dehydrating effect when introduced in significant quantities, so they need to be added to the solution of the HMC with parts with agitation.

Under the action of these factors, the phenomenon of coacervation is also observed - the separation of the system into two layers.

Under the influence of low temperatures, such phenomena as gelation or solidification and syneresis are possible.

HMC s and their solutions are very important in various industries, agriculture, as well as medicine and pharmacy. In medicine, they are used as medicines (enzymes, polysaccharides, mucus, extracts, etc.) And as excipients in the preparation of various dosage forms (bases for suppositories and ointments, emulsifiers, stabilizers, prolongators, solubilizers, flavoring agents as additives in the preparation of blood substitutes), as well as packaging material for dispensing drugs, for the manufacture of bottles, films, corks, cans and other packaging products.

Preparation of HMC ***solutions, swell indefinitely.***

HMCs swell indefinitely, which are most often used in pharmaceutical practice, include pepsin, licorice extracts, belladonna, etc. When preparing solutions of substances, they swell without limit, follow the general rules for the preparation of solutions of low-molecular substances, taking into account the properties of medicinal substances and solvents.

Preparation of HMC solutions, partially swell.

An example of a substance that swells to a limited extent is that in cold water and gelatin and starch swell indefinitely when heated.

For internal use and enemas prepare a 2% starch solution. Solutions of this concentration are prepared in cases where their concentration is not indicated in the recipe.

Methylcellulose (MC) refers to substances that swell limitedly in hot water and swell indefinitely in cold water.

For the preparation of aqueous solutions, MC is filled with water heated to 80-90 ° C (for complete and rapid dissolution) in an amount of 1/2 of the required volume of the resulting solution. After cooling to room temperature, add another cold water, mix and leave in the refrigerator for 10-13 hours until complete dissolution of methylcellulose.

A clear solution of methylcellulose formed is filtered through a No. 2 glass filter. The cooled solutions are transparent.

It is necessary to take into account that HMC solutions are more often prescribed in combination with various medicinal substances that can react with them, therefore, each time it is necessary to take into account their compatibility.

COLLOIDAL SOLUTIONS

Colloidal solutions are ultramicroheterogeneous systems in which the structural unit is a complex of molecules, atoms and ions, the so-called micelles.

The core of the micelle is formed due to the accumulation of individual molecules of a hydrophobic substance. The double layer of ions surrounding the nucleus (adsorption and diffuse) arises as a result of either the adsorption of ions, or the dissociation of surface molecules of the nucleus under the influence of the external environment. The compounds that form the double layer ions are called ionic groups.

Due to the large particle size, colloidal solutions have characteristic properties: low diffusion capacity, low osmotic pressure, had the ability to dialysis, the ability to scatter light in all directions when considering solutions in reflected light (a characteristic Tyndall cone is formed). The micelles in the colloidal solution are in a chaotic motion. They are characterized by Brownian motion.

Colloidal solutions can be stable only in the presence of the third component - stabilizer, - high-molecular compound (HMC) or surface-active substance (surfactant), which, adsorbed on the particle-medium interface, prevents coagulation. The stability of colloidal systems is also improved due to the appearance of solvation layers of solvent molecules.

The mechanism of the stabilizing action of the HMC and Surfactants is that they adsorb on the surface of the particles and orient themselves at the interface so that the polar part faces the polar liquid and the non-polar liquid faces the non-polar particles, forming a monomolecular adsorption layer on the surface. The surfactant ions, being adsorbed on the interface, have surface activity, while the repulsive forces between particles increase and their surface tension decreases, which contributes to aggregative stability. In addition, around the surfactant film

surrounding the particle, the molecules of the solvation layer are oriented (in water, the hydrate shell). Such colloids are called "protected."

Preparation of solutions of protected colloids.

In pharmaceutical practice, mainly three colloidal preparations are used. These are Collargol, protargol and ichthyol.

Collargol and protargol are used as astringents, antiseptics, anti-inflammatory agents. Their solutions are used for lubrication of the mucous membranes of the upper respiratory tract, in the eye practice, for washing the bladder, purulent wounds, etc.

Protargol (silver protein) - Argentum proteinicum is an amorphous brown-yellow powder, odorless, slightly bitter and slightly tart taste, easily soluble in water, is protected by a colloidal silver preparation, contains 7.3-8.3% (average 8%) of silver oxide . Protein hydrolysis products (albuminates) play the role of a protective colloid.

If glycerin is prescribed in the solution, in addition to water, then protargol is first triturated in a mortar with glycerin, and after its swelling, water is gradually added. In addition, it should be borne in mind that the solutions of protargol should be released in glasses made of dark glass. The solution of protargol should not be prepared as a stock.

Collargol solutions (silver colloid) - Argentum colloidale are greenish or bluish-black plates with metallic luster, are soluble in water, contain 70% silver oxide and 30% protein hydrolysis products (sodium salts of lysalbic or protalbinic acids), which serve as a protective colloid. Due to the small amount of protein (about 30%), the drug slowly dissolves in water. Therefore, to speed up the dissolution, you can apply two methods of preparation, depending on the concentration of the prescribed solution.

1. In a glass bottle for release, filtered (can be strained), purified water, pour collargol and the contents of the glass are shaken until the collagen is completely transferred into the solution. This method is convenient at small concentrations of collargol (up to 1%).

2. If you have to prepare solutions of greater concentration, then proceed as follows: collargol is placed in a mortar, add a small amount of purified water, leave the mixture 2-3 minutes for swelling, rub, and then gradually add to the stirring amount of remaining water.

The collagen swelling is relatively long, so it is more rational to apply the second method. If necessary, the solution of collargol is filtered through a glass filter No. 1 or No. 2 or filtered through a loose lump of cotton wool, washed with hot water. The solution is photosensitive, therefore it is released in a bottle of dark glass.

Solutions of ichthyol (ammonium salt of sulfuric acid shale oil) - Ichtyolum - it is almost black or brown syrup liquid of a peculiar sharp smell and taste. Soluble in water, glycerol, alcohol-ethereal mixture. Water solutions shake vigorously when shaking. It is a natural protected colloid.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.

- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).

- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.

- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	HMC Characteristics	Give the HMCdefinitions and their classification. Describe the properties of the HMC, depending on the structure	1, 2, 3, 4 ,5,6
2.	Features of technology of HMC solutions	Specify the peculiarities of the technology of solutions of pepsin, gelatin, starch and methyl cellulose.	1, 2, 3, 4 ,5,6
3	Assessment of the quality and storage of solutions of the HMC.	Name the NTD and the quality of the solutions of the HMC.	1, 2, 3, 4 ,5,6

8. Materials for self-control.

8.1. Questions for self-control.

1. Characterization and classification of macromolecular compounds (HMC), their classification.
2. Use of the HMC in pharmacy.
3. Dependence of dissolution of the HMC on the structure of their molecules.
4. Features of the technology of solutions of pepsin, gelatin, starch and methyl cellulose.
5.Rules for adding drugs to HMC solutions.
6.Assessment of the quality and storage of solutions of the HMC

8.2. Test tasks for self-control.

1. . To macromolecular substances that infinitely swell, include:

A. Pepsin

B. Starch
C. Polyvinyl alcohol
D. Gelatin
E. Methylcellulose

2. The warning label "Pre-Use Heater" provides solutions::
A. Gelatin
B. Krohmaly
C. Pepsin
D. Methylcellulose
E. Nazotozi

3. The pharmacist prepared the drug, dissolving the active substance in water, acidified with a solution of hydrochloric acid (1:10). Specify for which substance this technology is characteristic:
A. Pepsin
B. Tannin
C. Osarsol
D. Kolargol
E. Copper sulphate

4. The patient is prescribed a solution under the following word:
Rp .:Acidihydrochloric 2% - 100 ml
Pepsin 2.0
Da. Signa. On a tablespoon 3 times a day during meals.
How to dissolve pepsin to provide therapeutic activity of the drug?
A. In a pre-prepared solution of hydrochloric acid
B. In 20 ml of hydrochloric acid solution
C. In 98 ml of purified water
D. Rub off 10 ml of purified water
E. In 20 ml of hydrochloric acid solution

5. For the preparation of drugs, solutions of high molecular weight compounds are used. What kind of technological operation should be carried out in advance for the preparation of solutions of swollen substances?
A. Pour the optimum amount of water purified to swell
B. Dissolve in a small amount of hydrochloric acid
C. Dissolve in purified filtered water
D. Rub with a small amount of cleaned water
E.Dissolve in water purified when heated

6.Indicate which technology the pharmacist used to prepare the starch solution:
A. Blended with cold water, poured into boiling water and boiled for 1-2 minutes
B. Blended with hot water, poured into cold water
C. Dissolved in cold water, then heated
D. Dissolved in a vial for release in freshly distilled, filtered water purified
E. Dissolved in boiling water

7. Which of the following macromolecular compounds refers to infinitely swollen :

A.Whitefish extract

B.Gelatin

C.Methylcellulose

D.Polyvinylpyrrolidone

E.Starch

8. The patient needs to prepare a solution of gelatin. What is the feature of dissolving gelatin?

A.After swelling gelatin is dissolved in water when heated

B.Gelatin dissolves in boiling water

C.Gelatin dissolves in acidified water

D.Gelatine is rubbed with alcohol and dissolved in water when heated

E.Gelatin dissolves in the submerged water

9.The pharmacy received a recipe:

Rp .: Mucilaginis Amyli 50.0

Da. Signa. For an enema

What amount of starch and purified water was used by a pharmacist while cooking?

A. 1.0 starch; 49 ml of purified water

B. 1.0 starch; 50 ml of purified water

C. 2.0 starch; 48 ml of purified water

D. 5,0 starch; 45 ml of purified water

E. 10.0 starch; 40 ml of purified water

10.The pharmacist prepared 100 ml of starch solution 2%. Specify the rational technology:

A. 2.0 starch is poured into 8 ml of purified water; 90 ml of purified water is brought to a boil, poured into a suspension of starch, boiled under constant stirring for 1 min, filtered in a vial for release

B. In the stand, measure 198 ml of purified water, dissolve 2,0 starch, filter in a vial for release

C. In 98 ml of boiling water purified, dissolve 2,0 starch, filter in the vial for release

D. 2.0 starch is poured into 8 ml of purified water, boiled for 1 min, cooled, add the remaining purified water

E. In a bottle for leave, measure 98 ml of purified water, dissolve 2,0 starch, shake

11.Pharmacist has prepared a prescription drug:

Rp.: Sol. Protargoli 0.3% - 10 ml

Glycerin 1.0

DS For washing.

Specify the best technology option

A. Protargol rub in a mortar with glycerol and add water

B. Glycerol dissolves in water and add protargolum

C. Dissolve the protargol in the support and add glycerol
D. In a vial weigh the protargol, dissolve in water, add glycerol
E. In a vial we glycerin, water, protargol are sequentially weighed

12.A pharmacist prepares a solution of a protected colloid by the following technology: measures the water purified in a porcelain cup, pours on the surface of the water a thin layer and does not mix. Specify the substance for which this technology is characteristic:

A. Protargol
B. Kolargol
C. Ichthyol
D. Starch
E. Pepsin

13.The pharmacist prepared an aqueous solution of protargola. Specify which technology the pharmacist chose:

A. Poured on the surface of water and left to completely dissolve
B. Dissolved in the bottle for purification in the water
C. Dissolve when rubbed
D. Dissolved in warm water
E. Dissolved in cold water

14. The pharmacist prepared a solution of ihtiol. Specify the peculiarity of the dissolution of ichthyol:

A. Weighed ichthyol in a porcelain cup and, stirring, adding water, strain into the vial
B. In an old vial we weighed the ichthyol, added water and filtered
C. Ichthyol was weighed into an old mortar and torn with water
D. Put in a bottle water, added ichthyol, filtered
E. Weighed the ichthyol in the stool, added water, dissolved and strained into the vial for release

15.The pharmacist prepared a 2% solution of collargolum. Specify which technology is chosen by the pharmacist?

A. Dissolve when rinsed with water purified in a mortar
B.Poured on the surface of the water and left to completely dissolve
C. Dissolved in the bottle for purification in the water
D. Dissolved in hot water in the stand
E. Diluted in cold water, brought to a boil under constant stirring .

16.Specify the features of the collargol solution preparation:

A.Disperse with water or glycerol
B. Dissolved in acidified water purified
C. Pour onto the surface, do not shake the water
D. Add to boiling water as a suspension
E. Leave to swell at room temperature

17. Pharmacist prepared a 2% solution of collargol. Indicate which technology the pharmacist chose:

A. Dissolved when rubbed with water in a mortar
B. Dissolved in the bottle for purification in the water
C. Pour onto the surface of the water and leave to completely dissolve
D. Dissolved in hot water in the stand
E. Dissolved when rubbed with alcohol in a mortar

18. In medical practice, solutions of protected colloids are used. Specify a substance that belongs to the specified group:

A. Protargol
B. Bismuth nitrate is basic
C. Potassium iodide
D. Camphor
E. Sodium chloride

19.The pharmacist filtered the water in a vial for dispensing, collagen collapsed and shoved to prepare the collargol solution. For what concentrations of collargol is this technology desirable?

A. up to 1%
B. up to 2%
C. up to 5%
D. up to 10%
E. up to 20%

8.3. Control materials for the inmate of the busy stage:

Test:

1. The patient needs to prepare a solution of gelatin. What is the feature of dissolving gelatin?

A. Gelatin after swelling dissolves in water when heated
B. Gelatin dissolves in suspended water
C. Gelatin dissolves in boiling water
D. Gelatin dissolves in acidified water
E. Gelatine is rubbed with alcohol and dissolved in water when heated

2. The pharmacy has received a recipe, which includes a macromolecular compound. Which of the following substances belongs to a limited swelling group?

A. Gelatin
B. Ichthyol
C. Tannin
D. Pepsin
E. Liquorice extract

3.Which of the reduced macromolecular compounds is a substance that is limited to swell in hot water and unlimited in cold?

A. Methylcellulose
B. Gelatin
C. Starch

D. Pepsin
E. Dense extract of belladonna
4.Which of the following macromolecular compounds refers to infinitely swollen:
A. Extract of belladonna
B. Starch
C. Gelatin
D. Methylcellulose
E. Polyvinylpyrrolidone
5.The doctor prescribed a recipe for preparing a starch solution without determining its concentration. Specify the solution of starch which concentration should be prepared by the pharmacist.
A. 2%
B. 1%
C. 5%
D. 10%
E. 15%
6.A pharmacy receives the recipe:
Rp .: Mucilaginis Amyli 50.0
Da. Signa.For an enema
What amount of starch and purified water was used by the pharmacist to prepare the drug?
A. 1.0 starch; 49 ml of purified water
B. 1.0 starch; 50 ml of purified water
C. 2.0 starch; 48 ml of purified water
D. 5,0 starch; 45 ml of purified water
E. 10.0 starch; 40 ml of purified water
7. Laying the solution of the HMC into two layers: the first - a concentrated solution of the HMC, the second - a diluted solution of the same HMC, it is -
A. coacervation
B. coagulation
C. syneresis
D. fastening
E. vulgaris

Topic 9 “ Suspensions.**” – 5 hours.**

1. Relevance of the topic:
Many medicinal substances, despite their physicochemical properties, the eyes do not dissolve in water. And other solvents, so they are introduced into the dosage form in a finely divided state. With dispersion of the drug, its free surface increases, which allows increasing the contact of drugs with tissues and body fluids and, as a result, the possibility of interaction between them. The above indicates the relevance of the study of this topic.

2. Specific objectives:
- to learn how to prepare suspensions with medicinal substances of different physicochemical properties, to evaluate their quality and arrange them for delivery.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;

		form.	
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs Biopharmacy	 General technology of liquid dosage forms for internal use Technology solutions for internal use Theoretical fundamentals and production processes processing medicinal funds in medicinal drugs, their standardization, storage and release.	 Calculate the medicinal, auxiliary substances and purified water Technological stage production solutions for internal use Make calculations medicinal, auxiliary substances and water purified .
III	***Intersubjective integration*** Injection solutions and eye drops	 Preparation of solutions mass-volume method	 Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Suspensions -a liquid dosage form containing, as a dispersed phase, one or more finely ground powdered medicinal substances distributed in a liquid dispersion medium.

Depending on the method of application, suspensions are distinguished for internal, external and parenteral administration. If medicinal substances for internal use are prescribed in the form of suspensions, they are called suspension mixtures. As external means, suspensions are prescribed for lubrication, douching, etc. Less commonly, the suspension is used for injections, mainly intramuscular (not used for intravenous administration).

Factors affecting the stability of suspensions.

Suspensions do not have the ability to diffuse, osmotic pressure, they do not observe spontaneous chaotic movement of particles. A characteristic feature of suspensions is their ability to settle. Therefore, one of the important requirements for suspensions is their stability.

There are aggregative and sedimentation stability of suspensions.

Aggregative stability - it is resistant to the adhesion of particles.

Sedimentation stability - it is resistant to sedimentation of particles without them, only with their size.

During the sedimentation of suspensions, two different cases can be observed: in one case, each particle settles separately, not connecting with each other. Draft occurs more slowly. Such a dispersed system is called aggregatively resistant.

However, it is also possible that a solid suspension particles coagulate under the action of molecular attractive forces and settle in the form of whole flakes. Such systems are called aggregatively unstable.

In general, the deposition rate is found in the Stokes law in the Stokes law: the sedimentation rate is directly proportional to the particle radius of the dispersed phase, the difference in the density of the dispersed phase and the dispersion medium, and is inversely proportional to the viscosity of the dispersion medium.

When applying the Stokes formula it must be borne in mind that the particles of the dispersed phase must be strictly spherical in shape, absolutely hard and smooth; In addition, the Stokes formula does not reflect the phenomena occurring at the interface, depending on whether the substances are hydrophobic or hydrophilic.

Based on the Stokes formula, in order to increase the stability of suspensions, they resort to the following methods:

- to increase the viscosity of the dispersion medium. This is achieved by introducing surfactants, viscous liquids (glycerol, syrups), hydrophilic colloids, starch, and others;

- strive to disperse the solid particles of the dispersed phase as thin as possible. This is achieved by carefully grinding the substance in a mortar, first dry, then in the presence of a small amount of liquid.

The need to increase fluid explained that decreases. The content of the substance to be ground and, in addition, wetting liquids penetrate into small cracks of solid particles, which are formed during the grinding of the substance and exert a wedging pressure. Microcracks expand, and further grinding of the substance occurs. This phenomenon is known as the Rebinder Effect. The higher the wetting energy, the more pronounced the wedging effect and the better the splitting of the substance.

BV Deryagin found that the maximum effect of dispersion in a liquid medium is observed when adding 0.4-0.6 ml of liquid per 1.0 g of solid matter (40-60%).In accordance with this, in the technology of drugs there is the Deryagin rule: for fine grinding of a solid powdered substance, liquid is taken in half the amount of its mass.

Stabilization of suspensions. Aggregative stability of a suspension is acquired when their fractions are coated with solvation shells consisting of

molecules of the dispersion medium.Such envelopes prevent the coarsening of particles, being a stabilization factor for dilute suspensions.

In order to increase the stability of suspensions of hydrophobic substances that do not form protective layers of hydrates on their surface, they should be lyophilized, that is, they should add a hydrophilic colloid (stabilizer), thus the Messages-wettability properties.Natural or synthetic high-molecular substances are used as stabilizers: gum, proteins, gelatose, vegetable mucus, natural polysaccharide complexes, methylcellulose, sodium carboxymethylcellulose, polyvinylpyrrolidone, polyglucin, tweens, Spen, bentonites, etc.

The ratio between the solid phase of the suspension and the protective IUD depends on the degree of hydrophobicity of the drug and the properties of the protective substance, hydrophilicate

Methods for the preparation of suspensions.

Suspensions of medicinal substances are prepared in two ways:

- ***dispersive***
- ***condensation***

DISPERSION METHODS

The basis of the dispersion method is the principle of obtaining a certain degree of dispersion by grinding powdered drug substance.

In the preparation of suspensions by the dispersion method, large particles (coarse suspensions) are released, and in the preparation of suspensions by the condensation method, small particles (thin suspensions).

The technology of suspensions should include such technological methods that would ensure the preparation of suspensions with particles, finely dispersed. Suspensions with a drug concentration of 3% or more are prepared by weight.

Preparation of suspensions by the dispersion method. Depending on what substances are included in the suspension (hydrophilic or hydrophobic), the method of dispersion will be different.

Hydrophilic substances include magnesium oxide, zinc oxide, starch, white clay, bismuth basic nitrate, etc.

To hydrophobic - camphor, menthol, thymol, sulfur, phenyl salicylate and other similar substances.

Preparation of suspensions with hydrophilic substances. When prepared in the suspension bath of hydrophilic substances, the solid medicinal substance is first triturated in a mortar in a dry form, and then (according to the Deryagin rule) with half the amount of liquid (by weight of dry matter). The resulting mixture in the form of a slurry (pulp) is diluted with water and poured into a vial for tempering.

Preparation of suspensions with hydrophobic substances. Get wait a suspension of hydrophobic substances by simple rubbing with a liquid fails. In such cases, hydrophobic substances are mixed with a hydrophilic colloid to form adsorption casings on the surface of solid particles, providing the suspension with the necessary stability.

For substances ***with mild hydrophobic properties*** (terpinehydrate, phenyl salicylate, sulfanilamide preparations, etc.) Apricot gum, gelatin, 5% methylcellulose or tween-80 are used as stabilizers.

For substances ***with pronounced hydrophobic properties*** (menthol, camphor, etc.) The number of stabilizers is increased by 2 times. The properties of these protective hydrophilic substances appear in the presence of water. For the formation of primary pulp, a quantity of water equal to the half sum of the preparation and the protective substance is required.

When preparing suspensions with hydrophobic substances, a special approach requires the preparation of sulfur suspensions, since it refers to special substances with pronounced hydrophobic properties. Sulfur is adsorbed on the surface of air bubbles and its fractions float to the surface in the form of a foam layer. The use of common substances for the stabilization of sulfur suspensions is not always advisable, since they reduce its pharmacological activity. As a stabilizer for sulfur suspensions for external use, potash or green soap is used per 1.0 g of sulfur, 0.1-0.2 g of soap. Soap is not used if the suspension includes salts of heavy or alkaline-earth metals, since this forms insoluble precipitates. It should also be borne in mind that medical soap is incompatible with acids.

Preparation of condensation method suspensions.

In pharmacy practice, widespread use in the preparation of suspension suspensions denational method. In this case, the following cases of the formation of suspensions are distinguished:

- due to chemical interaction;
- due to the replacement of the solvent.

The basis of the condensation method is the combination of molecules into larger particles — aggregates characteristic of suspensions.

Condensation method The preparation of suspensions is based on the preparation of highly dispersed particles of substances of the dispersed phase, which are in the molecular or ionic state. The process of formation of these compounds depends on a number of conditions: on temperature; on the concentration of solutes; from mix order.

In pharmacy conditions, such mixture-suspensions are most often released as a result of the reaction of exchange decomposition, more rarely due to the reaction of hydrolysis, redox and other reactions.

To obtain fine dispersions, it is necessary that the starting materials be in the state of dilute solutions or colloidal systems.

QUALITY EVALUATION, STORAGE AND IMPROVEMENT of suspensions

The evaluation of the quality of the suspensions is carried out according to the following parameters: homogeneity of particles of the dispersed phase, time of settling, resuspendiveness , dry residue.

Homogeneity of the particles of the disperse phase. Determined by microscopic bathing. There should not be heterogeneous large particles. The size of the particles should correspond to those specified in the private articles.

Defending time. By the size of the layered layer, when stored, they judge the stability of the suspensions. The lower the height of the layered layer, the greater the stability.

Resuspendiveness . In violation of the stability of the suspensions, they must restore the uniform distribution of particles in all volume after 24 hours of storage during shaking for 15-20 seconds, after three days of storage - within 40-60 seconds.

Dry residue. Determine in order to check the accuracy of the dosage of suspensions. To do this, measure the required amount of suspension, dry and set the mass of dry residue.

Deviation in the content of active substances in 1 g (ml) suspension should not exceed ± 10%.

All suspensions are dispensed in vials of colorless glass so that you can see the results of shuffle, with the additional label "Shake before use". Store suspensions in a cool place.

Now promising is the preparation of "dry suspensions" (in the form of powders or granules), which represent a mixture of medicinal substances with a stabilizer, sometimes with the addition of preservatives. Prepare them in factory conditions. Dry slurries are convenient for transportation, can be stored for a long time.

The main directions of improvement of suspensions include: the search for new stabilizers, preservatives; introduction of instrumental methods for assessing quality; development of means of small mechanization.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006

- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.

- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украіри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.

- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characteristics of suspensions	Give the definition of the suspension. Specify the requirements for suspensions. Describe the factors that affect the stability of the suspensions	1, 2, 3, 4 ,5,6
2.	Dispersion method for preparing suspensions	Indicate the main technological steps of preparing suspensions of hydrophilic and hydrophobic substances by the dispersion method.	1, 2, 3, 4 ,5,6

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of suspensions, both dosage form and disperse system.
2. Requirements for suspensions.
3. Cases of formation of suspensions.
4. Classification of suspensions depending on the composition and method of preparation.
5. Factors influencing the stability of heterogeneous systems.
6. Dispersion method for the preparation of suspensions with hydrophilic and hydrophobic drugs. Accept scalping .
7. The value of the Rebinder effect and the rules of Deryagin in the preparation of suspensions.
9. Assessment of the quality of suspensions, packaging rules, design and storage in accordance with the requirements of the regulatory and technical documentation.
10Condensation method for obtaining suspensions (chemical dispersion, solvent replacement).
requirements of normative and technical documentation.

8.2. Test tasks for self-control.

11. The pharmacist prepared a suspension consisting of 2 grams of streptocide. What amount of methyl cellulose should be used to stabilize the suspension?

A. 2,0
B. 0,5
C. 1.0
D. 5.0
E. 0,2

2. The pharmacist prepares a suspension containing 2.0 phenylsalicylate . Specify the optimal amount of methylcellulose required to stabilize the suspension:

A. 2,0
B. 1.0
C. 3.0
D. 4,0
E. 5.0

3. Suspensions are characterized by the following positive features:
A. The ability to correct the taste
B. Accurate dosage
C. The impossibility of their release in the form of dry semifinished products (granules)
D. Aggregate resistance
E. Sedimentary stability

4. The instability of the disperse system in the form of suspensions is positively influenced by:
A. Reduced viscosity of dispersed medium
B. Increased viscosity of dispersed medium
C. Minimum particle dispersion
D. Small magnitude of the difference between the density of the phase and the medium
E. Reduced temperature

5. To hydrophilic medicinal substances include:
A. Zinc oxide
B. Menthol
C. Terpinhydrate
D. Timol
E. Sulfur

6. To substances with expressed hydrophobic properties include:
A. Menthol
B. Magnesium oxide
C. Sulfur
D. Terpinhydrate
E. White clay

7. The method of preparation of suspensions depends on the properties of the substance that is part of their composition. Specify substances that have hydrophobic properties:
A. Terpinhidrat, fenilsalitsylat
B. Sulfur, Bismuth Nitrate Basic
C. Zinc oxide, white clay
D. Terpinhydrate, zinc oxide
E. Phanylsilicylate , talc

8. It is necessary for the patient to prepare a suspension consisting of 2 grams of menthol. What amount of 5% solution of methyl cellulose should be added to stabilize the suspension?

A. 4.0
B. 0,5
C. 1.0
D. 0,4
E 2.0

9. The pharmacist prepared a suspension with a hydrophobic substance. Specify the disperse system stabilizer:
A. Twin-80
B. Sodium chloride
C. A solution of hydrochloric acid
D. A solution of sodium hydroxide
E. Esilon

10. When preparing suspensions, the medicinal substance is triturated with a small amount of liquid. Specify its optimal amount according to Deryagin's rule , which is necessary for grinding 20 g zinc oxide.
A. 10 ml
B. 5 ml
C. 2 ml
D. 1 ml
E. 0.5 ml

8.3. Control materials for the inmate of the busy stage:
Test:

1. Sustainability of suspensions increases when substances are added to them, which increase the viscosity of the dispersion medium. Specify the substances that have these properties.
A. Glycerin
B. Water is purified
C. Ethyl alcohol
D. Dimexid
E. Ether

2. Seed-up stability is directly proportional to:
A. Viscosity of the dispersion medium
B. Radius of particles
C. The values of acceleration of free fall
D. Differences in the value of the density of the disperse phase and the dispersive medium-high
E. Storage time

3. To obtain a stable dispersion system, the stabilizer needs to be added up to:
A. Terpinhydrate
B. Ichthyol
C. Protargol
D. Bismuth of basic nitrate

E. Krohmaly

4. By mass, water suspensions are prepared with the concentration of medicinal products:

A. 3% and more
B. 1% or more
C. Up to 2%
D. 2% or more
E. Up to 5%

5. Completeı: There is no stage in the manufacture of slurries ...

A. Filtration
B. Shredding
C. Mixing
D. Packings
E. Registration

6. The pharmacist prepared a suspension by a method of scabbing. With which of the listed substances he prepared the drug:

A. Bismuth nitrate is basic
B. Menthol
C. Sulphadimezin
D. Sulfur is precipitated
E. Starch

7. The assistant prepared a slurry by condensation method. Which of the following substances form a sediment:

A. Calcium chloride with sodium bicarbonate
B. Caffeine: Sodium benzoate from zinc oxide
C. Sodium Bromide with Camphor
D. Potassium bromide with sodium benzoate
E. Magnesium potassium sulfate with iodide

8. The pharmacist has prepared a suspension of sulfur. Specify which stabilizer to use:

A. Soap medical
B. Lanolin
C. Gelatosis
D. Starch solution
E. The methylcellulose solution

9. The pharmacist prepared a suspension of hydrophobic substance, for which he took an equal amount of 5% solution of methyl cellulose. Specify this substance:

A. Phyenylsalicylic acid
B. Zinc oxide
C. Timol
D. Talc
E. Sulfur

10. Indicate which basic suspension quality indicator is to be checked in accordance with the requirements of the DF:

A. Resuspendiveness
B. Transparency
C. Volume
D. Color
E. Thermal stability

Topic 10 «Emulsions»**– 5 hours.**

1. Relevance of the topic:
Recently, interest in emulsions has increased significantly. Emulsion dosage forms are promising for use in medicine, since they can combine fluids that do not mix, mask an unpleasant taste, regulate the bioavailability of medicinal substances, eliminate the irritant effect of certain medicinal substances, which is the reason for the practical need to study this topic.

2. Specific objectives:
- to learn how to prepare oil emulsions for internal use with different ingredients, evaluate their quality and arrange for the dispensing..

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;

II.	***The following disciplines*** 1. Organization and economics of pharmacy.	General technology of liquid dosage forms for internal use	Calculate the medicinal, auxiliary substances and purified water
	Tech industrial production of drugs	Technology solutions for internal use	Technological stage production solutions for internal use
	Biopharmacy	Theoretical fundamentals and production processes processing medicinal funds in medicinal drugs, their standardization, storage and release.	Make calculations medicinal, auxiliary substances and water purified .
III	***Intersubjective integration*** Injection solutions and eye drops	Preparation of solutions mass-volume method	Conduct calculations of the amount of dry matter and water

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Emulsions - homogeneous type of dosage form, consisting of mutually insoluble finely dispersed liquids, intended for internal, external or parenteral use.

The particle size (droplets) of the dispersed phase in emulsions ranges from 1 to 50 microns. But more highly dispersed systems can be prepared.

Emulsions as a dosage form have their positive and negative qualities.

Positive qualities include:

- ability to assign in one means liquids do not mix, which is very important for the accuracy of their dosing;
- with the fragmentation of oil increases its free surface, which contributes to higher speeds th the action of medicinal substances dissolved in it, and also accelerates the process of hydrolysis of fats by enzymes of the gastrointestinal tract, leading to a more rapid therapeutic effect;
- in emulsions it is possible to alleviate the irritating effect on the gastric mucosa of certain medicinal substances;
- there is the possibility of masking the unpleasant taste and smell of fatty and essential oils, resins, balms and some medicines, it is easier to receive viscous oils that are poorly dosed;
- emulsions are valuable drugs in pediatric pharmacotherapy.

Negative qualities include:

- low stability, as they quickly collapse under the influence of various factors;
- emulsion is a favorable environment for the development of microorganisms;
- the relative duration of preparation (this requires appropriate technological methods, practical experience)
- the need to use emulsifiers to keep the phase in a dispersed state.

for preparations emulsions use peach, olive, sunflower, castor, vaseline and essential oils but also fishes "bovine fat, balms and others liquids NOT are mixed with water emulsions have be stabilized emulsifiers.

Types of emulsions. Two liquids do not mix, they can form two types of emulsions depending on which of the liquids will be turned into a dispersed phase and a dispersion medium. There are emulsions of the type oil-water (B / B) and water-oil (B / O).

In the I / B emulsions, the dispersion medium is water, and the dispersed phase is fatty or essential oils, balsams and other hydrophobic liquids. In B / O emulsions, oil is the dispersion medium, and water is the dispersed phase.

For internal or parenteral use, emulsions B / B are used, for external use - both B / B and B / O emulsions.

Emulsions of the type M / B are also called direct, or of the first kind (which are washed away with water), and of the type B / O are called reverse, or of the second kind (indelible with water). These types of emulsions differ significantly in their properties and formation conditions.

Emulsions - thermodynamically unstable systems. The task of preparing stable emulsions comes down mainly to finding the most effective emulsifier for this combination of components.

Emulsifiers - it is diphilic surfactants, oriented distributed on the interface of two liquids.

The mechanism of the stabilizing action of emulsifiers is that they, adsorbed on the phase boundary, reduce surface tension and accumulate at the interface, and most importantly, enveloping the droplets of the substance dispersed, form an adsorption film, which has mechanical strength, prevents the formation of large particles, the merging of droplets in a continuous layer (coalescence) and imparts emulsion resistance (it seems to arm the drops of the dispersed phase). School of academic Rebinder experimentally proved that the film formed - the main factor in the stabilization of emulsions.

The type of emulsion formed depends on the solubility of the emulsifier in one phase or another. The dispersion medium becomes the phase in which the emulsifier preferentially dissolves. Thus, to obtain stable emulsions of the M / V type, it is necessary to use hydrophilic emulsifiers - gum, proteins, alkaline soap, mucus, pectins, saponins, some plant extracts, polyoxyethylene glycol, and esters of higher fatty alcohols, acids, Spen (tween-80, OS preparation- 20) and others.

TECHNOLOGY OF EMULSIONS.

Oil emulsions are prepared by grinding an emulsifier with emulsified liquid and water in a mortar. If the emulsifier in the recipe is not specified, then the pharmacists at their discretion, given the purpose of the emulsion, the physico-chemical properties of the ingredients included, select the appropriate emulsifier.

It should be borne in mind that the emulsifier will have a proper emulsifying action only if the emulsifier, water and oil are taken in certain quantities.

In the absence of indication of the oil in the emulsion, use peach, olive or sunflower. In the absence of instructions on the concentration for the preparation of 100.0 g of the emulsion take 10.0 g of oil.

The preparation of oil emulsions consists of two stages:

· Getting the primary emulsion (housing)

· Breeding primary emulsion required amount of water.

Getting the primary emulsion - the most crucial moment of the preparation of the emulsion. If the emulsion does not come out, and after adding water you can see large drops of oil, then you should not correct it, but you need to cook it again.

When preparing the primary emulsion, it is necessary to adhere to certain technological receptions:

1. An emulsifier is first added to the mortar, which is thoroughly ground, and then oil and water are added.

2. The pestle must be rotated in a spiral with vigorous mass rubbing all the time in one direction. When the pestle moves in a viscous medium in one direction, the oil particles are drawn into the threads, which, when torn, allow the droplet to be coated with an emulsifier shell. If the movement of the pestle is done in different directions, then the stretching of the oil in the yarn decreases, and the balls formed in this process collide and coalesce, the process of dispersing becomes difficult. The pestle should be kept so that it collides with the walls of the mortar as much as possible. He must not only rub the emulsified mixture, but also drive air into it.

3. In the preparation of primary emulsions, it should also be borne in mind that very cold oils (at temperatures below 15 ° C) can be emulsified with difficulty. In such cases, the oil is slightly heated.

4. For a better mixing of the ingredients that make up the primary emulsion, it is recommended several times to collect a thick mass from the walls of the mortar and pestle with the celluloid plate in the center of the mortar.After this, gradually with stirring, add the amount of water remaining.

Three methods can be used to obtain the primary emulsion.

Continental (Bodrimont method). An optimum amount of emulsifier is placed in a dry mortar and thoroughly triturated, then the oil is added and the oil is mixed with the emulsifier with a uniform movement of the pestle until a homogeneous mass is obtained, and oleozol is formed. To this mixture, water is added dropwise in an amount equal to half the sum of the mass of oil and emulsifier, and the grinding is continued until a characteristic crackle.

In this case, the mixture takes the form of a creamy mass, and when applying a drop of water, which is lowered along the wall of the mortar, it leaves a white mark, which indicates that the primary emulsion is ready and there is no free oil surface. If the primary emulsion is not ready, then a drop of water deposited on its surface does not spread.

After the end of emulsification, it is advisable to leave the obtained primary emulsion alone for about 5-10 minutes to destroy the reverse type emulsion, it is always formed, and then stirred again. By this method, the emulsion works well only if the mortar and emulsifier are dry. If the emulsifier is wet, the oil will not be able to moisten it.

English way. An optimal amount of emulsifier is placed in the mortar, which is triturated, and then mixed with water until a homogeneous mass is obtained, and hydrosol is formed. An oil is added dropwise to this mixture with thorough stirring. When all the oil has been borrowed, the rest of the water is added to the primary emulsion.

This method is laborious in its execution, however, practice has shown that it gives good results. In this case, the emulsions are of good quality, even if the mortar and emulsifier are not sufficiently dry, which is very important, and especially if you have to work with an emulsifier such as gelatose, which is very hygroscopic and always contains moisture.

Russian way. The optimal amount of emulsifier is placed in the mortar. Water is weighed into a porcelain cup, and oil is weighed onto the surface of the water, the mixture is poured into a mortar and ground to a primary emulsion. This method is quite simple and convenient when the emulsion does not include substances soluble in oil.

The readiness of the body is determined by the appearance - the mixture has the appearance of a creamy mass, and when a drop of water is poured down the mortar wall, it leaves a white mark, which indicates that there is no free oil surface. If the primary emulsion is not ready, then a drop of water deposited on its surface does not spread.

Dilution of the primary emulsion. The finished primary emulsion is diluted with the necessary amount of water to a given mass. When this water is added in several stages with stirring. If it is diluted too quickly with water, the phases of the emulsion may be destroyed or reversed. Therefore, dilution of the primary emulsion is done gradually with stirring. The finished emulsion is filtered, if necessary, through two layers of gauze into a calibrated vial for tempering and adjusted to the desired mass with water.

Properly prepared emulsion is a homogeneous liquid, resembles milk, with a characteristic odor and taste depending on the oil taken.

Calculate the number of components. In determining the mass of oil, water and emulsifier are guided by the following provisions:

· The amount of oil is determined by the words in the recipe;

· Amount of emulsifier - its emulsifying ability;

· Amount water for the formation of the primary emulsion - the solubility of the emulsifier in water.

Therefore, the recipe for obtaining the primary emulsion is different depending on the emulsifier used. For example, if gelatose is used as an emulsifier for the preparation of 100.0 g of emulsion, then 5.0 g of gelatose is taken for 10.0 g of oil, water is half the amount of the amount of oil and emulsifier (10 + 5): 2 = 7.5 ml. Water for dilution of the primary emulsion 100 - (10 + 5 + 7.5) = 77.5 ml
When using other emulsifiers for 10.0 g of oil is taken:
· 2.0 g tween-80 (in 2-3 ml of water);
· 2.0 g of potash soap;
· 10.0 g of dry milk (in solution from 10 ml of water);
· 1.0 g methylcellulose (in the form of a 5% solution - 20 ml)
· 5.0 g of starch (in the form of 10% paste - 50 ml)
· 1.5 g of emulsifier T 2 (15% by weight of the oil).

The solubility of the Twins depends on the length of the polyethylene oxide chains.

For example, in the preparation of an oil emulsion with tween-20 per 10.0 g of oil, an emulsifier is taken of 5.0 g, water is 7.5 ml (half the amount of the amount of oil and emulsifier). The emulsifier in this case is layered on the oil, and then water is added and ground. A primary emulsion is obtained, which is diluted to 100.0 m. In the same way, emulsions are prepared with tween-40 and tween-60.

Nowadays, in pharmaceutical practice, tweens are widely used (as solubilizers) to obtain transparent solutions of oils. Using tween-20, an aqueous solution of mint oil was obtained. Twin-60 dissolves pink and mint oils, twin-80 - pink and lavender.

Emulsions - homogeneous type of dosage form, consisting of mutually insoluble finely dispersed liquids, intended for internal, external or parenteral use.

Emulsifiers - it is diphilic surfactants, oriented distributed on the interface of two liquids.

ADDITION OF MEDICINES TO EMULSION.

The composition of oil emulsions often include various medicinal substances, the introduction of which can have a significant impact on the therapeutic effect of drugs. Therefore, it is necessary to take into account the properties of these substances, their concentration and quantity.

1. If medicinal substances are soluble in water, they are dissolved in a portion of the water intended for diluting the primary emulsion. The solution of these substances is added to the finished emulsion last. It is impossible to introduce them into the primary emulsion, since the destruction of the emulsion can occur due to the action of the electrolyte or a large concentration of the substance, salted out. The use of concentrated solutions is permitted if their volume is 1 / 2-1 / 3 less than the volume of water intended for dilution of the primary emulsion.

2. If the medicinal substances are soluble in oils (camphor, menthol, thymol, as well as fat-soluble vitamins, hormonal and other preparations), they are dissolved in oil until it is introduced into the primary emulsion.In this case, the amount of emulsifier is calculated taking into account the mass of the oil solution.

An exception to this rule is an intestinal antiseptic phenylsalicylate. It is not recommended to dissolve in oil because it is badly hydrolyzed into the intestine , resulting in an oily solution that does not exhibit antiseptic action.

3. If the medicinal substances are not soluble in water and oils, then they are added in the form of fine powders by thorough rubbing with a finished emulsion, if necessary, add the emulsifier in the required amount.

ASSESSMENT OF QUALITY, STORAGE AND IMPROVEMENT OF EMULSION

The assessment of the quality of the emulsions is carried out according to the following indicators: homogeneity of particles of the dispersed phase, time of flaking, thermal resistance, viscosity.

Homogeneity of the particles of the disperse phase. The size of the particles determined by microscopy should not exceed the rates specified in the private articles.

Time of flutter. The layers of emulsions are determined using a centrifuge. Emulsion is considered stable, if you do not observe the stratification of the system in a centrifuge with a speed of 1,5 thousand / min.

*Thermal stability of emulsions.*The emulsion is considered to be stable if it maintains a heating temperature of 50 ° C without stratification.

*Viscosity*in emulsions are determined by pharmacopoeial techniques using special devices - viscometers, etc.

When storing emulsions, their homogeneity as a result of defending may be affected. When defending the particles of the dispersed phase do not merge, but are collected in the upper layers, since the particles of oil dispersed, although coated with the adsorption shell of the emulsifier, but due to the fact that they are lighter than water, expose to the surface. This emulsion is easy to restore by vigorous shaking. Therefore, the emulsion, which is defending, is subject to the release, because defending - the process is reversible.

It is necessary to be able to distinguish between the process of defending the emulsion from the irreversible flutter process, which consists of slowly and gradually lowering the dispersion of the oil phase, if it is an O / B type emulsion, and an aqueous phase if it is an E / O type emulsion. When splitting first, the balloons of oil come to the surface, then begin to stick together (coalescence) into a solid mass, the liquids lay out, and such an emulsion can not be restored. Lamination is faster, the less rugged surface protective shell of balls (particles) of oil.

In accordance with this, the main trends in the improvement of pharmaceutical emulsions are increased physical stability and the prolongation of

the action of medicinal substances included in their composition. The most promising ways of extending the action of the medical substances included in the emulsions are the development of medicinal preparations based on multiple emulsions, as well as the modification of the physical and chemical properties of the dispersion medium by the introduction of hydrophilic solvents, solubilizers , etc.

In order to increase the stability of emulsions, it is expedient to use a complex of synthetic nonionic surfactants (emulsifiers O / V and B / O) that have a pronounced stabilizing effect. Equally important role in the stabilization of emulsions belongs to rational technology, which includes not only certain temperature regimes and the order of mixing of components, but also the use of modern equipment.

Therefore, the promising direction of development of emulsions is the introduction of means of small mechanization (dispersants, homogenizers, etc.); expansion of the range of stabilizers; introduction of instrumental quality assessment methods.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску

лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.

- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.

- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4
1.	Characteristics of emulsions	Give the definition of the emulsion. Describe the emulsifiers.	1, 2, 3, 4 ,5,6
2.	Technology of cooking oil emulsions	Specify the main technological steps of cooking emulsions using different methods.	1, 2, 3, 4 ,5,6

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of emulsions as a pharmaceutical form and disperse system, their classification.
2. SPh requirements for emulsions.
3. Types of oil emulsions and methods of their determination.
4. Characteristics of emulsifiers, IKi is used when cookingbath emulsions, their classification and mechanism of action.

8.2. Test tasks for self-control.

1. In the absence of a designation of oil in an emulsion, according to the instructions of the DF, the following are used:
   A. Peach
   B. Ritsinov
   C. Vaseline
   D. Mitya
   E. Balsam
2. What number oils and emulsifier(desires) necessary to take, in order to prepare150 ml oil emulsion?
   A. 15.0 and 7.5
   B. 10.0 and 15.0
   C. 7.5 and 10.0
   D. 10.0 and 5.0
   E. 1,5 and 0,75
3. According to the order of the Ministry of Health of Ukraine No. 197 dated September 7, oil emulsions are prepared:
   A. By weight
   B. Mass-volume method
   C. By volume
   D. With medicinal substances up to 3% - by mass-volume method, more than 3% by weight
   E. With medicinal substances up to 5% - mass-volume method, more than 5% - by weight
4. The pharmacist has prepared 150.0 emulsions. Specify the amount of oil he took if the doctor did not specify in the recipe.
   A. 15.0
   B. 10.0
   C. 30.0
   D. 5.0
   E. 20.0
5. The recipe contains 100.0 oil emulsion. Specify the amount of oil, desiccant, and purified water required for the manufacture of the primary emulsion by the continental method:
   A. 10.0; 5,0; 7.5 ml

B. 20.0; 10.0; 30 ml
C. 5.0; 10.0; 7.5 ml
D. 10.0; 5,0; 1.5 ml
E. 5.0; 5,0; 5 ml

6. The pharmacist prepared an emulsion of type o / v. Specify what determines the type of emulsion:

A. The nature of the emulsifier
B. Number of oils
C. Amount of water
D. Nature of medicinal substances
E. Method of administration of medicinal substances

7. A pharmacist prepares a 200.0 oil emulsion. Specify the scales that need to be used to weigh 20.0 peach oil:

A. Scales technical kilograms
B. Torsion balance
C. Scales manual twenty - gram
D. Scales manual stogram
E. Scales manually one - gram

8. A recipe came to the pharmacy:
Rp .: Emulsi oleos 100.0
Menthol 2.0
Misce. Da. Signa. 1 item l 3 times a day
As an emulsifier a pharmacist used desirable. How much of the purified water should be measured to prepare the primary emulsion?

A. 9 ml
B. 5 ml
C. 7.5 ml
D. 10 ml
E. 12 ml

9. The pharmacist prepared the primary emulsion and added to it a remnant of water to 100,0 - on a surface of an emulsion appeared greasy spots. What are his further actions?

A. Emulsion need to be re-prepared
B. Within 15 min. mix with a homogenizer type MR-302 and let go of the patient
C. Pour part of the emulsion, add 2 ml of potassium soap, shake and combine with the remainder of the emulsion
D.Add to the emulsion 20 ml of a 5% solution of methyl cellulose and shake
E. Paste the label "Before use shake" and release

10. The patient should prepare 100.0 emulsions containing 2.0 camphor. Specify the amount of desaturation required to prepare the emulsion:

A. 6,0 g
B. 12.0 g

C. 5.0 g
D. 1.0 g
E. 0 g

11. Identify a rational way of introducing into the emulsion of menthol:
A. Dissolve in oil
B. Disperse with the addition of a finished emulsion
C. Dissolve in water intended to dilute the primary emulsion
D. Dissolve in the final emulsion when heated
E. Enter into the finished primary emulsion

12. The pharmacist prepared an emulsion of zinc oxide. Specify a rational way of administering the substance:
A. Introduction to the type of suspension in the prepared emulsion
B. Solubility in oil
C. Shredding with water for dilution of the primary emulsion
D. Dissolution in water for the preparation of a primary emulsion
E. Dissolution in the ready emulsion

13.The doctor prescribed emulsion of olive oil, which includes anesthetic. Specify the anesthetic administration feature:
A. Dissolve anesthezin in oil before cooking the emulsion
B. Dissolve anesthezine in a finished emulsion
C. Dissolve anestezin in purified water
D. Dissolve anestezin in the primary emulsion
E. Dissolve in alcohol and add to the primary emulsion

14. The composition of the emulsion is injected zhelatozu. Describe the role played zhelatoza in emulsions.
A. Emulsifier
B. Preservative
C. Solvent
D. The taste flavor
E. Antioxidant

8.3. Control materials for the inmate of the busy stage:

Test:

1. A pharmacist prepared an emulsion of bismuth with basic nitrate. Specify which liquid he used to grind it:
A. Ready emulsion
B. Oil
C. Water purified
D. Ethyl alcohol
E. Vaseline oil

2. The pharmacist prepared 100.0 g of the oil emulsion, using as an emulsifier a 5% solution of methylcellulose. Specify the amount of oil and emulsifier required to prepare the preparation:

A. 10.0 g, 20.0 g
B. 20.0 g, 30.0 g
C. 10.0 g, 10.0 g
D. 10.0 g, 30.0 g
E. 20.0 g, 10.0 g

3. The doctor prescribed 300 grams of fish oil emulsion. How much fish oil should be weighed down by the pharmacist to prepare such an emulsion?

A. 30.0 g
B. 60.0 g
C. 15.0 g
D. 3.0 g
E. 0.3 g

4. The pharmacist has prepared 100.0 grams of oil emulsion. Specify the required amount of twin-80.

A. 2,0
B. 4,0
C. 6.0
D. 10.0
E. 1.0

5. According to the prescription of a doctor in the pharmacy, it is necessary to prepare an emulsion, which includes phenylsalicylate . How does a pharmacist need to administer a drug in an emulsion so that the drug does not lose pharmacological effect?

A. To grind under the rule of Deryagin with a finished emulsion
B. Rub with emulsifier and oil
C. Dissolve with finished emulsion
D. Dissolve in water for dilution of the emulsion
E. Dissolve in oil

6. The pharmacist has prepared oil emulsion. How does he need to enter a menthol?

A.Dissolve in oil at 40-50 ° C
B. Mix with the emulsifier and add purified water
C. Add to the finished emulsion
D. Enter the type of suspension into the prepared emulsion
E. Dissolve at 40-50 ° C in purified water

7. Emulsions, like heterogeneous disperse systems, can be stratified by various factors. Which of the following factors leads to the coalescence of emulsions most quickly?

A. Adding strong electrolytes
B. Adding an excess of emulsifier
C. Adding fragrant waters
D. Breeding with water
E. Insignificant temperature increase

8. The pharmacist has prepared emulsion. How to enter water-soluble substances?

A.Dissolve in the part of purified water intended for dilution of the emulsion

B. Dissolve in purified water, intended for the preparation of the primary emulsion

C. Put into an oil phase

D. Enter in the primary emulsion

E. Add to the finished emulsion

9. The pharmacist has prepared emulsion. How did he introduce water soluble substances?

A. Dissolve in the part of water for dilution of the emulsion

B. Added to the finished emulsion

C. Introduced into the oil phase

D. Introduced in the primary emulsion

E. Dissolved in water to prepare a primary emulsion

10. The pharmacist prepares the oil emulsion. Indicate the optimal method for introducing camphor to the drug:

A. Dissolve in oil

B. Dissolve in alcohol

C. Dissolve in water

D. Dissolve on air

E. Dissolve in glycerol

Topic 11 «Soft medical forms. Lineaments and ointments are homogeneous. Ointments combined. Ointments are heterogeneous. Ointments combined. Creams. Gels»**– 5 hours.**

1. Relevance of the topic:

Soft dosage forms: Liniment apply in of many areas of medicine. At the same time, anti-inflammatory, antibacterial, fungicidal and other means for application in dermatology, surgery, gynecology, combustiology, proctology, etc., receive primary development.

Ointment - are widely used in medical practice. Ointments are among the ancient dosage forms that are widely used in everyday life, in various industries, in cosmetics and medicine in order to protect the skin of hands and exposed parts of the body.

The scope of application of drugs in the form of soft dosage forms is constantly expanding. Ointments are used in 13 areas of medicine and belong to 30 pharmacotherapeutic groups. At the same time, anti-inflammatory, antibacterial, fungicidal and other means for application in dermatology, surgery, gynecology, combustiology, proctology, etc., receive primary development.

Soft dosage forms have high bioavailability and pharmacological activity. The foregoing necessitates the study of this topic.

2. Specific objectives:

- to learn how to prepare homogeneous, heterogeneous and combined liniments, evaluate their quality and arrange for the release.
- to learn how to prepare homogeneous, heterogeneous and combined ointments, evaluate their quality and arrange for the release.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
			Carry out fractional

	3. Physical and colloid chemistry. 4. Latin language 5. Pharmacy technology of drugs	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions. Basics of grammar. Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	distillation. . Be able to write Latin names of drugs and medicines. Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs Biopharmacy	General technology of soft dosage forms for external use Soft Drug Technology The technological process of making soft drugs.	Carry out calculations of medicinal, auxiliary substances. Technological stages of manufacturing soft medicinal Prepare soft drugs for external use, taking into account the physico-chemical properties of the ingredients.
III	***Intersubjective integration*** Injection eye medicinal forms	Preparation of Ointments	Calculate the amount of drugs and auxiliaries

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.

5. Content of the topic.

Liniment (or liquid ointment) **-** dosage form for external use, is a thick liquid or gelatinous mass, melt at body temperature.

Liniment takes an intermediate position between liquid and soft dosage forms: they are very close to other groups of ointments for the substances used, method of application, at the same time, the technological methods of preparation, the liquid consistency combine them with liquid dosage forms.

Name liniment comes from the Latin. linire - rub and indicates the method of use of this dosage form - by rubbing into the skin. This characteristic feature

distinguishes liniments from other groups of ointments and liquid dosage forms for external use (drops, washes, lotions).

The widespread use of liniments in medical practice is due to their advantages:

- medicinal substances from liniment are easily absorbed by the skin, that is, they have a high biological availability;
- in comparison with ointments, liniments are easier applied to the skin;
- fewer marks are left on the skin and clothes of the patient.

The disadvantages of this dosage form:

- low stability of a number of formulations;
- inconvenience of transportation.

Classification of liniments. There are medical and physico-chemical classifications (Figure 10). The therapeutic effect of liniments are analgesic, irritating (distracting), anti-inflammatory, astringent, dried, insecticidal, fungicidal

Classification of LINES:

1. By the nature of the dispersion medium:

Fatty L. pinquia seu olimenta

Alcohol L. spirituosa

Saponimenta soap-clay saplings

Vassylations Va solimenta

2. By type of disperse system:

Homogeneous (Solutions, Extractive)

Heterogeneous (Suspension, Emulsion, Combined).

2. According to the type of disperse system:

Homogeneous (solutions, Extraction)

Heterogeneous (Suspension, Emulsion, Combined).

By their physico-chemical nature, liniments are dispersed systems with a liquid dispersion medium. By the nature of the dispersion medium, the liniments are divided into fatty, alcoholic, soap-alcoholic, vazoliment.

Fatty liniments (Linimenta pinquia seu Olimenta) as a dispersion medium contains fatty oils or fat-like substances (lanolin). The most commonly used sunflower, flaxseed, castor oil. The composition of fatty liniments can include both liquid medicinal substances (chloroform, turpentine, ether, tar) and powder (camphor, menthol, novocaine, dermatol, etc.).

Alcohol liniments (Linimenta spirituosa) contain alcohol or tinctures (most often peppermint tincture), as well as various medicinal substances.

Soap-alcohol liniments (Saponimenta) as a dispersion medium contain alcohol solutions of soap. They can be liquid (if they contain potassium soap) or dense, gelatinous (if they contain sodium soap). When rubbed into the skin cause emulsification of sebum, so quickly penetrate into it, seizing medicinal substances.

Vazolimenty (Vasolimenta) are characterized by the presence of vaseline oil. Due to the chemical inertness of vaseline oil, they are quite stable during storage. Nowadays, soap-alcohol liniments and vazimentimentov are rarely used.

According to the type of dispersed systems, the liniments are divided into homogenous and heterogeneous. To homogeneous include liniments-solutions and extraction, to heterogeneous - liniments-suspensions, emulsions and combined.

GENERAL RULES PREPARATION OF LINIMENTS

Liniments are prepared according to the general rules for the preparation of liquid dosage forms in accordance with the "Instruction for the preparation in pharmacies of dosage forms with a liquid dispersion medium."

Homogeneous liniments are usually prepared directly in a dry glass for the holidays. It should be remembered that thick and viscous liquids (fatty oils, tar, etc.), as well as liquids differing in density from water (ether, chloroform, methyl salicylate, turpentine), are released by weight.

Soluble medicinal substances are introduced into the composition of the liniments in accordance with their solubility in the prescribed components - dissolved in the solvent in which they are better soluble, and then mixed with the rest of the ingredients.

In the preparation of liniment suspensions, the medicinal substances insoluble in the prescribed liquids are ground in a mortar using the Deryagin rule, and then mixed with the liquid components. Since the dispersion medium in the liniment is thick, viscous, no surfactant is added to the suspension liniments if they are not prescribed by a doctor. The stability of the suspension is achieved due to the high viscosity of the medium.

Emulsion liniment prepared using emulsifiers according to the general rules for the preparation of emulsions. In some cases, emulsion liniment prepared in a glass for tempering, because the emulsion is formed easily. The volatile and odorous substances are added last.

TECHNOLOGY LINIMENTS

Liniment-solutions - these are transparent mixtures (real or colloidal solutions) of fatty oils with essential oils, chloroform, methyl salicylate, ether, skip and for nothing. Their composition may include various solids that are soluble in prescribed liquids: camphor, menthol, anestezin, etc.

Liniment suspensions - these are two-phase systems, which are thin suspensions of powdered medicinal substances insoluble in prescribed liquids.

Most often, they include the following substances: zinc oxide, talc, xeroform, calcium carbonate, starch, sulfa drugs. Glycerin, fatty oils, alcohol, water, etc. are used as the dispersion medium. Prepare them according to the general rules for the preparation of suspensions.

Emulsion liniments - These are two-phase systems, which can be an emulsion of type M / V or B / M. They consist of a mixture of greasy oils with

alkalis or containing soap solutions. Emulsifier or specified in the prescription in, or is formed as a result of the interaction of components that are part of the liniments. A typical example, which is an emulsion of the type M / V, - liniment is ammonia, or volatile.

Combined liniments - a combination of various disperse systems: emulsions, suspensions, solutions. Prepare them according to the general rules of preparation of separate disperse systems. Powdered medicinal substances are included in the combined lineaments, depending on their physical and chemical properties: soluble in oil - in the oil phase; soluble in water - in the aqueous phase to obtain an emulsion; insoluble in water or in oil - in the form of suspensions in ready-made emulsion.

QUALITY CONTROL, STORAGE AND IMPROVEMENT OF TECHNOLOGY LINERY IV

The quality control of liniments is carried out according to the deviation in the mass, as well as for the organoleptic parameters: homogeneity, absence of extraneous inclusions, count Ir, smell.

Pack linimenti usually in the bottle with three screeches, get screwed. In the case of pharmacology of pharmacology of licenses, all of them are taken from the cold, hooded from the light of others, who are not privately owned by private articles. Heterogeneous licenses are drawn up with the pre-registration label “Before the Victory Day.” Contents of consistency in wide-mouth bottles.

Improvement of the technology of liniments is carried out in several directions.

The use of means of small mechanization (equipment for the preparation of ointments UPM-2; mixer for emulsions and suspensions - SES; shredders of tissues RT-2; dispensers) allows not only to accelerate and facilitate the preparation of liniments, but in some cases, in the preparation of emulsion liniments and to increase them quality.

Increasing the stability of a number of prescriptions of liniments can be achieved by the proper selection and use of new emulsifiers, thickeners and so on.

Promoting the use of antioxidants (α-tocopherols, butyloxianisole, etc.) is promising to increase chemical stability, slow down the decomposition of lipophilic bases.

Reducing microbial pollution contributes to the introduction of lineaments of preservatives (benzyl alcohol, nipagin, nipazole, sorbic acid) and the development of new types of packaging.

Ointments **-** a soft dosage form, designed for application to the skin, wounds or mucous membranes. Ointments consist of bases and medicinal substances, evenly distributed in it.

Shepherd - it's ointment with in city of dry substances more than 25%.

By consistency are distinguished: liquid ointments (or liniments), creams, gels, ointments, dense ointments - pastes, dry ointments, semi-finished products, intended for water or fats.

By the type of disperse systems (depending on the degree of dispersion of the drug substance and the nature of its distribution in the basis) distinguish homogeneous and heterogeneous ointments.

Homogeneous ointments - these are systems characterized by the lack of a phase-to-surface interface between the drugs and the base of the ointment.

Heterogeneous ointments - these are systems that have a phase separation with different boundary layers. These include suspension (or triturative) emulsion and combined ointments.

By type (nature) of ointment bases distinguish ointments, prepared on: hydrophobic (lipophilic), hydrophilic and difluent (hydrophilic-lipophilic) bases.

GENERAL RULES FOR PREPARING MILK MEDICINAL PRODUCTS (MASSES, PASTE, GELES, KREMS)

The main technological task during the preparation of ointments is the uniform distribution of medicinal substances in the basis, which provides the necessary therapeutic effect.

The preparation of ointments consists of several successive technological steps: melting, dissolving, dispersing, emulsifying, mixing, packaging, putting into circulation.

In the absence of instructions on the concentration of the drug in the prescription, the ointment is prepared for 10% or according to a separate article. In the absence of guidance on the basis for its application, it is chosen taking into account the physicochemical properties of medicinal substances, the compatibility of the components, the prescription of the drug, and others like that.

Introduction of medicinal substances in the ointment carry out taking into account their physical and chemical properties and prescribed quantities.

Medicinal substances, insoluble in water, not in the base (zinc oxide, bismuth nitrate basic, white clay, dermatol, norsulfazol, sulfur, streptocide, talc, etc.). As a rule, they are introduced into suspension ointins in the form of powders, crushed to the maximum degree of dispersion. In the suspension ointment, water soluble substances are also introduced, which require a significant amount of water to dissolve (sodium tetraborate, boric acid, sulfanilamide preparations, etc.). This also applies to substances that are difficult to dissolve in fats.

Medicinal substances soluble in water (salt of alkaloids, potassium iodide, novocaine, silver nitrate, etc.), in They mainly use emulsion ointments, dissolving them in a minimum amount of water.

Preparation of homogeneous ointments.

Ointment solutions are prepared by dissolving the medicinal substances in the ointment. If the medicinal substances are prescribed in an amount up to 5%, then they are dissolved when rubbed with equal quantities of the same type with the base of the liquid, and then mixed with the base.

If the medicinal substances are prescribed in a concentration of more than 5%, they are dissolved in an equal amount of molten base (warmed mortar or porcelain cup), and then mixed with the base residue.

Oils-alloys are prepared by fusion of components in a water bath in a porcelain cup. First of all melt more refractory substances and to the obtained melt add other ingredients in order of decreasing melting temperature; the liquid components add in the last turn; get the ointment, if necessary (when cooking the intra-pharmacy preform - be sure), filter through a gauze in a heated mortar and mix until cool.

The volatile substances are added to the semi-cooled base.

Examples of ointments-sp lava: Spermacetova Ointment (Unguentum Cetacei) - an alloy of 1 part of wax with 2 parts spermacet and 7 parts of peach oil; ointment diahilic and (Unguentum Diachylon) - an alloy of equal parts of lead plaque and petroleum jelly; official ointment naphthalene and (SPh IX, item 728) and others.

Ointment extractive are getting extraction acting substances from raw materials vegetable or animal origin molten basis or vegetable oil. The resulting extractor is filtered and stirred until the ointment is cooled completely.

Pasta - it is ointment with at city of dry substances more than 25%.

Consistency distinguish between: liquid ointments (or liniments), creams, gels, actual ointments, dense ointments - pastes, dry semi-finished ointments, intended for dilution with water or fats.

By type of dispersed systems (depending on the degree of dispersion of the medicinal substance and the nature of its distribution in the base) there are homogeneous and heterogeneous ointments.

Homogeneous ointment - these are systems that are characterized by the absence of an interfacial interface between the medicinal substances and the base of the ointment.

Heterogeneous ointment - These are systems that have phase separation with different boundary layers. These include suspension (or trituration), emulsion and combination ointments.

By type (nature) of ointment bases There are ointments prepared on: hydrophobic (lipophilic), hydrophilic and diphilic (hydrophilic-lipophilic) bases.

GENERAL RULES PREPARATION OF SOFT MEDICINES (OINTMENTS, PASTES, GELS, CREAMS)

The main technological task during the preparation of ointments is the uniform distribution of medicinal substances in the base, provides the necessary therapeutic effect.

The preparation of ointments consists of several successive technological stages: melting, dissolving, dispersing, emulsifying, mixing, packaging, and dispensing.

If there is no indication in the prescription on the concentration of the medicinal substance, the ointment is prepared 10% or in accordance with a

separate article. In the absence of instructions on the basis for its application, it is chosen taking into account the physicochemical properties of medicinal substances, the compatibility of the component, the purpose of the drug, and the like.

The introduction of medicinal substances in the ointment carry out taking into account their physico-chemical properties and the quantities prescribed.

Medicinal substances that are insoluble neither in water nor in base (zinc oxide, bismuth nitrate basic, white clay, dermatol, norsulfazole, sulfur, streptotsid, talc, etc.). As a rule, they are introduced into the composition of suspension ointments in the form of powders, ground to maximum degree of dispersion. Water -soluble substances that require a significant amount of water to dissolve (sodium tetraborate, boric acid, sulfa drugs, etc.) are also added to suspension ointments. This also applies to substances that are hardly soluble in fats.

Medicinal substances soluble in water (salts of alkaloids, potassium iodide, novocaine, silver nitrate, etc.), AT lead mainly to the composition of emulsion ointments, dissolving them in a minimum amount of water.

Medicinal substances soluble in fats (camphor, menthol, thymol, chloral hydrate, crystalline phenol, anesthesin up to 2%, phenyl salicylate, etc.), are introduced into single-phase ointment solutions, dissolving them in a fatty basis.

Preparation of heterogeneous ointments and pastes.

Ointment suspensions prepared by dispersing medicinal substances, n e soluble neither in the base nor in the water, and their uniform distribution in the base.

Hardly soluble and water-soluble medicinal substances, which are prescribed in ointments in quantities of more than 5% (that is, to dissolve them, you must add a large amount of water) are also introduced into the composition of the ointment by type of suspensions.

Zinc sulfate and resorcinol in dermatological ointments are administered as suspensions.

Technological features:

1. If medicinal substances are prescribed in an amount of up to 5%, then they are thoroughly ground in a mortar, first in the dry state, and then with half the amount (by mass of substances) of the same type with the base of the liquid. To the thus ground medicinal substances add the ointment base and mix until homogeneous.

2. If the content of the prescribed substances in the ointment is from 5 to 20%, then they are carefully ground in a pre-heated mortar, first in the dry state, and then with half the amount (by mass of substances) of the molten base. Add in parts the remainder of the unmolten base and mix thoroughly. To reduce losses, small amounts of petroleum jelly (up to 5.0 g) are better than pidplavlavly directly in a heated mortar, large (more than 5.0 g) - in a porcelain cup in a water bath.

Z. Yakscho prescribed pastes, that is, suspension ointments containing more than 20% of the solid phase, they are prepared in a pre-heated mortar by mixing powdered medicinal substances with the entire molten base.

Typical representatives of suspension ointments are officinal and: mercury white xeroform ointment, zinc, etc.

The main formulations of trituration ointments differing in exceptional variety.

Pasta - These are ointments containing more than 25% of the solid phase.

They are characterized by a denser consistency. When the temperature of the human body paste only softens, not melting, and therefore may linger for a longer time on the skin. Depending on the destination paste are divided into dermatological, dental and dental.

If the quantity powders, incoming the composition of the paste is very large (more than 75%), then the phases can be reversed. The mixture begins to crumble due to the fact that the base ceases to be a continuous phase and turns into small particles, sticks to the particles of the powder, which turns from a dispersed phase into a dispersion medium.

GENERAL COOKING RULES EMULSION AND COMBINED OILS

Preparation of heterogeneous ointments

Ointment emulsion - These are heterogeneous systems consisting of two phases and have an interface between the phase and the medium.

Ointment emulsion they are prepared by dissolving the drugs in water, glycerin or alcohol, emulsifying the resulting solution and mixing the finished emulsion with the base.

Technological features:

1. Substances well soluble in water and prescribed in ointments in small quantities (up to 5%) are usually introduced into the ointment in the form of an aqueous solution, which is then emulsified with anhydrous lanolin. If water for dissolving medicinal substances is not indicated in the recipe, then it is calculated from the mass of water lanolin (30%). When prescribing in the recipe of lanolin (without specifying - water or anhydrous) always use water lanolin. Without a doctor's instructions, up to 5% of the total weight of the ointment can be added.

2. Protargol, Collargol, tannin is dissolved in water regardless of the prescribed amount, and then the resulting solution is emulsified with lanolin and mixed with the base. Protargol is better to first disperse with glycerin (1/2 by weight of protargol), and then dissolve in water.

Z. Dry and thick extracts are introduced into ointments in the form of a solution (1: 2) in an alcohol-water-glycerin liquid (1: 6: 3), which is then emulsified with lanolin and mixed with the base.

M / V type ointment emulsions are predominantly cooling ointments. They are characterized by a high content of water or aqueous solutions, which give these ointments softness, friability.

Being applied to the skin, these ointments have a soothing, cooling effect, depending on the evaporation of water. Cooling ointments are indicated for inflammatory processes, acute and subacute forms of eczema, dermatitis. The effect of emulsion ointments of type M / B is compared with the action of wet dressings.

Preparation of combined ointments

Technological features:

1. Combined ointments are prepared by combining ointments of various types of disperse systems (solutions, suspensions, emulsions, alloys), prepared according to general rules.

2. Combined ointments are prepared in one mortar, if necessary shifting the previously prepared part of the ointment to the edge of the mortar.

Z. Yakshcho. The ointment contains medicinal substances that form a suspension type of ointment. It is advisable to prepare an ointment suspension first in a mortar.

These ointments can be considered as mixed-type ointments consisting of separate types of ointments. Combined ointments are complex multicomponent ointments containing several medicinal substances with different physicochemical properties that require the preparation of various types of ointments: suspensions, emulsions, solutions, alloys.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkov, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.

• 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

- **Additional**

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.

- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украіри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська,

Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ pp	Main tasks	Directions	Responses (literature)
1	2	3	4

1.	Characteristic liniments	Give a definition of the concept liniment	1, 2, 3, 4 ,5,6
2.	Cooking technology liniments	What are the main technological stages of cooking? liniments	1, 2, 3, 4 ,5,6
3	Quality assessment, packing, design and storage rules liniments	Name the NTD and Quality Score liniments	1, 2, 3, 4 ,5,6
4	Characteristics of ointments	Give a definition of ointment	1, 2, 3, 4 ,5,6
5	Technology of preparation ointments	What are the main technological steps of cooking ointments?	1, 2, 3, 4 ,5,6
6	Evaluation of quality, packing rules, design and storage of ointments	Name the NTD and quality indicators of ointments	1, 2, 3, 4 ,5,6

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of liniments as a medicinal form and a disperse system, their classification.
2. Rules for making liniments of various disperse systems: solutions, suspensions, emulsions, combined.
3. Pharmacopoeia and complicated prescription of liniments.
4. To choose and substantiate the optimum technology of liniments on an individual record.
5. Classification of liniments depending on the physical and chemical properties of the ingredients and medical purpose.
6. Calculate the percentage content included in the prescription soluble in the basis of medicinal substances.
7. Calculate the amount of auxiliary substances for the preparation of the dosage form.
8 Assessment of quality, storage of liniments in accordance with the requirements of the normative and technical documentation, packaging and design for release.
9. Definition of ointments, their classification and requirements to them.
10. Classification of bases for ointments. Characteristics of the differential bases.
11. Requirements for ointment bases. Characteristics of hydrophobic and hydrophilic bases.
12. Characteristics of homogeneous ointments, rules of their preparation.
13. Characteristics of suspension ointments and general rules of their preparation.
14. The peculiarity of the preparation of suspension ointments depending on the percentage content of the solid phase.
15. Use of ointment concentrates in ointment technology. Means of small mechanization in technology of ointments.
16. Certified suppository ointment.
17. Paste, their classification. Features of the preparation of the dermis like that them and protective pastes.

18. Evaluation of the quality of ointments in accordance with the requirements of normative and technical documentation.

8.2. Test tasks for self-control.

1. What is the disperse system is the following lineament?
Rp.: Iodi 0.3
Paraffin 1 5.0
Spicy aethylici 95% 10 ml
Chloroformium 80.0
Misce Da Signa for warm dressings
A. Solution
B. Suspension
C. Emulsion m /in
D. Emulsion in / m
E. Combined system

2 To which prescriptions belongs the medicinal product - Vishnevsky's ointment?
A. Manual
B. Standard
C. Trunk
D. Extemporal
E. Non-standard

3 The pharmacy prepares the Rosenthal lineup.
Take: Yoda 1.0
Potassium iodide 2.0
Paraffin 20.0
Ethyl alcohol 70% 20 ml
Chloroform 130.0
Indicate the optimal method for dissolving iodine in the manufacture of such a liniment.
A. In the calculated amount of purified water dissolve potassium iodide, in the resulting saturated solution of potassium iodide dissolve iodine, add ethyl alcohol 95%
B. Dissolve iodine in ethyl alcohol 70%
C. In alcohol, 70% of potassium iodide is dissolved in ethanol, iodine is dissolved in the resulting saturated solution
D. Dissolve iodine in chloroform
E. Iodine is added at the end to the finished quote

4 Specify what you can replace the castor oil in the Vishnevsky line:
A. Fish oil
B. Sunflower oil
C. Skipper
D. Peach oil
E. Almond oil

5. The pharmacist has prepared the preparation by the name:
Take it: Drink
Xerox by 3.0
Ricin oils up to 100.0
Mix up Give it Mark Balsamic liniment for Vyshnevsky.
Specify the type of disperse system:

A. Liniment is a suspension
B. Liniment is combined
C. Liniment - emulsion
D. Liniment - a solution
E. Liniment is extractive

6 The pharmacist prepared the Vinnyts'kyj line-up. Specify a rational way of administering xerophore:

A. In a bottle, mix with oil
B. In a mortar disperse with oil
C. In a mortar disperse with alcohol alcohol
D. Grind in a mortar with half the amount of tar
E. In a vial mix with oil and tar

7 The pharmacist has prepared a suspension lineament. Indicate the rational way of introducing dry substances that are insoluble in the base:

A. In a bottle for leave we weigh dry substances and add liquid components
B. Measured in the mortar liquid components and added dry matter
C. Disperse in a mortar according to the rule of Deryagin with liquid components
D. Mix in a stand with liquid components
E. Dry the solids in a evaporating cup and mix with liquid components

8 A pharmacist prepares an ammonia (volatile) liniment. Specify which components are included:

A. K-th olein, sunflower oil, 10% ammonia solution
B. K-tai oleinum, Vaseline oil, 10% ammonia solution
C. K-th olein, castor oil, 10% ammonia solution
D. Novocaine, chloroform, menthol, sunflower oil, 10% ammonia solution
E. Chloroform, turpentine, sunflower oil

9 The assistant prepared an ammonia liniment. What substance should I add to emulsification?

A. Acid stearin
B. Twin 80
C. 5% solution of methyl cellulose
D. Emulsifier T-2
E. Oleic acid

10 What type of lineament does it have?
Rp .: Ol. Helianthi 7.4
Sol Ammonia caustici 25 ml

Ac Oleinic 0.1
Mf linimentum DS For rubbing.

A. Line-emulsion type m / a
B. Combined liniment
C. Liniment-solution
D. Liniment-suspension
E. Emulsion lineament in / o

11. Specify hydrophilic ointment bases:

A. Silicones, Vaseline, Lanolin, Hydrogenated Fats
B. PEG bases, cellulose ethers, starch gels, starch-glycerol, glycerol ointment
C. Yesilon-4, esilon-5, petrolatum with lanolin (9: 1 and 8: 2)
D. Artificial Vaseline, Pork Fat, Beef Fat
E. Ceresin, paraffin, spermaceti, tragacanth-glycerin gels

12. Specify lipophilic ointment bases:

A. Vaseline with lanolin, vaseline oil
B. Vaseline, paraffin, petroleum jelly, ceresin
C. Pork fat, beef tallow
D. Hydrocarbons, beef tallow, lard, silicones
E. Hydrogenate vegetable oils, ozokerite, artificial vaseline

13 If the recipe does not indicate which lanolin to use, then take?

A. Lanolin containing 30% water
B. Lanolin containing 5% water
C. Lanolin containing water in a ratio of 1: 2
D. Lanolin containing 10% water
E. anhydrous lanolin

14. A pharmacist prepared a lipophilic-based suspension ointment. Specify the substance that forms the ointment of the specified type:

A. Tannin
B. Herbal Extracts
C. Xeroform
D. Protargol
E. Menthol

15. A pharmacist prepared an ointment solution on a lipophilic basis. Specify the substance forming the ointment of this type:

A. Menthol
B. Novocain
C. Dermatol
D. Starch
E. Sulfur

16 A pharmacist prepares a superficial ointment. What basis should i use?

A. Vaseline
B. The basis of Kutumov
C. Pork fat

D. Vaseline - water lanolin
E. gelatin-glycerin gel

17 A pharmacist prepared a lipophilic-based suspension ointment. Specify the substance that forms the ointment of the specified type:
A. Protargol
B. Wax
C. Ichthyol
D. Potassium iodide
E. Bismuth nitrate basic

18. The pharmacist prepared the ointment. Specify the basis that is able to absorb skin secretions and has a cleansing effect:
A. Gelatin-glycerin
B. Polyethylene oxide
C. Vaseline
D. Spermaceti
E. hydrogenated fats

19. Medicinal substances readily soluble in water and discharged in small quantities are introduced into ointment bases in the form of aqueous solutions. Which of the listed substances require fractional go dissolving I in water?
A. novocaine and protargol
B. Novocain and Ephedrine Hydrochloride
C. Potassium iodide and Novocain
D. Ephedrine hydrochloride and etylmorphine hydrochloride
E. Potassium iodide and sodium thiosulfate

20. The pharmacist needs to prepare 200.0 lanolin water. Specify the required amount of purified water and anhydrous lanolin:
A. 3 ml and 197.0
B. 30 ml and 170.0
C. 60 ml and 140.0
D. 140 ml and 60.0
E. 170 ml and 30.0

21. The base, which contains aqueous lanolin, sunflower oil and petroleum jelly belongs to the group:
A. Hydrophilic
B. lipophilic
C. diphilic emulsion
D. Synthetic Combined
E. diphil absorption

22. By the type of formation of the emulsion system in the composition of the ointment on lipophilic bases enter:
A. Protargol
B. Bismuth nitrate basic
C. Camphor

D. Timol
E. Penicillin salts

23. A pharmacist has prepared an ointment. Specify the substance that is injected into the lipophilic base, heated to 40 ° C:
A. Camphor
B. Anestezin
C. Benzoic acid
D. Streptocide
E. Vinyline

24. Pharmaceutical technologist took a prescription for ointment. How did a pharmacist put in a dry substance? Rp.:Unguentum Resorcini 1.5% 10.0 Da. Signa. Apply to the affected skin.
A. Grated with a few drops of vaseline oil.
B. Rasterized in a mortar with a few drops of ethyl alcohol.
C. Rasterized portions of water.
D. Added to melted petroleum jelly.
E. Rasterized parts of petroleum jelly by the Deryagin rule.

25. Sunflower oil is used to disperse medicinal substances when introduced into the bases:
A. Pig fat and other fatty bases
B. gelatin-glycerin base
C. Vaseline
D. Vaseline - lanolin
E. Methylcellulose gels

26. The patient is prepared ointment for the nose, which contains protargol and glycerin. How should a pharmacist introduce protargol into ointment bases?
A. First grind with glycerol, and then mix with water
B. First grind with a base, then with glycerin.
C. Grind with water or alcohol
D. Pour a thin layer of water-glycerin mixture onto the surface
E. Grind with alcohol or ether

27. The patient needs to prepare 50.0 g of xeroform ointment. Amount of xeroform used by a pharmacist?
A. 5.0 g
B. 2.5 g
C. 1.0 g
D. 10.0 g
E. 0.5 g

28. A pharmacist put diphenhydramine in a diphilic ointment. How did he do it?
A. Dimedrol opened in a few drops of water, mixed with the base mixed
B. Shredded dry and mixed with ointment base
C. Raster Dimedrol under the Deryagin rule with a melted base
D. Diphenhydramine pounded with liquid, suitable to the base

E. Raster in a mortar with glycerin and added base

29. The pharmacist prepares the ointment on a hydrophobic basis. Is the substance needed to lower the melting point of the base?

A. Vaseline oil
B. Glycerol
C. PEG-400
D. Dimexide
E. Ethanol

30. The pharmacist prepares the ointment on a hydrophobic basis. Is the substance needed to increase the melting point and viscosity of the base?

A. Anhydrous lanolin
B. Vaseline
C. Paraffin
D. Naftalanska oil
E. Pork fat

8.3. Control materials for the inmate of the busy stage:

Test:

1. In the manufacture of liniment, a pharmacist in a vial for equal amounts of water measured the limestone, weighed the linen oil and shaved vigorously. Evaluate the correct technology choices:

A. The technology is correct, complies with the rules for making liniments, emulsions

B. The technology is wrong, because liniment should be cooked in a mortar

C. The technology is wrong, because the flaxseed oil needs to be dosed in volume

D. The technology is wrong, because the prepared liniment needs to be filtered

E. Technology is incorrect, because the cooked liniment must be sterilized

2 A pharmacist prepares a liniment-solution. Specify cookware for the liniment preparation:

A. Stand
B. Cylinder
C. Vacuum bottle
D. Mortar
E. Measured bulb

3 The pharmacist has prepared a prescription drug:
Take: Chloroform
Sunflower oil
Methyl salicylate by 10.0
Mix up Give it Mark To rub off
Specify the type of disperse system and dosage form:

A. Liniment - a solution

B. Liniment is combined
C. Liniment - emulsion
D. Liniment - a suspension
E. Liniment is extractive

4 A pharmacist needs to prepare liniment on peach oil. Specify a substance that will form a homogeneous system with oil:
A. Zinc oxide
B. Xerox
C. Camphor
D. Dermatol
E. Streptocide

5 The pharmacist needs to make a lineup of the word:
Take: Chloroform 10.0
Sunflower oil
Skipped to 20.0
Mix up Give it Mark Rub into the patient's joint
Specify the best technology option:
A. In a bottle for release weigh the turpentine, sunflower oil, measure chloroform, shake
B. In a bottle for letting weigh the sunflower oil, chloroform and turpentine, shake
C. In the bottle for release, weigh the components and strain into the stand, shake
D. In a bottle for leave, measure turpentine, sunflower oil, chloroform, shake
E. In a bottle for release weigh chloroform, sunflower oil, turpentine, shake

6 In the liniment containing linseed oil and lime water, novocaine must be added. Specify a rational technological approach for this:
A. Novokain dissolve in water limestone before cooking liniment
B. Dissolve novocaine in a finished emulsion
C. Dissolve novocaine in ethyl alcohol at a temperature of 30-400 ° C and add to the finished emulsion lineament
D. Dissolve novocaine in a minimum amount of ethyl alcohol and add to the finished liniment
E. Dissolve novocaine in lime water when heated in a water bath before making liniment

7. The pharmacist has prepared a suspension lineament. Specify the method of introducing dry substances:
A. dispersed count in a mortar rule Deryah and on liquid components
B. In a bottle we weigh dry substances and add liquid components
C. Measured liquid components in the mortar and added dry matter
D. Mix in a stand with liquid components
E. Dry the solids in the evaporating cup and mix with the liquid components

8. The assistant has prepared an ammonia liniment. What substance he added for emulsification.

A. Oleic acid
B. Stearic acid
C. Twin-80
D. 5% solution of methyl cellulose
E. Emulsifier T-2

9. A pharmacist prepares suspension lipids on a lipophilic basis. Specify the substance that forms the ointment of the specified type:

A. Wax
B. Ichthyol
C. Potassium iodide
D. Zinc oxide
E. Protargol

10. The pharmacist prepared 150.0 lanolin of water. Specify the amount of water purified and lanolin anhydrous:

A. 45.0 ml and 105.0 ml
B. 30.0 ml and 120.0 ml
C. 105.0 mL and 45.0 ml
D. 50.0 ml and 100.0 ml
E. 75.0 ml and 75.0 ml

11. The pharmacy got different bases for ointments. What kind of ointment bases are PEO?

A. Hydrophilic
B. Fatty
C. Silicones
D. Differential
E. Hydrocarbon

12. Indicate which of the listed substances is soluble in polyethylene oxide?

A. Streptocide
B. Dermatol
C. Gray cleared
D. Zinc oxide
E. Bismuth nitrate is basic

13. The pharmacist prepares an ointment on a hydrophobic basis. What type of ointment forms menthol?

A. Ointment - a solution
B. Ointment - Suspension
C. Ointment - emulsion
D. Extraction ointment
E. Ointment is an alloy

14.. It is necessary to make dermatological paste. Indicate how you need to introduce medicines based on paste?

A. Mix in mortar with glycerine and add melted base
B. In a warm mortar, disperse with alcohol and mix with the base
C. Grind with a fluid that is similar to the base
D. Grind with half the amount of solids by melted base in a warm mortar
E. Grind and mix with the base in a warm mortar

15. The pharmacy turned to the patient who needs to prepare a non- fat cream. What component is most often included in this cream:
A. Cerezine
B. Glycerol
C. Spermaceti
D. Polyvinyl alcohol
E. Vaseline oil

16. It is necessary to prepare a protective cream. What substance most protects the skin from harmful environmental factors?
A. Zinc oxide
B. Sodium chloride
C. Calcium chloride
D. Cotton oil
E. Almond oil

17. The pharmacy received a recipe for the preparation of streptocidal ointment without indication of concentration. In what concentration is it necessary to prepare an ointment?
A. 10%
B. 5%
C. 1%
D. 20%
E. 2%

18. Ointment of suspension type on l and pp and linen and This basis forms:
A. Bismuth nitrate is basic
B. Camphor
C. Anesthetic
D. Novokain
E. Dimedrol

19. The pharmacy turned to the patient who needs to prepare a zinc ointment. What amount of zinc oxide should be weighed by the pharmacist to make 25 grams of ointment?
A. 20.0 g
B. 12.5 g
C. 2.5 g
D. 5,0 g
E. 1,25 g

20. The pharmacist prepared the ointment. Specify the substance that is injected into the lipophilic base, heated not higher than 40 ° C:

A. Dermatol
B. Xeroform
C. Menthol
D. Salicylic acid
E. Novocain

21. In the manufacture of protargol ointment, the pharmacist made a mistake when introducing the ingredient into the base. How to enter protargol in the base?
A. Grind in a mortar with petroleum jelly
B. Grind in a mortar with water
C. Grind in a mortar with glycerin, then with water
D. Grind in a mortar with vaseline oil
E. Grind in a mortar with lanolin

22. Specify which of the following substances should be administered as an aqueous solution in soft dosage forms to preserve the pharmacological effect?
A. Novocain
B. Furacilin
C. Resorcin
D. Camphor
E. Akrikhin

23. The pharmacist must prepare a drug of the following composition:
Take: Ointment of resorcinol 1.5% - 10.0
Give. Mark. Apply to the affected skin.
Specify how to introduce the dry matter in the ointment bases?
A. Grind parts of purified water
B. Grind with a few drops of vaseline oil
C. Grind in a mortar with a few drops of ethyl alcohol
D. Add to melted vaseline
E. Grind portions of petroleum jelly by the rule of Der I Gin

24. The pharmacist must prepare 10% ointment with xeroform. Specify the best technology option:
A. Mix xeroform with neroztoplenoyu base
B. dissolve xeroform in water and mix with base
C. Crush xeroform in dry form and add to base
D. emulsifying xeroform with all melted base
E. disperse the xeroform with ½ part of the amount of the substance of the molten base, then mix it with the rest of the neuro-topographic base

25. A pharmacist prepares a combination ointment. In what sequence does it prepare?
A. Ointment suspension - ointment solution - ointment emulsion
B. Ointment solution - ointment suspension - ointment emulsion
C. Ointment solution - ointment emulsion - ointment suspension
D. Ointment emulsion - ointment suspension - ointment solution
E. Ointment emulsion - ointment solution - ointment suspension

26. Choose the scheme of introduction dikaina in the ointment:
Take: Dikaina 0.05
Ointment glycerin 10,0
Mixture to form ointment
Give a few. Ointment for the nose.

A. Dicaine is first diluted with a few drops of water, then emulsifying, and added in portions to the finished glycerin ointment

B. Dikain grind with a few drops of glycerin and add to the finished ointment

C. Dicainum is dissolved in 0.5 ml of purified water and mixed with the prepared starch-glycerin gel

D. Dikain enter the type of suspension, as it is a toxic substance

E. Preparing the ointment according to the general rules.

27. How is tannin introduced into hydrophobic ointment bases?

A. dissolved in a minimum volume of warm water

B. Dissolve in the minimum amount of vaseline oil.

C. Enter into the ointment base on the type of suspension

D. dissolved in molten hydrophobic base

E. Use hydrophobic ointment base

28. The doctor prescribed sulfur ointment for scabies. Specify the basics that you need to use for its preparation in a pharmacy:

A. Pork fat or emulsion base

B. Soap-glycerin or starch-glycerin

C. Lanolin or paraffin

D. Wax or Vaseline

E. Cocoa Butter or Butyrol

29. For the preparation of ointments using lipophilic bases. Specify the lipophilic base component that is representative of hydrocarbons.

A. Paraffin

B. Spermaceti

C. phytosterols

D. Combine

E. Efilon- 4

Topic 12 «Suppositories. Production of suppositories by a method of pumping. Sticks. Pills. Production of suppositories by pouring method»**– 5 hours.**

1. Relevance of the topic:

Suppository dosage forms have been known since antiquity. From a technological point of view, in the history of suppositories there are distinguished: the first period is the time before the introduction of cocoa butter, as suppository bases (approximately to the XVIII century), the second is the time of its indivisible predominance as the basis. And the third is the time for extensive searches for cocoa butter substitutes (present). Such a periodization in the history of the suppository is quite natural and necessary, since, on the one hand, the properties, the introduction of the suppository are mainly determined by the foundation, and on the other, the nature of the applied foundation as a whole is due to the development of pharmacy and medicine, progress in the development of medicines and their introduction into practice.

The importance of rectal suppositories as a means of rapid delivery of drugs in life-threatening cases has increased. Suppositories are available for the relief of hypertensive crises, spasm of blood vessels and bronchi, rapid recovery of heart rhythm and respiratory distress. In some cases, medicinal substances, administered as suppositories, enter the bloodstream faster than with subcutaneous administration, and have a therapeutic effect in smaller doses (estrogenic hormones). The promise of this dosage form becomes apparent when you consider that some medicinal substances taken orally are inactivated by the digestive juices and injure the gastrointestinal tract.

The rectal route of administration of medicinal substances is becoming increasingly widespread in the treatment of many diseases. Especially promising is suppositories in pediatric and geriatric practice, with the use of medications, the absorption of which in the application of per os and other ways is difficult to administer. Rational selection of suppository bases, the method of administering drugs and the method of preparation of the suppository allows you to create a high-quality drug. This explains the need to study this topic.

2. Specific objectives:

- to learn how to prepare suppositories by a method of pumping
- to study the methods of suppository preparation: manual shaping, pouring;
- use the GF and other regulatory documentation and reference books to search for the necessary information on the preparation of suppositories in the manner you use.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

	Know	**Be able to**

1. Prev Latin tongue	The basics grammar. Spelling Latin names of medicinal and chemical substances, medicinal plants, families and raw materials plant and animal origin. Recipe.	Assess the correctness of the recipe design.
Anatomy and physiology human	The structure and functional characteristics of the organism at different levels: molecular, cellular, organ, system.	Assess the functional state of the body as a whole and individual organs and systems
General and in organic chemistry	The main provisions of the atomic-molecular teachings. The processes that take place in aqueous solutions of electrolytes.	Calculate molar and equivalent masses of chemical compounds. To characterize the processes that take place in aqueous solutions of electrolytes.
Physics	Methods of analysis of drugs.	Determine the main indicators of the quality of liquid drugs: refractometry, polarimetry, mass spectrometry, UV, IR spectrophotometry, photocolorimetry.
Physical and colloid chemistry	Characteristics and properties of the high molecular weight compounds.The solubility of the high molecular weight compounds in liquids.	Determine the molar mass, the concentration of the substance solutions.
Organic chemistry	Physical, chemical properties of organic compounds and the main methods of their analysis.	To carry out elemental analysis and identification of organic compounds.
Analytic chemistry	Methods for the qualitative and quantitative analysis of inorganic and organic substances	Perform qualitative and quantitative analysis of individual substances and their mixtures, to carry out the necessary calculations according to the analysis.
2. ***The following discipline*** Organization and Economics of Pharmacy	General technology suppositories	Carry out calculations of medicinal, auxiliary substances
Industrial Medicine Technology	Soft Drug Technology	Technological stages of manufacturing soft medicinal
Biopharmacy	Technology suppositories	Prepare suppositories taking into account the physico-chemical properties of the ingredients.
3*. Intra-subject integration* Injection solutions and eye drops	Preparation of suppositories	Calculate the amount of drugs and auxiliaries

4. Questions for independent work in preparation for the lesson

1. The main regulatory and technical documents in the manufacture of medicinal forms.
2. Rules for the introduction of medicinal substances with different physicochemical properties into the base when using the casting method.
3. Technological stages of preparation of suppositories by pumping method.

5. Content of the topic.

Suppositories are solid at room temperature and such that dosage forms are melted or dissolved at body temperature.

Suppositories are both homogeneous and heterogeneous dispersed systems, so the main technological task is to distribute the most dispersed drugs evenly not only in the suppository mass, but in each candle, ball or stick, giving them the necessary geometric shape.

If the weight of the candle in the recipe is not specified, then in accordance with the instructions of the DF, they are prepared in weights of 3.0 g. In children's practice, the weight of the candle must be indicated in the recipe.

If the mass of vaginal suppositories is not indicated, they are prepared with a weight of at least 4.0 g. The size of the sticks should be indicated in the recipe.

Methods for the preparation of suppositories. Suppositories can be prepared by three methods: roll-out (manual forming), pouring into molds and pressing.

Preparation of suppositories using the method of spilling.

The casting method, being universal, allows you to prepare suppositories of the same shape using different bases, which is impossible with other methods. The cooking process is much faster, more hygienic, and the appearance of candles, balls and chopsticks is better compared to the download method.

As a disadvantage of this method, it is necessary to note the violation of the homogeneity of the mixture during freezing, especially due to liquids, do not mix with the bases and the solid phase.

The casting method consists of the following stages:

- preparing and melting the corresponding base;
- mixing prescribed medicinal substances with a molten base;
- preparing molds and casting cooked drinking cold mass to form;
- cooling;
- packaging;
- clearance.

When preparing suppositories by pouring out their mass depends on the size of the nest form (about volume) density of used drugs and bases.

In cases where medicinal substances are discharged in an amount of up to 5%, it is possible not to take into account a minor amount. Volume, which they occupy in forms. If medicinal substances are included in suppositories in quantities

of more than 5% (in this case, about Volume, which they occupy, displaces a significant amount of base), then it is necessary to find the exact ratio between the volume occupied is registered medicinal substance, and the basis.

Otherwise, dosing accuracy is impaired.

This ratio is expressed by a “replacement rate” or “inverse replacement rate”.

The replacement ratio (Hedgehog) refers to the amount of drug substance as but replaces one weight part of the fat base with a density of 0.95.

That is, a given amount of drug substance takes the same Volume, as one weight part of the fat base.

Preparation of suppositories in hydrophilic bases.

Candles, as a rule, are prepared on a soap-glycerin basis, and gelatin-glycerin base is used more often for the preparation of vaginal suppositories. Prepare them only by casting.

Soap-glycerin suppositories are used as a laxative, so other medicinal substances are not included in their composition.

The introduction of drugs in hydrophilic bases.

1. Medicinal substances soluble in water or glycerine are not first dissolved in a portion of the water or glycerin used to make the base, and then added to the molten base ready for pouring into the mold.
2. Medicinal substances that are not soluble in water or in glycerol, first triturated with a portion of the glycerin in a thin suspension, and then added to the finished, molten base before pouring into the form.
3. Medicinal substances, soluble in polyethylene oxide base or collagen gel, are injected directly into the molten part or the entire base (gel), followed by stirring and pouring the finished homogeneous mass into the forms. Insoluble substances are first triturated with the liquid part of the base, and then they are mixed to the whole mass and poured into molds.

QUALITY ASSESSMENT AND STORAGE

The quality of the prepared suppositories is evaluated in the same way as other dosage forms, that is, they check the documentation (recipe, passport, packaging, design, color, smell, absence of mechanical inclusions).

Specific to the quality of suppositories are: size, shape, which should not correspond to the recipe recipe.

Uniformity of mixing - on the slice of the suppository mass should be homogeneous, without inclusions, the presence of an air core or a funnel-shaped recess is allowed.

The weight of the candles should be in the interval indicated by the State Fund XI. The deviation in the mass of individual candles should not exceed ± 5%.

Ready su n pozitornih dosage form should have s certain rigidity to ensure their use, otherwise they will become useless because they can be deformed in the patient's hands before they are used.

For suppositories prepared on hydrophobic bases, the melting point is determined by method 2a (SPh XI, vol. I, p. 18), which should not exceed 34 ° C, unless otherwise indicated in its own articles. If it is difficult to determine the melting point, then the time of complete deformation is determined using a special device.

Water is supplied to the cabinet with a constant temperature (37 ° C). Into the tube, pour 15 ml of water so that part of it, below the restriction, is filled and held up by a device to equalize the temperature of all its parts for 5 minutes. Then the suppository is lowered into the tube with a pointed tip down, a rod is placed on top of it and a stopwatch is inserted. Mark the time during which the rod will immerse itself to the mark (zero division). This time is taken during the deposition of suppositories, should be within 3-15 minutes. The rod should be lowered only under the influence of its weight.

For suppositories prepared on hydrophilic bases, determine the time of dissolution. To do this, one suppository is placed on the bottom of a vessel with a capacity of 100 ml containing 50 ml of water with a temperature of 37 ± 1 ° C. The vessel is shaken every 5 minutes so that the liquid and the sample gain a rotational movement.

The suppository should dissolve within 1:00, unless otherwise indicated in its own articles.

Determination of the quantitative content and uniformity of dosing of active substances should be specified in their own articles.

Suppositories stored in a cool dry place, unless otherwise indicated in their own articles.

After the manufacture of fat candles and balls, they are wrapped in waxed paper, cellophane or foil, and a gel-like candle is wrapped in waxed or waxed paper. Balls, pessaries are placed in cardboard boxes in corrugated caps, and packs in the folds of paper. Decorated labels "External", "Store in a cool dry place."

On packets of suppositories made on a polyethylene oxide basis, there should be an indication of the need to moisten suppositories before entering the body cavity.

The structural and logical scheme of technology and quality control of suppositories is presented in Scheme 15.

TECHNOLOGY IMPROVEMENT

Improvement of suppository technology is carried out both in the direction of expanding the assortment of suppository bases, improving their quality, and creating new dosage forms, for example:

- Empty suppositories that have a cavity inside to fill it in the pharmacy with medicinal substances. The lack of previous suppositories - when the base is melted on the mucous membrane, highly concentrated solutions of medicinal recichovine can get into, which leads to its irritation;

- Two-layer and multi-layer suppositories consisting of a shell and a rod. The latter can be prepared from low-melting fats with dispersed substances, the shell - from alloys of hydrogenated fats with surfactants. Bilayer suppositories make it possible to combine medicinal substances of different properties;
- Rectal capsules - containers filled with medicinal substances. Rectal capsules are recommended to be cooked with gelatinous mass containing sugar, salicylic acid, sodium metabisulphite and other substances;
- Pressed suppositories are prepared on solid bases by the method of pressing by analogy with tablets. In our country for this purpose and use granular powdergramm to and - magnesium carbonate, magnesium stearate, starch, iron lactate, sodium bicarbonate in a mixture with hydrogenated fats. Perspective rectal enemas, ointments, infusions;
- Lyophilized suppositories are obtained from aqueous suspensions or emulsions, the bulk of which is the active substance, and the amount of auxiliary substances is limited to a minimum. The principle of manufacturing is to deep freeze the emulsion or a homogeneous suspension (lyophilization). The suppositories thus obtained have a porous structure and a large internal surface; the insignificant amount of the secretion of the rectal mucus easily dissolves without causing irritation of the mucous membranes.
- Porous suppositories are prepared by pouring the molten mass into molds, followed by evacuation at a vacuum depth of 600 mm Hg. Such suppositories increase the surface of contact with the mucous membrane of the rectum and facilitate the release of drug components;
- Film coated suppositories control the delivery of drugs, slow down the diffusion of the active ingredient. As a film coating, hydrophilic polymers (cellulose ethers, alginates, gelatin, etc.) are most often used;
- Effervescent suppositories are prepared from a solid high-polymer of water-soluble second substance, the foaming agent forms a foam when dissolved enii suppository in an aqueous medium with gas evolution and foam stabilizer (RSA) capable of reducing the surface tension of water.

Thus, based on the analysis of current trends, it is possible to predict promising directions for the development of suppository dosage forms:
1. Identification of biochemical processes occurring during the action of the drug.
2. Creation of dosage forms with controlled release of ingredients that give the expected therapeutic effect in the right place and at a certain time, as well as with targeted delivery of the medicinal substance to the diseased organ, which makes it possible to achieve a given therapeutic effect with a smaller amount of drugs.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016

- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkiv, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

Additional

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.

- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П.

Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.

- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua

- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	suppository characteristic	Define the concept of a suppository.	1, 3, 4 (p. 354-356), 5 (p. 189-190), 6 (p.81), 7.
2	Technology of preparation of suppositories by pouring	What are the main technological stages of the preparation of suppositories by the method of pouring?	1, 3, 4 (p. 356-364), 5 (p. 190-192), 6 (82).
3	Quality assessment, rules for packaging, processing and storage of suppositories	What are the NTD and suppository quality indicators	1, 2, 3, 4 (p. 364), 5 (p. 192-194).

8. Materials for self-control.

8.1. Questions for self-control.

1. Characterization of suppositories as a dosage form and dispersion system. Requirements for suppositories.
2 Methods for prescribing suppositories; checking doses of poisonous, narcotic and potent drugs in them.
3. Technological stages of preparation of suppositories by the method of pouring.
four. The value of the replacement rate.
4. Rules for the introduction of medicinal substances with different physico-chemical properties in the base.
6. Methods for assessing the quality, packaging, clearance to leave, the rules for the storage of suppositories in accordance with the requirements of regulatory and technical documentation.
7 The introduction of drugs, soluble in water, sp and mouth and and glycerol in fatty and water soluble bases;
8. The introduction of insoluble medicinal substances in fat and water-soluble bases;

9. Registration for the release, storage and quality assessment of suppositories.

8.2. Test tasks for self-control.

1. The patient must be prepared by casting vaginal suppositories. Specify which parameters to use to calculate the amount of suppository base.
   A. Type of base suppository mass and their number, replacement factor.
   B. Type of base substitution factor.
   C. Mass of suppository, their number, replacement factor.
   D. Type of base suppository mass and their number.
   E. Type of base suppository mass and their number.
2. The patient needs to prepare rectal suppositories by casting. Specify a hydrophilic base for such suppositories.
   A. Polyethylene oxide.
   B. Cocoa butter.
   C. Butyrol.
   D. Lazupol.
   E. Witepsol.
3. A pharmacist prepared candles with streptocid on a polyethylene oxide basis. Specify the method of entry:
   A. Discovered in a molten base
   B. Shredded parts of the base
   C. Opened in Vaseline Oil
   D. Opened in water
   E. Grind with petroleum jelly
4. The pharmacist discovered the substance in a lipophilic base heated to 40 C. Choose a substance soluble in the base:
   A. Menthol
   B. Dermatol
   C. Xeroform
   D. Salicylic acid
   E. Salicylic acid
5. A pharmacist prepared suppositories on butyrol. Specify the preparation of the casting mold:
   A. Smeared with soapy alcohol
   B. Lubricated with Vaseline Oil
   C. Smeared with alcohol
   D. Lubricated with ether
   E. Oiled Castor Oil
6. It is necessary to prepare suppositories (on a hydrophobic basis) with protargol. Specify the features of technology
   A. Protargol is dissolved in a few drops of water, glycerin or triturated with the indicated liquids, emulsified and mixed with the base.

B. Protargol is dissolved in a portion of the molten base and then mixed with the rest of the base.

C. Protargol dissolved in the entire amount of the liquid base

D. Protargol is introduced into the composition of the hydrophobic mass in the form of fine powder.

E. Protargol rubbed with a few drops of fatty oil (peach, almond), and then mixed with the crushed base

7. The doctor wrote suppositories without specifying the grounds. Specify the basis used by the pharmacist for the preparation of suppositories by rolling out method:

A. Cocoa Butter

B. Lazupol

C. Gelatin-glycerin

D. Butyrol

E. Polyethylene oxide

8. In the prescription, the doctor prescribed suppositories in cocoa butter, but it is not in the pharmacy. Specify the basis for replacing it:

Laurel oil pedunculate

Butyrol

Gelatin-glycerin

Vitepsol

Soap-glycerin

9.The recipe contains suppositories for hemorrhoids on butyrol. Specify the components of this suppository base:

Cocoa butter, paraffin, hydrogenated fats

Cocoa butter, ozocerite, hydrogenated fats

Cocoa butter, ceresin, hydrogenated fats

Cocoa Butter, Wax, Hydrogenated Fats

Cocoa butter, petrolatum, hydrogenated fats

10. For the preparation of suppositories using various methods: download, casting, pressing. Specify the basis for the preparation of suppositories by pouring:

Butyrol

paraffin

cacao butter

petroleum jelly

coriander oil

11. A pharmacist prepared a suppository mass with novocaine and cocoa butter, but it turned out to be fragile. Specify the substance that must be added to form a plastic mass:

Anhydrous lanolin

water lanolin

paraffin

petroleum jelly

wax

12.At the pharmacy, a pharmacist prepares rectal suppositories. Specify the permissible limits for the average weight of these suppositories:

1.0-4.0
2.0-5.0
3.0-6.0
4.0-7.0
5.0-8.0

13.In a pharmacy, a pharmacist prepares vaginal suppositories. Specify the permissible limits for the average weight of these suppositories:

1.5-6.0
1.0-4.0
2.0-6.5
3.0-7.0
4.0-7.5

14.The pharmacy prepares suppositories using various methods. Specify the method by which you can make rectal suppositories in cocoa butter:

Download
tabletting
granulation
pouring out
extraction

15. A pharmacist prepares rectal suppositories on Witepsol. Specify the fluid that needs to be lubricated suppository form:

Soap alcohol
Vaseline oil
ethanol
purified water
Peach oil

16. In the prescription, the doctor prescribed suppositories for a laxative effect on a soap-glycerin basis. Specify from these components it consists of:

Glycerin, sodium carbonate, stearic acid
Soap, water, glycerin
Sodium carbonate, water, stearic acid
Stearic acid, glycerin, water
Water, sodium carbonate, glycerin

17. A pharmacist prepares rectal suppositories on a polyethylene oxide basis. Specify the liquid that needs to wipe the suppository form:

Vaseline oil
ethanol
soap alcohol
purified water
Peach oil

Topic 13 «Solutions for injections. Isotonic and infusion solutions. Solutions for injections with thermoplastic substances. Suspensions for injection»**– 5 hours.**

1. Relevance of the topic:

Dosage forms that should be prepared under aseptic conditions include: dosage forms for injections, dosage forms for treating eyes, dosage forms with antibiotics, dosage forms for children.

All these dosage forms are characterized by the fact that they should not contain microorganisms and their dispute.

The need for sterile and aseptically prepared dosage forms is caused by a special way of using them, for example, injections are introduced into the body through a cannula

with violation of the integrity of the skin and mucous membranes. Availability

in them, microorganisms can lead to infection of the body, and, consequently, to serious consequences.

Dosage forms with antibiotics require aseptic conditions of preparation, since in the presence of microorganisms, antibiotics lose their activity.

The listed dosage forms, regardless of whether they are subject to further sterilization or not, must be prepared under aseptic conditions. Sanitary requirements for the preparation of drugs under aseptic conditions are governed by the order

Ministry of Health of Ukraine No. 139 of 06/14/93. "On approval of instructions) of the sanitary regime of pharmacies.

Injectable dosage forms include sterile aqueous and non-aqueous solutions, suspensions, emulsions and solids which dissolve in a sterile solvent immediately prior to administration. The injectable method of drug administration has a number of advantages, the main of which are the speed of therapeutic action, the accuracy of dosing, the possibility of their administration to a patient who is unconscious.

Blood plasma, lymph, lacrimal and cerebrospinal fluid have a constant osmotic pressure. The introduction of the injectable solution into the body leads to its changes. To avoid this, solutions should be injected into the body with a pressure equal to the osmotic pressure of body fluids (750 kPa). Therefore, the study of different methods for calculating the isotonic concentration for the manufacture of injectable solutions is important. The need to obtain sterile and aseptically prepared dosage forms is caused by a special way of their use, for example, injections are administered through a hollow needle with a violation of the integrity of the skin and mucous membranes. The presence of microorganisms in them can lead to infection of the body and, consequently, to serious consequences.

This explains the need to study this topic.

2. Specific objectives:

• Nomenclature of sterile and aseptic dosage forms.
• Conditions for preparation of aseptic dosage forms.

• Characterization and classification of injectable dosage forms.
• Requirements of the State Pharmacopoeia of Ukraine and the AND, for the manufacture, quality control and design for the release of injectable solutions.
• Quality assessment, storage of injectable solutions, sealing and preparation for release in accordance with the requirements of the State Pharmacopoeia and other regulations.
• Methods of stabilization of solutions for injections;
• Principles of selection of stabilizers and calculation of their number in accordance with the requirements of the AND;
• Composition and brands of glass for preparation of solutions for injections;
• Features of solution technology for injections that need stabilization;
• Requirements of the State Pharmacopoeia of Ukraine and other AND to solutions for infusions;
• Different methods of calculating isotonic concentration (based on Vant-Goff's law, isotonic equivalents for sodium chloride, cryoscopic method);
• Principles of selection of excipients for isotonization of solutions;
• Nomenclature of solutions for infusions;
• Features of technology of infusion solutions;

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
		Technology of preparation	Choose the best option of

	5. Pharmacy technology of drugs	of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy. Tech industrial production of drugs Biopharmacy	General technology of soft dosage forms for external use Soft Drug Technology The technological process of making soft drugs.	Carry out calculations of medicinal, auxiliary substances. Technological stages of manufacturing soft medicinal Prepare soft drugs for external use, taking into account the physico-chemical properties of the ingredients.
III	***Intersubjective integration*** Injection eye medicinal forms	Preparation of Ointments	Calculate the amount of drugs and auxiliaries

4. Questions for independent work in preparation for the lesson

-Technology of solutions for injection with thermolabile substances.
-Packing, preparation for release of injectable solutions with thermolabile substances.
- Nomenclature of the most frequently used solutions for infusions.
- Plasma (blood substitute) fluids, their classification by medical purpose and composition.

5. Content of the topic.

Dosage forms that should be manufactured under aseptic conditions include: dosage forms for injections, dosage forms for treating eyes, dosage forms with antibiotics, dosage forms for children. All these dosage forms are characterized by the fact that they should not contain microorganisms and their dispute.

The need to obtain sterile and aseptically manufactured dosage forms is regulated by a special method of their use, for example, injections are introduced into the body through a cannula with a violation of the integrity of the skin and mucous membranes. The presence of microorganisms in them can lead to infection of the body, and, consequently, to serious consequences.

Dosage forms with antibiotics require aseptic manufacturing conditions, since in the presence of microorganisms, antibiotics lose their activity.

The listed dosage forms, regardless of whether they are sterilized or not, must be manufactured under aseptic conditions. Sanitary requirements for the

manufacture of drugs in aseptic conditions are governed by the Order of the Ministry of Health of Ukraine No. 139 of 06/14/93. "On approval of instructions for the sanitary and anti-epidemic regime of pharmacies."

Characteristics of dosage forms for injection

Injectable dosage forms include sterile aqueous and non-aqueous solutions, suspensions, emulsions and dry solids (powders, porous masses, tablets), which are dissolved in a sterile solvent immediately before administration.

Medicines for injection began to be applied in medical practice somewhat later than other dosage forms. For the first time, the Russian doctor Lazarev performed the subcutaneous injection of drugs in 1851. His device consisted of a barometric tube with a piston, at the free end of which a silver tip was extruded into a needle. A modern syringe was offered in 1852 by Pravc.

The injection method of administration of drugs has positives and disadvantages. ***The advantages include the following:***

- The completeness of absorption and the rate of action of the injected drugs, sometimes after a few seconds
- Drugs are introduced, bypassing such protective barriers of the body as the gastrointestinal tract and liver, where under the influence of enzymes can change, and sometimes disintegrated medicinal substances;
- With this method of administration, the inconveniences associated with the unpleasant smell and taste of drugs are completely excluded;
- The ability to accurately dose the medication;
- Ability to localize the action of medicinal substances;
- The possibility of administering a drug to a patient who is unconscious;
- Ability to replenish the required volume of fluid after significant blood loss
- Ability to procure sterile drugs for future use.

At the same time, the injection route of administration has disadvantages:

- There is a serious danger of introducing infection into the body;
- With the introduction of solutions into the blood there is a danger of embolism due to solid particles or air bubbles with a diameter greater than the diameter of small vessels (with embolism of vessels feeding the brain, death is possible)
- The injury is inflicted on the patient both physically and mentally;
- The use of the input method is associated with the need to attract medical personnel;
- The introduction of drugs can cause a violation of pressure, pH, etc., especially with the introduction of large quantities of the solution intravenously or intraarterially. These physiological disorders are painfully perceived by the body over time (sharp pain, burning, sometimes fever).

Types of injections.

Depending on the injection site, the injections are divided into: intracutaneous, subcutaneous, intramuscular, intravenous, intraarterial, cerebrospinal, intracranial, intraperitoneal, intrapleural, intraarticular, etc.

Currently, a needleless injection method is used. Using a special injector, the solution is injected under pressure into the subcutaneous tissue without compromising the integrity of the skin.

The method of jet injection of medicinal substances in comparison with conventional injections with a needle has the ***advantages:***

- painlessness of injections,
- rapid onset of effect,
- reduction of the required dose,
- impossibility of transferring "syringe infections",
- liquid sterilization of the injector,
- increasing the number of injections per unit time (up to 1000 per hour).

REQUIREMENTS FOR INJECTABLE DOSAGE FORMS.

SPh XI puts forward the following requirements for injection forms: absence of mechanical impurities, sterility, stability, apyrogenicity, in some solutions is isotonicity, which is indicated in the relevant regulatory documents or recipes. Injection solutions can be isohydric and iso-ionic according to the requirements of their own articles.

For the implementation of these requirements, you must comply with the special conditions for the manufacture of injection dosage forms. They include: requirements for premises, production equipment, personnel, medicinal and auxiliary substances, solvents, sealing materials, organization and conduct of technological processes (dissolution, stabilization, filtration, sterilization, packaging, labeling).

The most important component of the technological process of all injection dosage forms is the organization of work under aseptic conditions and sterilization.

SOLVENTS

In the manufacture of injection dosage forms as solvents used water for injection, fatty oils, ethyl oleate, as well as complex solvents.

Water for injection (Aqua pro injectionibus). Sanitary requirements for receiving, transporting and storing water for injection are given in the order of the Ministry of Health of Ukraine No. 139 dated 06/14/93. "On approval of the instruction on the sanitary and anti-epidemic regime of pharmacies." It should meet all the requirements of FS 42-2620-89 to purified water and not contain pyrogenic substances.

Organization of work in aseptic conditions

Sources of contamination of sterile solutions can be raw materials, environment, equipment, containers, closures, working personnel.

Aseptics are certain working conditions, a complex of organizational measures that allow to protect the drugs from microorganisms in

them to the maximum degree. Asepsis includes a series of consecutive events that complement each other, and the mistake made in one link of this series negates all the work done.

Aseptic conditions provide for the availability of a special room in the pharmacy for the manufacture of sterile and aseptic medicines - an aseptic unit, which must have at least three rooms:

1. The press service (gateway) is intended for personnel training to work.
2. Aseptic is intended for the manufacture of dosage forms.
3. Hardware - it is installed autoclaves, sterilizers, devices, allowing to obtain water for injection.

Aseptic conditions for the manufacture of parenteral drugs in accordance with the requirements of the SPU, orders of the Ministry of Health № 275, № 812, standard ST-N MOH 42-4.6: 2015 provide:

1. Requirements for the room.

The production of drugs under aseptic conditions is carried out in "clean" rooms, where the cleanliness of the air is normalized according to the content of microbial and mechanical particles.

The aseptic unit is usually located far from the sources of contamination with micro- organisms (a room for patient care, washing, packing, sanitary facilities).

2. Requirements for staff.

3. Requirements for medicinal and auxiliary substances

4. Requirements for packaging.

5. Requirements for production equipment.

6. Requirements for preparation.

Water for injection

Water for injection (Aqua pro injectionibus). Sanitary requirements for receiving, transporting and storing water for injection are given in the order of the Ministry of Health of Ukraine No. 139 of June 14, 1993 “On approval of the instruction on the sanitary and anti-epidemic regime of pharmacies”. It should meet all the requirements of FS 42-2620-89 to purified water and not contain pyrogenic substances.

Pyrogenic substances (from the Greek word rug - fire, the Latin generatio - birth) call the waste products of microorganisms, toxins, dead microbial cells.

To determine pyrogenicity in Ukraine adopted the method described in the GF XI ("Testing pyrogenicity"). Modern world pharmacopoeias, such as the British 1998, European 1997, United States 1995, Czech 1997 along with the test for bacterial endotoxins also contain the “Test for pyrogens”.

Water for injection can be obtained by distillation of drinking water under aseptic conditions in apparatus, the design of which allows the release of water vapor from small droplets of un-distilled water.

TECHNOLOGY SOLUTIONS FOR INJECTION AND QUALITY CONTROL

Solutions for injections are prepared in accordance with the requirements of the Global Fund XI, orders of the Ministry of Health and instructions. The technological process of manufacturing solutions for injection consists of the following stages:

1. Preparatory work.
2. Preparation of the solution (stabilization, isotoning, if necessary).
3. Filtration and packaging.
4. Sterilization of the solution.
5. Control of finished products.
6. Registration.

Preparatory work (personnel training, aseptic block preparation, organization of work under aseptic conditions, preparation of dishes and auxiliary materials, preparation of solvents and preparations) are provided on pages 450-455.

Consider the stage of direct manufacture of solutions for injection.

Preparation of the solution. Production of solutions for injection can be carried out only in pharmacies that have permission to do so, issued by an authorized body.

It is prohibited to prepare solutions for injections in the absence of methods for their complete chemical analysis, sterilization regime, data on the chemical compatibility of the incoming ingredients and technology.

Personal responsibility for the organization of the work of aseptic blocks and the preparation of solutions for injection rests with the heads of pharmacies. They are required to conduct an annual briefing and examination of employees of aseptic units on the rules for preparing solutions for injections, as well as when they are accepted or transferred to work in an aseptic unit. Persons who do not possess the technology of injection solutions are not allowed to work in the aseptic unit.

Due to the very responsible method of application and the high risk of errors that can be made during operation, the manufacture of injection solutions requires strict regulation and strict adherence to technology.

The simultaneous manufacture of several injection solutions is not allowed, they include various ingredients, or the same, but in different concentrations. At the workplace in the manufacture of injection solutions should not be shtanglas with medicinal substances that are not related to these solutions.

Preparation of injection solutions is carried out by mass-mass method, in which the medicinal substance is taken by weight, and the solvent - to obtain a certain volume of solution. The need to manufacture solutions in bulk concentration is due to the fact that when injected with a syringe, the drug is dosed by volume.

Technological stage “Preparation of a solution” includes three technological operations: preparation of raw materials (calculations, weighing substances and measuring the solvent), direct production of a solution (dissolving substances, if you need to add a stabilizer, obtain the required volume) and primary analysis.

The medicinal substance taken by weight is placed in a sterile volumetric flask, dissolved in a small amount of solvent, and then brought to a certain volume. In the absence of measuring dishes, the amount of solvent needed to prepare a solution is determined by a calculation method using the density of the solution of a given concentration or volume increase factor.

The volume occupied by stabilizers is included in the total volume of the solution, so they are added simultaneously with medicinal substances.

When enlarged manufacturing solutions for injection required capacity of 10 liters or more. In large inter-hospital and hospital self-supporting pharmacies, the dissolution of drugs is carried out in glass 20-liter reactors equipped with electric heating and an electric mixer. In medium-capacity production of interhospital pharmacies, the process of mixing the fluid is mechanized using various type of agitators.

Immediately after preparation of the solution, conduct a survey control. Next, the prepared solution for injection is subjected to complete primary chemical control, is to determine the authenticity (qualitative analysis) and the quantitative content of active substances and stabilizer (quantitative analysis).

The results of the complete chemical control of injection solutions are recorded in a journal in the prescribed form.

In the case of a satisfactory result, proceed to filtration and packaging.

Filtration and packaging solutions for injection. One of the requirements for injection dosage forms is the absence of mechanical inclusions. Injection solutions should not contain particles visible to the naked eye, that is, particles with a size of 10 microns or more. However, it seems advisable to bring the filters up to 5 microns, that is, injection solutions should not contain particles larger than the diameter of the blood cells (5-9 microns). The presence of suspended particles is unacceptable, since embolism is possible with intravascular injection.

For packaging injection dosage forms, two types of packaging are used: ampoules and vials of glass, polyethylene or other material, do not change the properties of medicinal substances.

Sterilization of solutions for injection should be carried out no later than three hours from the beginning of production under the control of a specially selected specialist.

Control of finished products. After sterilization, secondary control is carried out for the absence of mechanical impurities, qualitative and quantitative analysis. For analysis, one vial of solution is taken from each batch (for one batch of solution, the products obtained in one container from one batch of medicinal substance are counted).

Registration of the manufacture of injection solutions is carried out as they are made

Solutions for injections are considered to be unsatisfactorily manufactured with non-compliance with their physico-chemical parameters, with the content of visible mechanical impurities, non-sterility and pyrogenicity, violation of the closure fixation, insufficient filling of the volume of the bottles.

Solutions that meet all the requirements, suitable and subject to registration for distribution.

Design solutions for injection. Solutions for injections for outpatients are issued with a basic blue label “For Injections” (it should contain the pharmacy number, composition, method of use, date of manufacture, prescription number), additional label “Sterile” and, if necessary, warning labels about the conditions storage (“Keep in a cool and dark place,” “Keep out of the reach of children”, etc.). On the bottle with the solutions prepared under aseptic conditions without sterilization, an additional label “Prepared Aseptically” is pasted.

Dosage forms for treatment-and-prophylactic institutions are issued with a label, which should contain the following designations: pharmacy number and hospital number, department, date of manufacture, shelf life, prepared, checked, released. No. of analysis, method of use, the composition of the dosage form (indicated in Latin).

STERILIZATION

Sterilization is the process of complete destruction of microorganisms and their spores in medicinal substances, dosage forms, dishes, auxiliary materials, tools and apparatus.

The term "sterilization" is derived from the Latin sterilis, which means sterile. Sterility is achieved by observing asepsis and applying sterilization methods in accordance with the requirements of the Global Fund XI - the article “Sterilization”.

When choosing a method and duration of sterilization, it is necessary to consider the properties, volume or mass of materials to be sterilized.

Sterilization methods can be divided into: physical, mechanical, chemical.

Sterilization methods. These include: thermal or thermal sterilization, sterilization by ultraviolet rays, radiation sterilization, sterilization by high-frequency currents.

Of these methods in the conditions of pharmacies applied thermal sterilization, as well as sterilization by ultraviolet rays. Other methods of sterilization in pharmacies have not yet been applied.

Physical methods:

Thermal sterilization. With this method of sterilization, the death of microorganisms occurs under the influence of high temperature due to the

coagulation of proteins and the destruction of the enzymes of microorganisms. The most widely used in the pharmacy practice is sterilization with dry heat and steam.

Sterilization by ultraviolet rays. UV radiation is a powerful sterilizing factor that can kill vegetative and spore forms of microorganisms. UV rays are widely used in various sectors of the national economy for the disinfection of indoor air, water, etc. Their use in pharmacies is of great practical importance and significant advantages compared with the use of disinfectants, since they can be adsorbed by medicines, which because of this foreign odors.

Radiation sterilization *is a* highly efficient and promising method of sterilization, which in recent years has become increasingly common for sterilization of medical products. The possibility of radiation sterilization of drugs is being studied (saline infusion solutions, therapeutic eye films, etc.). The bactericidal effect of ionizing radiation is the result of the impact on metabolic processes in the cell. The sensitivity of microorganisms to ionizing radiation depends on many factors: the presence of moisture, oxygen, pH, temperature, etc.

Sterilization with high frequency currents. High-frequency currents are called currents that form an electromagnetic field that changes with a high frequency, causes a change in the orientation of the molecules and the absorption of part of the field energy by the substance. As a result, the substance is rapidly heated and sterilized.

Mechanical sterilization methods.

For solutions of medicinal substances that are sensitive to thermal and radiation effects, can be used the method of sterilization by filtration through small-pore filters. Unlike other sterilization methods, in which microorganisms only lose their viability, with sterilizing filtration, they are completely removed from the solution, thereby ensuring its sterility and apyrogenicity. Filtration sterilization method is a kind of solution filtration (microfiltration). With sterilizing filtration, finer purification is achieved using appropriate filter media in the form of depth and membrane filters.

Chemical sterilization methods.

Chemical sterilization and preservatives.

By preservatives advances a number of requirements: pharmacological indifference at the concentration used (absence of general toxicity and local irritating action); wide antimicrobial spectrum; lack of chemical interaction with medicinal substances and other components of drugs; no effect on the organoleptic properties of drugs; storage stability; support of sterility of dosage forms during the whole time of their use, that is, reliable antimicrobial activity.

Stabilizers - substances that increase the chemical resistance of medicinal substances in solutions for injection.

Substances used as stabilizers must meet the following requirements: to be safe for the patient, both in pure form and in combination with the components of the drug, are permitted by the pharmacological committee for use in medical practice to perform the functional purpose - to ensure the sustainability of the drug.

The choice of stabilizer depends on the nature of the substance and the nature of the chemical process occurring in the solution.

The stabilizers used can be divided into two groups:

- Substances that prevent the hydrolysis of salts and saponification of esters.
- Antioxidants (antioxidants) - substances that prevent oxidation.

In each case, the addition of stabilizers is determined by the results of studies of the chemical kinetics of decomposition of drugs and biological tests for the harmlessness of the solution. The amount of stabilizer attached is indicated in the GF, as well as existing orders of the Ministry of Health and instructions.

The mechanism of action of stabilizers is reduced to improving the solubility of medicinal substances (solubilization), the creation of a certain pH value of the medium, the prevention of redox processes.

The solubility of medicinal substances is improved by adding hydrotropic cosolvents to the solution, complexing agents (citrates, etc.), or the solubilizer itself (mannitol, sorbitol, carboxylic acids, etc.). For example, a solution of oxyprogesterone capronate 12.5% in oil is made by adding to the peach oil 30% (volume) benzyl benzoate; 2.5% progesterone solution in oil - by adding 20% (by volume) benzyl benzoate. A solution of chloramphenicol 2% receive, using as a solvent solution of hexamethylenetetramine 40% (the solution is prepared aseptically after prior sterilization of chloramphenicol).

Infusion solutions of ciprofloxacin (Woweg) and Alexan infusions concentrate (Heinrich Mack) are prepared using lactic acid as a solubilizer.

A certain pH value of the medium is created by buffer solutions, acids and alkalis.

When considering the issues of stabilization of solutions for injections, medicinal substances can be roughly divided into 3 groups (according to the classification proposed by A. S. Prozorovsky and N. A. Kudakov):

1. Solutions of salts formed by weak bases and strong acids.
2. Solutions of salts formed by strong bases and weak acids.
3. Solutions of easily oxidized substances (stabilized by antioxidants).

Stabilization of salt solutions formed by weak bases and strong acids. This group includes salts of alkaloids and synthetic nitrogenous bases (atropine sulfate, scopolamine hydrobromide, gomatropine hydrobromide, cocaine hydrochloride, pilocarpine hydrochloride, physostigmine salicylate, novocaine, strychnine nitrate, dibazole, etc.). Aqueous solutions of such salts, as a rule, can have a neutral or weakly acid reaction due to hydrolysis, which occurs almost completely.

Salt BA completely decomposes into dissociating acids and weak dissociating acids. Hydroxyl ions, which are formed during the dissociation of water, are associated with the low dissocial base of VON. This leads to a decrease in pH.

$BA + HOH = BOH + H^{+} + A^{-}$

In addition to these solutions of free acid, that is, an excess of hydrogen ions, inhibits hydrolysis, causing an equilibrium shift to the left. The decrease in the concentration of hydrogen ions in the solution, for example, as a result of exposure to alkali, separated by glass, shifts the equilibrium to the right, that is, it enhances the hydrolysis.

Heating solutions increases the intensity of salt hydrolysis and increases the degree of dissociation, leading to an equilibrium shift to the right. Therefore, with the next sterilization and maintaining the pH of the injection solution rises. For the stability of salts of alkaloids and other specified substances, the solutions must have a certain pH.

If the salt is formed by a weak base and a strong acid, then as a stabilizer, inhibits the process of salt hydrolysis and saponification of esters, it is recommended to add hydrochloric acid.

The amount of hydrochloric acid required to stabilize the solution depends on the properties of the drug. The most common rate of stabilizer consumption is 10 ml of 0.1 M hydrochloric acid solution per liter. In the manufacture of small amounts of solutions to ensure accurate dosing, it is advisable to prepare a 0.01 M stabilizer solution: 0.42 ml of diluted (8.3%) hydrochloric acid per 100 ml of solution. The solution is poured into small bottles of 10 ml from neutral glass, sterilized. Compared with a 0.1 M solution of hydrochloric acid, this stabilizer (0.01 m) is added 10 times more. The shelf life of it for 5 days.

To stabilize the solutions of novocaine, it is necessary to add hydrochloric acid to pH 3.8-4.5. With an increase in its concentration, the amount of stabilizer increases (solutions of 0.25, 0.5, 1.2% require 3, 4, 9, 12 ml of 0.1 M , hydrochloric acid solutions per 1 liter of solution, respectively) .

Novocain is a hydrochloride of 3-diethylaminoethyl para-aminobenzoic acid. After sterilization of novocaine solutions, free PABA appears, due to which the pH of the solution shifts to the acid side. The amount of novocaine decomposed in a solution with a neutral or slightly alkaline medium reaches 2.28%, and at pH 8.0 it increases to 11%.

In the foreign literature there are reports of the presence of aniline in solutions of novocaine after sterilization, which is explained by the decarboxylation of para-aminobenzoic acid. The use of solutions of novocaine mixed with aniline is accompanied by side effects (edema, pain). To stabilize 2.5 and 10% solutions of novocaine, add hydrochloric acid 0.1 M 4, 6 and 8 ml, respectively, and 0.5 g of sodium thiosulfate per 1 l of solution.

Solutions of novocaine 5% for spinal anesthesia are prepared aseptically without heat sterilization using sterile auxiliary materials, dishes and sterile substances. Novocain powder is pre-sterilized in glass or porcelain containers with a layer height of not more than 0.5-1 cm with hot air in air sterilizers at 120 ° C for 2:00, the pH of this solution is 5.0-5.3.

The proposed technology of this solution on citrate buffer solvent with the addition of 1.5% polyvinyl as a stabilizer. A solution of novocaine of this

composition can withstand heat sterilization and is stable for 30 days. 5 and 10% novocaine solutions used in otolaryngological practice are stabilized by adding 0.3% sodium metabisulfite and 0.02% citric acid or 10 ml of a 0.1 M solution of hydrochloric acid per 1 liter of solution.

To produce a stable solution of novocaine (1-2%) in an isotonic solution of sodium chloride, add 5 ml of a 0.1 M solution of hydrochloric acid per liter.

Novocain is sometimes prescribed in a prescription with adrenaline hydrochloride solution (1: 1000). In these cases, a stabilizer consisting of 0.05 g of salicylic acid, 0.4 g of sodium sulfite and 0.2 g of sodium metabisulfite is added. The solution is sterilized at 100 ° C for 15 minutes.

Stabilization of salt solutions formed by strong bases and weak acids. This group includes: sodium nitrite, sodium caffeine-benzoate, sodium thiosulfate, aminophylline, etc. In aqueous solutions, these substances readily hydrolyze, dissociate into ions, and the solution becomes alkaline. Dissociate into ions and water molecules. As a result of the interaction of salt ions and water, a weakly dissociating acid HA is formed. This leads to a decrease in the solution of free hydrogen ions and the accumulation of an excess of OH ions, as a result of which the pH of the solution increases.

$BA + HOH = B^{+} + HA^{-} + OH^{-}$.

This leads to the formation of difficult-to- dissolve compounds, which produce turbidity or precipitate in solutions, which is unacceptable for injection solutions.

To stabilize solutions of salts of strong bases and weak acids, it is recommended to add stabilizers of the main nature — 0.1 M solution of sodium hydroxide or sodium bicarbonate.

To ensure favorable conditions for the stabilization of drugs, they undergo hydrolysis, the pH of the solution is adjusted to the criterion, corresponds to the minimum decomposition of substances, the addition of various substances or buffer systems. The optimum pH value is specified in the documentation or is established empirically.

So, to stabilize 1 liter of 10 and 20% solution of caffeine sodium benzoate, it is recommended to add 4 ml of 0.1 M solution of sodium hydroxide, and up to 30% solution of sodium thiosulfate sodium bicarbonate in an amount of 20 g per 1 liter.

The sodium thiosulfate solution, having a medium close to neutral , with a slight decrease in pH, decomposes, releasing sulfur and sulfur dioxide.

Euphyllinum is a complex salt of a weak acid (theophylline) and a weak base (ethylenediamine). It easily decomposes in an acidic environment. Adding sodium hydroxide to the solution also leads to decomposition of aminophylline. Therefore, to obtain stable solutions of aminophylline, it is necessary to use a drug with an ethylenediamine content of 18-22% instead of 14-18% theophylline 75-82%,

which withstands additional testing (GF X p. 276). Water for injection should be freed from carbon dioxide by boiling or saturating with nitrogen.

Abroad, stable theophylline solutions are obtained by adding aminopropylene glycol or diethylaminopropylene glycol (0.75-1.5 stabilizers are taken per 1.0 g of theophylline). High polymers are also used to stabilize sodium salts — derivatives of barbituric acid, which, being salts of a strong base and a weak acid, are easily hydrolyzed in aqueous solution with increasing pH.

Thus, a change in the pH of the medium is not the only means of protecting medicinal substances from hydrolysis.

In the last decade, there have been many studies on the effect of surfactants on the kinetics of chemical reactions. It has been proven that non-ionic and anion-active surfactants inhibit, and cation-active surfactants accelerate the process of hydrolysis of a number of drugs. It has been established that in the presence of surfactants, an increase or decrease in reaction rates is due to the formation of micelle associates of surfactant molecules. The surfactant micelles have large colloidal sizes and large volumetric capacity, that is, they have voids into which relatively small molecules of the drug substance can penetrate under the influence of intermolecular attraction forces. Molecules with hydrophobic properties penetrate into the micelle. For example, the inhibitory effect of 0.5% tween-80 is associated with the introduction of dicain molecules into micelles of surfactants. In this case, the anesthetic activity of dikain corresponds to the initial substance. The hydrophilic molecule of a substance occupies a position between the individual molecules of the micelle and joins the outer, most hydrophilic part of the micelle. The complex compounds formed are more resistant than medicinal substances.

In this regard, surfactants are used to suppress the hydrolysis of a number of medicinal substances, for example, anesthetics, antibiotics and others. At the same time, it is necessary to take into account possible changes in the therapeutic action of complex compounds. In each case, the use of stabilizers in their introduction into the composition of the drug requires careful study.

Stabilization of solutions of easily oxidized substances. This group includes: ascorbic acid, vikasol, sodium salicylate, salyuzid, soluble streptocide, sulfacyl sodium, thiamine chloride, ethyl morphine hydrochloride, epinephrine hydrotartrate, phenothiazine derivatives, procainamide, and some other medicinal substances. In the manufacture of solutions, and especially during sterilization, in the presence of oxygen contained in water and in the air space of the vial (above the solution), these substances are easily oxidized to form physiologically inactive compounds. The oxidation process is greatly enhanced under the influence of the so-called sensitizing factors (from the Latin. Sensibilis -chuliness), such as light, heat, pH, etc.

The mechanism of oxidation of easily oxidized substances is based on the Bach-Engler peroxide theory and the theory of branched chain reactions of Semenov. In pharmaceutical practice, there are various methods to slow down the oxidation process. For example, the addition of antioxidants. Antioxidants are

auxiliary substances that prevent oxidation. they can be divided into direct and indirect.

Direct antioxidants include strong reducing agents that have a higher ability to oxidize than medicinal substances stabilized by them: rongalite, sodium sulfite, sodium metabisulfite, ascorbic acid, thiourea, cysteine, methionine, etc.

Sodium sulfite stabilizes solutions of streptocide soluble 5 and 10% (2.0 g per 1 liter of solution).

Sodium metabisulfite is added to a solution of sodium salicylate 10% (1.0 g per 1 l of solution), ascorbic acid solution 5% (2.0 g per 1 l of solution). Ascorbic acid itself can be used as an antioxidant for substances with a lower ability to oxidize.

The stabilization mechanism consists in the fact that antioxidants oxidize more easily than the active substances, and oxygen dissolved in the injection solution is used to oxidize the stabilizer, thereby protecting the preparation from oxidation.

Indirect antioxidants include substances that bind cations of metals (Cu^{2+}, Fe^{3+}, Mn^{2+}, etc.) into practically undissociated compounds, which enter solutions of medicinal substances as impurities from drugs and are catalysts for oxidative processes.

It has been established that the color change of salicylate solutions is due to the oxidation of phenolic hydroxyl in the presence of traces of manganese ions. Ions of heavy metals, participating in an oxidation-reduction chain reaction, are able to detach electrons from various ions present with them in solutions, translating the latter into radicals:

$$Cu^{2+} + RCOO^{-} \rightarrow Cu^{+} + RCOO^{\cdot}$$

$$Cu^{2+} + POOH \rightarrow P^{\cdot}$$

The resulting radical can react with oxygen to form a peroxide radical, which will continue to be involved in the chain reaction. Partly restored while the heavy metal ion can easily be oxidized by oxygen to its original form, after which the process repeats.

$$Cu^{+} \xrightarrow{O_2} Cu^{2+}$$

It is the chain character that explains the catalytic effect of heavy metal ions when they are present in solutions in insignificant amounts. For example, the catalytic effect of copper ions is in fractions of a microgram.

Heavy metal ions often pass into solutions from glass or instrumentation, or may be present in the drug substance as a manufacturing impurity. To obtain stable solutions of easily oxidized substances, it is necessary to get rid of traces of heavy metal ions. Methods for cleaning water from heavy metals and solutions of medicinal substances by filtration through a layer of activated carbon and the sodium form of oxidized cellulose are now proposed.

Indirect antioxidants are complexing agents. These include: many basic carboxylic acids, hydroxy acids (citric acid, salicylic acid, tartaric acid, etc.), ethylene diamine tetraacetic acid disodium salt (Trilon B), and Trilon B calcium salt (thetacin), unithiol, as well as amino acids, thiourea, etc.

Examples of stabilization with unithiol are solutions of thiamine bromide 3 and 6% and thiamine chloride 2.5 and 5%, to increase the stability of which uniothiol 0.2% is used. Trilon B stabilizes solutions of saluzid soluble 5% and lipoic acid 0.5% (at a concentration of 0.01%), solutions of cyclobutonium 0.7% (at a concentration of 0.05%).

To stabilize easily oxidized substances, it was proposed to use high molecular substances (polyglucin, polyethylene glycol, propylene glycol, etc.), among which oxidation and other reactions are slowed down. This is probably explained by the penetration of low-molecular substances into the interior of the high-polymer molecules, which leads to a decrease in their reactivity.

The oxidation of drugs can also be reduced by eliminating the sensitizing effect of light, temperature. Sometimes solutions of certain drugs (for example, phenothiazine) are prepared under red light. Some solutions are stored in a package with light-protective glass.

Stabilization of solutions for injection is sometimes achieved by the introduction of several stabilizers (stabilization by the complex method). Such a complex can be represented by a combination of different types of stabilizers: several direct antioxidants; direct and indirect antioxidants; antioxidant and pH agent; antioxidant and preservative (antimicrobial stabilization). For example, a solution of diprazine 2 and 2.5% is stabilized with several antioxidants, for injections (ascorbic acid — 0.2%, anhydrous sodium sulfite — 0.1%, sodium metabisulfite — 0.1%).

Antioxidant and pH regulator stabilizes a solution of indigo carmine 0.4%. As a stabilizer, it contains rongalite - 0.05% and sodium - 0.1%.

A solution of apomorphine 1% is made on a solvent containing analgin 0.5 g, cysteine - 0.2 g, 0.1 M hydrochloric acid - 40 ml per 1 l of solution.

Thus, to stabilize the compounds are oxidized, it is necessary to exclude the effect of oxygen on medicinal substances, to create optimal pH values of solutions, to exclude the effect of catalysts in the process of manufacture, sterilization and storage of the drug.

Isotonic solutions are solutions that have an osmotic pressure equal to the osmotic pressure of body fluids (blood, plasma, lymph, tear fluid, etc.).

The name isotonic comes from the Greek words isos - smooth, tonus - pressure.

The osmotic pressure of blood plasma and tears in the body is normal at 7.4 atmospheres (72.82 x 104 Pa). With the introduction of any solution of an indifferent substance into the body, it deviates from the natural osmotic pressure of the serum, causes a pronounced feeling of pain, which will be the stronger, the more the osmotic pressure of the solution, introduced, and the body fluid differs.

Plasma, lymph, lacrimal and cerebrospinal fluids have a constant osmotic pressure, but with the injection of the injection solution into the body, the osmotic pressure of the fluids changes. The concentration and osmotic pressure of various fluids in the body is maintained at a constant level by the action of the so-called osmoregulator.

With the introduction of a solution with a high osmotic pressure (hypertonic solution) as a result of the difference in osmotic pressures inside the cell or erythrocytes and the surrounding plasma, water moves from the erythrocyte to the osmotic pressure equalization. Erythrocytes at the same time, getting rid of the water, lose their shape (shrink) plasmolysis occurs.

Hypertonic solutions in medical practice are used to relieve edema. Hypertonic solutions of sodium chloride in concentrations of 3.5, 10% are used externally for the outflow of pus in the treatment of purulent wounds. Hypertonic solutions also have an antimicrobial effect.

If a solution with a low osmotic pressure (a hypotonic solution) is injected into the body, the fluid will penetrate inside the cell or red blood cell. The erythrocytes begin to swell, and with a large difference in osmotic pressures inside and outside the cell, the membrane does not withstand the pressure and breaks - hemolysis occurs.

The cell or erythrocyte in this case die and turn into a foreign body, which can cause blockage of vital capillaries or vessels, resulting in paralysis of individual organs or death. Therefore, such solutions are introduced in small quantities. It is advisable instead of hypotonic solutions to prescribe isotonic.

Methods for calculating isotonic concentrations. There are several ways to calculate isotonic concentrations: the method based on the Vant-Hoff law or the Mendeleev-Clapeyron equation; method based on the law of Raul (cryoscopic constants) method using isotonic equivalents of sodium chloride.

The calculation of isotonic concentrations according to the law of Vant Hoff. According to Avogadro and Gerard's law, a 1-gram molecule of gaseous substance at 0 ° C and a pressure of 760 mm Hg. occupies a volume of 22.4 liters. This law can be attributed to solutions with a low concentration of substances.

Calculation of isotonic concentrations according to the law of Raul, or a cryoscopic method. According to Raul's law, the vapor pressure above the solution is proportional to the molar fraction of the solute.

The conclusion from this law establishes the relationship between a decrease in vapor pressure, the concentration of a substance in a solution and its freezing point, namely: a decrease in freezing temperature (depression) is proportional to the decrease in vapor pressure and, therefore, proportional to the concentration of the solute in the solution. Isotonic solutions of various substances are frozen at the same temperature, that is, they have the same temperature depression of 0.52 ° C.

Depression of the blood serum (At) is 0.52 ° C. So, if the prepared solution of a substance has a depression equal to 0.52 ° C, then it will be isotonic to the blood serum.

Depression (lowering) of the freezing point of a 1% solution of a drug substance (At) shows how many degrees the freezing point of a 1% solution of a drug substance is reduced compared to the freezing point of a pure solvent.

PLASMA SUBSTITUTING (PHYSIOLOGICAL) SOLUTIONS

Characterization and classification of plasma-substituting solutions. With blood loss, impaired water-electrolyte balance and the acid-base state of the body, there is a need to introduce into the bloodstream significant amounts of blood-substituting liquids. The simplest of them is an isotonic solution of sodium chloride, the introduction of which has a favorable hemodynamic effect. However, this solution cannot maintain a constant ionic composition of the plasma, and in some cases it is necessary to introduce more complex solutions, which include a number of salts present in the blood plasma.

Plasma-substituting solutions (formerly called physiological, or blood-borne liquids) are solutions, the composition of dissolved substances can support the vital activity of cells and organs and do not cause significant changes in physiological balance in the body.

On this basis, it is wrong to call the “physiological” isotonic sodium chloride solution, the introduction of large doses of which leads to a change in the ratio between the mineral salts of the plasma, causes a painful condition in the form of “salt fever”, and sometimes “salt glycosuria”.

At present, the classification has been adopted; it divides plasma-substituting solutions into the following groups:

1. Regulators of water-salt and acid-base equilibrium (Ringer, Ringer-Locke solutions, lactasol, acesol, disol, trisol, chlosol, quartosol, etc.); salt solutions, osmodiuretikov. Carry out the correction of the blood during dehydration.
2. Hemodynamic (protivoshokovye) blood substitutes (polyglukin, reopolyglukine, gelatinol, dextran). Designed for the treatment of shock of various origins and the restoration of hemodynamic disorders, including microcirculation, using heart-lung machines for dilution of blood during operations, etc.
3. Detoxification blood substitutes (hemodez, polydez). Contribute to the removal of toxins during intoxication of various etiologies.
4. Preparations for parenteral nutrition (hydrolysin, amino peptide, polyamine). They serve to ensure the energy resources of the body, the delivery of nutrients to organs and tissues.
5. Blood substitutes with oxygen transfer function. Designed to restore the respiratory function of the blood.
6. Blood substitutes of complex action. Have a wide range of action may include several groups of plasma-substituting solutions.

Requirements for plasma-substituting solutions. Depending on the purpose, there are also requirements for individual groups of infusion solutions, but it’s

common for them that they must be completely eliminated from the body without disrupting the functions of organs, have constant physical and chemical properties, be non-toxic, pyrogen-free, sterile, stable during long-term storage.

One of the main requirements for infusion solutions, administered in significant quantities during blood loss, is the observance of the physiological correspondence between the composition of the body fluid and the injection fluid.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkiv, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

Additional

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В.

Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.

- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:

- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristic of sterile and aseptic medicines in pharmacies/	Define the concept of sterile and aseptic medicines in pharmacies.	1, 3, 4, 5, 6, 7.
2	Technology of preparation of solutions for injection	What are the main technological stages of the preparation of solutions for injection?	1, 3, 4, 5, 6.
3	Quality assessment, rules for packaging, processing and storage of sterile and aseptic medicines in pharmacies	What are the NTD and sterile and aseptic medicines in pharmacies quality indicators	1, 2, 3, 4, 5.
4.	Characteristics of injectable with stabilizers	Define the concept of parenteral drugs, injectable drugs	1, 3, 4, 5, 6, 7.
5.	Requirements for injectable solutions	What are the main requirements for the preparation of medicines	1, 3, 4, 5, 6.
6.	Basic technological operations for the preparation of injectable solutions with stabilizers	What are the main technological stages of preparation of solutions for injection according to SPh. Rules for the introduction of drugs into	1, 2, 3, 4, 5.

		injectable solutions	
7.	Quality assessment, rules of packaging, design and storage of solutions for injections with stabilizers	What are the NTD and quality indicators of injectable solutions	1, 2, 3, 4, 5.

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics and classification of injectable dosage forms.
2. Advantages and disadvantages of injectable dosage forms. Types of injections.
3. Requirements for injectable dosage forms.
4. Solvents used to make injectable dosage forms. Requirements for them.
5. Organization of work in aseptic conditions.
6. Sterilization methods used in the manufacture of injectable solutions with thermolabile substances and suspensions for injection.
7. Stabilization of injectable solutions with thermolabile substances and suspensions for injection.
8. Technology of solutions for injection with thermolabile substances.
9. Packing, preparation for release of injectable solutions with thermolabile substances.
10. Requirements of HFCs and features of preparation of suspensions for injections.
11. Evaluation of the quality of injectable solutions with thermolabile substances and suspensions for injection.
12. The value of isotonicity of solutions for injection.
13. Methods for calculating isotonic concentrations using sodium chloride equivalents, Raoul's laws (cryoscopic method), Vant-Goff, and the Mendeleev-Clapeyron equation.
14. Principles of selection of isotonic substances and general technological methods of preparation of isotonic solutions.
15. Infusion (physiological) solutions; requirements of the State Pharmacopoeia and other normative documents to them.
16. Classification of infusion solutions according to their medical purpose and composition. Nomenclature of the most frequently used plasma-replacing and anti-shock solutions in the form of finished dosage forms.
17. Features of technology of infusion solutions depending on structure of active substances.
18. Rules for preparation of solutions for injections with thermolabile substances and suspensions for injections.
19. Assessment of the quality of solutions in accordance with the requirements of the State Pharmacopoeia and other regulations, sealing, registration for release and storage (orders of the Ministry of Health of Ukraine from 14.06.93 № 139, the Ministry of Health of the USSR from 19.07.72 № 583, from 03.04.91 № 96, from 02.09.91 № 276).

20. Stability of injectable dosage forms and factors affecting it.
21. Stabilization of solutions for injection by physical, chemical and complex methods.
22. Stabilizers used for preparation of injectable solutions, their classification.
23. Characteristics of stabilizers used for the preparation of injectable solutions.
24. Stabilization of solutions of drugs subject to hydrolysis and saponification. Calculations of the amount of stabilizer.
25. Stabilization of solutions of easily oxidizable substances. Antioxidants, their classification and calculation of quantity.
26. Principles of stabilizer selection and calculation of its quantities in accordance with the requirements of NTD.

8.2. Test tasks for self-control.

1. A pharmacist prepares an injection solution with a substance that requires stabilization with a 0.1 M hydrochloric acid solution. Specify this substance:
   Novocain
   calcium chloride
   potassium chloride
   hexamethylenetetramine
   sodium benzoate
2. A pharmacist prepared an injection solution with the addition of a stabilizer — sodium bicarbonate. Specify the substance that requires the use of this stabilizer:
   Sodium thiosulfate
   novocaine
   ephedrine hydrochloride
   sodium chloride
   glucose
3. A pharmacist prepared an injection solution using a stabilizer — 0.1 M sodium hydroxide solution. Specify the substance that requires the use of this stabilizer:
   Caffeine sodium benzoate
   Dibazol
   sodium bicarbonate
   sodium chloride
   glucose
4. A pharmacist prepared an injection solution with an easily oxidizing substance, which requires stabilization with an antioxidant. Specify the substance:
   Vitamin C
   Dimedrol
   sodium chloride
   urotropin
   calcium gluconate

5. A pharmacist prepared 100 ml of a 0.5% solution of novocaine for injections. Specify the amount of 0.1 M hydrochloric acid solution necessary for stabilization:

0.4 ml (8krapel)
0.5 ml (10krapel)
0.7 ml (14krapel)
0.9 ml (18krapel)
1.0 ml (20 drops)

6. A pharmacist prepared 100 ml of 10% glucose solution for injections. Specify the amount of Weibel stabilizer required for cooking:

5 ml
10 ml
15 ml
20 ml
25 ml

7. A pharmacist prepares the solution for injection at a temperature of 20 EC, agitates it, fills thick-walled vials at 80% of the volume and sterilizes it in a horizontal position and. Specify the substance for which the technology is characteristic:

Sodium bicarbonate
aminocaproic acid
glucose
apomorphine hydrochloride
calcium gluconate

8. A pharmacist must sterilize 400 ml of calcium gluconate injection. Specify the time of sterilization of the solution in an autoclave at a temperature of 120 ° C:

12 min
10 min
15 minutes.
12 min
8 min

9. A pharmacist must prepare 100 ml of a mixture that contains glucose for a child of 8 months. Indicate by which technological stage, the preparation of children's medicine, will differ from its preparation for adults:

Sterilization stage
filtering stage
design stage
filtration stage
capping stage

10. A pharmacist prepared eye drops containing silver nitrate. Does he need to take the substance to ensure isotonicity?

Sodium nitrate
sodium chloride

borate acid
glucose
sodium sulfate

11. A pharmacist prepared 100 ml of isotonic sodium chloride solution. Specify the method of sterilization of the final product:

steam
air
gas
mechanical
radiation

12. A pharmacy received a prescription for preparing eye drops containing protargol. Specify the substance chosen by the pharmacist for the addition of eye drops.

Do not izotonuyut
sodium chloride
sodium nitrate
sodium sulfate
boric acid

13. A pharmacist prepared eye drops containing silver nitrate. Does he need to take the substance to ensure isotonicity?

Sodium nitrate
sodium chloride
borate acid
glucose
sodium sulfate

14. The pharmacist must prepare eye drops with pilocarpine hydrochloride. Specify optimal isotonizing agent:

Sodium chloride
sodium sulfate
glucose
boric acid
sodium nitrite

15. Pharmacies prepare infusion solutions that must meet the requirements of HFCs. Specify additional requirements for such solutions:

Isotonicity, isovykist, isohydric, isoionic.
Isotonicity, isovykist, isohydricity.
Isotonicity, isoionichnist.
Isoosmoticity, isohydricity.
Isotonicity, isohydric.

16. To achieve isotonicity of solutions, several methods of calculating isotonic concentrations are used. Specify the method of calculation that is most often adopted in pharmacy practice.

Using equivalents for sodium chloride.

According to the law of van't goff.
Graphic method.
According to the law of Raul.
According to the equation of Mendeleev-Clapeyron.

17. The patient needs to prepare eye drops with riboflavin. Does the substance need to be incorporated into the solution to ensure its isotonicity in the absence of instructions in the recipe?

Sodium chloride.
Sodium sulfate.
Borate acid.
Glucose.
Sodium nitrate.

18. The pharmacy prepares an infusion 2% glucose solution. Specify the substance that is used to ensure that this solution is isotonic.

Sodium chloride.
Sodium nitrate.
Sodium sulfate.
Sodium sulfite.
Borate acid.

19. Infusion solutions should be isohydric. Specify the optimum pH value that is acceptable for infusion solutions intended for intravenous administration.

7.35-7.45.
7.0-7.2.
7.2-7.4.
7.25-7.45.
7.35-7, 55.

20. Sodium chloride solutions for injections or infusions are prepared in pharmacies. Specify additional requirements for the quality of sodium chloride, intended for the preparation of infusion solutions.

H.ch., depyrogenation.
Ch.d.a.
Variety "for others" injection "
There are no impurities of manganese salts.
Anhydrous, ch.d.a.

21. Pharmacist prepared a Weibel stabilizer for stabilization of glucose solution. Specify its composition:

A. Sodium chloride and hydrochloric acid solution
B. Hydrochloric acid solution
C. Sodium bicarbonate and boric acid solution
D. Sodium hydroxide solution
E. Boric acid and sodium tetraborate solution

22. The pharmacist should prepare a stable solution for injection that contains substances that are easily oxidized. Indicate which stabilizer he added:

A. Sodium sulfite, sodium metabisulfite
B. Hydrochloric acid
C. Sodium bicarbonate
D. Sodium hydroxide
E. Sodium chloride

23. The pharmacist-technologist prepared a 20% injectable solution of caffeine-sodium benzoate. Specify the stabilizer needed to create the optimal pH value:

A. 0.1 M sodium hydroxide solution
B. 0.1 M hydrochloric acid solution
C. Webel Stabilizer
D. Sodium metabisulfite
E. Sodium sulfite

24. The pharmacy received a prescription for the preparation of a liquid dosage form, which contains a substance that is soluble in an alkaline environment. Specify this substance:

A. Osarsol
B. Potassium bromide
C. Iodine
D. Protargol
E. Furacillin

25. Injectable solutions are prepared in a pharmacy. What solution is prepared without the addition of a stabilizer?

A. Sodium bicarbonate solution
B. Sodium thiosulfate solution
C. Caffeine sodium benzoate solution
D. Glucose solution
E. Novocaine solution

26. The pharmacist should prepare a glucose solution for injection. Which stabilizer should be used?

A. Weibel stabilizer
B. Sodium chloride solution
C. Hydrochloric acid solution
D. Sodium nitrate solution
E. Sodium sulfate solution

27. A pharmacist must be given a stabilizer to prepare a solution of atropine sulfate for injection. Indicate which stabilizer he chose:

A Hydrochloric acid
B Sodium hydroxide
C Sodium bicarbonate
D Sodium metabisulfite
E Ascorbic acid

28. The pharmacist prepared 150 ml of 10% glucose solution. Indicate how much Weibel's liquid he added to stabilize this solution:

A 7.5 ml
B 5 ml
C 10 ml
D 15 ml
E 3 ml

29.The pharmacist prepared 100 ml of isotonic sodium chloride solution. Specify the method of sterilization of the final product:

A. Steam.
B. Air.
C. Gas.
D. Mechanical.
E. Radiation.

30. The pharmacist prepared an injectable solution of sodium bicarbonate. Specify the maximum filling volume of the vial.

A. 80%.
B. 100%.
C. 50%.
D. 40%.
E. 60%.

31.The pharmacist has prepared a solution for injection that contains a salt formed by a strong base and a weak acid. Specify the required stabilizer.

A. Sodium hydroxide.
B. Sodium sulfate.
C. Hydrochloric acid.
D. Ascorbic acid.
E. Cysteine.

32. The pharmacist prepares a solution for injection with a substance that requires stabilization with a 0.1 M hydrochloric acid solution. Specify this substance:

A. Novocaine.
B. Calcium chloride.
C. Potassium chloride.
D. Hexamethylenetetramine.
E. Sodium benzoate.

33. The pharmacist prepared an injection solution, with the addition of a stabilizer - sodium bicarbonate. Specify the substance that requires the use of this stabilizer:

A. Sodium thiosulfate.
B. Novocaine.
C. Ephedrine hydrochloride.
D. Sodium chloride.
E. Glucose.

34. The pharmacist prepared an injection solution, using a stabilizer - 0.1 M sodium hydroxide solution. Specify the substance that requires the use of this stabilizer:

A. Caffeine-sodium benzoate.
B. Dibazole.
C. Sodium bicarbonate.
D. Sodium chloride.
E. Glucose.

35. The pharmacist prepared an injectable solution with an easily oxidizing substance that needs to be stabilized by an antioxidant. Specify this substance:

A. Ascorbic acid.
B. Diphenhydramine.
C. Sodium chloride.
D. Urotropin.
E. Calcium gluconate.

36. The pharmacist prepared 100 ml of 0.5 \% solution of novocaine for injection. Specify the required amount of 0.1M hydrochloric acid solution for stabilization: * 0.4 ml (8 drops)

A. 0.5 ml (10 drops)
B. 0.7 ml (14 drops)
C. 0.9 ml (18 drops)
D. 1.0 ml (20 drops)

Topic 14 «Eye medicine forms»**– 4 hours.**

1. Relevance of the topic:

Ophthalmic dosage forms are allocated in a special group in connection with the method of their use. The famous Soviet ophthalmologist, academician V.P. Filatov wrote: "It can be said without exaggeration that the organ of sight is the most precious among the human sense organs."

Currently, in the treatment and prevention of eye diseases, solutions for instillation, ointment, eye films, tablets, lamellae, Injection medication, as well as using contact lenses and electrophoresis are used for local application.

Ophthalmic dosage forms are assigned to a special group in connection with the specific requirements for them, which are regulated by analytical and regulatory documentation. Features of the anatomical structure of the eye provide great opportunities for local application of drugs. Treatment by local means is used in diseases of the auxiliary organs of the eye and its anterior part. This creates the conditions for the direct impact of drugs on the pathological process. Different concentrations of drugs are used, as well as different methods of their introduction: instillation of eye drops, ointments, eye films on the conjunctival sac, injections under the conjunctiva, the introduction of drugs into the episcleral space, retrobulbar, in the anterior chamber eyes, in the vitreous. Topical therapy is the basis of pharmacotherapy of eye diseases. Often in eye diseases, topical therapy is the only method of treatment; general therapy is used according to indications.

2. Specific objectives:

• Contents of general articles of the State Pharmacopoeia of Ukraine «Ophthalmic drugs»,"Soft drugs prepared in pharmacies", the main provisions of standards and orders of the Ministry of Health of Ukraine, regulating prescribing (order dated 19.07.05 № 360), production and release of extemporal dosage forms (orders dated 17.10.12 № 812, dated 07.09.93 . № 197), provision of sanitary and hygienic conditions for the manufacture of drugs (order of 15.05.06, 75275).

• Peculiarities of work with toxic, narcotic, potent substances, checking the compliance of one-time release of narcotic and similar substances with the maximum permissible amount of the drug per prescription.

• Basic safety and pharmaceutical regulations in the pharmacy.

• Physico-chemical properties of the ingredients used.

• Rules and technological operations of aseptic production of ophthalmic dosage forms and addition of medicinal substances to them in accordance with the requirements of the State Pharmacopoeia.

• Assessment of quality, storage of ophthalmic dosage forms, closure and registration before release in accordance with the requirements of the State Pharmacopoeia and other regulations.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy.	General technology of soft dosage forms for external use	Carry out calculations of medicinal, auxiliary substances.
	Tech industrial production of drugs	Soft Drug Technology	Technological stages of manufacturing soft medicinal
	Biopharmacy	The technological process of making soft drugs.	Prepare soft drugs for external use, taking into account the physico-chemical properties of the ingredients.
III	***Intersubjective integration*** Injection eye medicinal forms	Preparation of Ointments	Calculate the amount of drugs and auxiliaries

4. Questions for independent work in preparation for the lesson

- Using the IUD to prolong the action of eye drops. An assortment of concentrated solutions and preservatives in the preparation of eye drops.
- Characteristics of the bases used for the preparation of eye ointments, their technology and sterilization.
- Preparation of eye ointments. Features of zinc sulfate and resorcinol.
- Quality assessment, registration for delivery and storage of medicines in accordance with the regulatory and technical documentation.
- Requirements for antibiotic dosage forms.

5. Content of the topic.

In practical ophthalmology, instillation of solutions, bookmarks in the conjunctival sac of ointments, eye films, tablets, lamellae, injection injection of medicinal substances, as well as using contact lenses and electrophoresis are used to treat eye diseases. A variety of dosage forms also corresponds to the listed routes of administration of ophthalmic drugs: solid, liquid, soft and gaseous:

- ✓ ***for solid eye dosage forms include:*** tablets, lamellae, pencils, powders, eye medicinal films;
- ✓ ***in gaseous*** - aerosols (eye sprays)
- ✓ ***to soft*** - ointments are homogeneous and heterogeneous;
- ✓ ***to liquid*** - true water and oil solutions, solutions of high molecular compounds, colloidal solutions, emulsions and suspensions.

They are used in the form of eye drops, lotions, washes, solutions for injection and electrophoresis.

The type of dosage form in ophthalmic pharmacotherapy is determined by a number of interrelated factors:

- the state of the pathological process,
- general indicators of the patient's state of the patient,
- the presence of corresponding traumatic injuries of the organ of vision,
- the degree of permeability of the hemato-ophthalmological barrier,
- the physicochemical properties of medicinal substances,
- the features of the pharmacological action of medicinal and auxiliary substances.

Eye drops (GUTTAE OPHTALMICAE)

Eye drops are liquid dosage forms, which are aqueous or oil solutions, as well as thin suspensions of medicinal substances intended for administration to the eye.

Apply them to the mucous membrane of the eye with a sterile eye pipette. Eye drops are prescribed in small quantities (5-10 ml) with the expectation of their use in a short time.

In the form of eye drops, solutions of various medicinal substances are used. Many of them are unstable and change or collapse under the influence of high temperature, sunlight, microflora and other factors.

Especially often prescribed eye drops with vitamins (ascorbic acid, thiamine bromide, riboflavin), salts of alkaloids (atropine sulfate, pilocarpine hydrochloride, etc.), antibiotics (benzylpenicillin, levomycetin, neomycin, etc.). There are about 80 medicinal substances used in ophthalmic practice, and a significant number of various combinations of them.

Requirements for eye drops. Poor quality eye drops and, above all, their contamination with microorganisms can cause serious consequences, including loss of vision. In this regard, the requirements for eye drops should be similar to those provided for injection solutions: sterility, absence of mechanical impurities, stability, comfort, (isotonicity, optimal pH value), prolonged action.

Sterility. Eye drops, as well as concentrated solutions used for their preparation, should be made under aseptic conditions, followed by sterilization.

The method of sterilization of eye drops depends on the resistance of drugs in solutions to temperature effects. On this basis, medicinal substances can be divided into three groups:

1. Medicinal substances whose solutions can be subjected to heat sterilization without the addition of stabilizers (boric acid, nicotinic acid, sodium chloride, furatsilin, etc.)
2. Medicinal substances, the solutions of which can be subjected to heat sterilization after the addition of stabilizers (sulfacyl-sodium, etilmorphine hydrochloride, physostigmine salicylate, Pass-sodium, soluble salyuzid, etc.).
3. Medicinal substances whose solutions do not withstand heat sterilization (protargol, collargol, lidaza, himopsina, trypsin, penicillin, etc.) and are made aseptically without further sterilization.

Under aseptic conditions also prepared solutions of medicinal substances, sterilization regimes which have not been developed.

Eye drops may contain preservatives, buffers, prolongators. Preservation of eye drops provides for the prevention of the development of microorganisms in the dosage form during storage and use.

The mechanism of action of preservatives is reduced to disruption of the cell membrane, protein coagulation, blocking of free sulfhydryl groups, chemical antagonism.

In ophthalmic dosage forms used their limited range. Thus, from **inorganic preservatives**, boric acid is more often used in a concentration of 1.9–2% with a pH of about 5.0 (the optimum pH of ophthalmic solutions is 4.5–9.0). In addition, boric acid has buffer properties, prevents changes in the pH of the solution when adding a drug substance, especially from the group of alkaloids, give an acidic solution in solutions (pH below 4.0).

Of **organic preservatives**, b-phenylethyl alcohol - 0.3-0.5%, benzyl alcohol - 0.9%, esters of p-hydroxybenzoic acid: nipagin-0.05-0.23%, nipazol - 0, 03-0.08% or their mixture (nipagin - 0.18%, nipazol - 0.02%), levomycetin 0.15%, salts of quaternary ammonium bases (benzalkonium chloride, cetylpyridium chloride, dodecyl dimethylbenzylammonium chloride) at a concentration of 1 10000 .

Sorbic acid has found application with acids; it has no irritating and allergic effect on the skin and mucous membranes. Most effective at pH 3.0-4.0; has very strong fungicidal properties, is used in a concentration of 0.05-0.2%.

With **organometallic preservatives**, ethanolmercurium chloride 0.01% and merthiolate 0.005% are of interest.

Preservatives are added to the dosage form before sterilizing the solution.

Stability. In the eye drops must be ensured the stability of medicinal substances. Heat sterilization and long-term storage of eye solutions in glass containers lead to the destruction of many medicinal substances (alkaloids, anesthetics, etc.). As a result of hydrolysis, oxidation, etc. Therefore, when making eye drops, and especially when they are sterilized, much attention should be paid to chemical glass stability, since alkaline glass (the presence of sodium silicate) gives an alkaline reaction to water, during sterilization, the pH can reach 10.0. The rate of destruction of drugs depends not only on the sterilization temperature, but also largely on the pH of the medium.

To store stability, most solutions require a low pH (around 5.0). On this basis, there is a need to manufacture eye drops on buffer solvents. When using buffer solutions, an increase in chemical stability, therapeutic activity, as well as a reduction in the irritant effect of ophthalmic solutions is achieved. SPh XI recommends using sterile isotonic solutions with preservative and buffering properties as solvents in the manufacture of eye drops. But these solutions can be used only as directed by a physician.

The choice of buffer solvent depends on the physicochemical properties of the drug substance. On this basis, they can be divided into two groups.

The first group includes drugs, in solutions of which a pH of about 5.0 should be maintained. In this case, it is recommended to use an isotonic solution of boric acid (concentration of 1.9%), whose pH is below 5.0.

The second group includes medicinal substances, in solutions of which a pH of about 6.8 should be maintained. In this case, phosphate buffer with a pH of 6.8 is recommended. isotonation with sodium chloride.

The stabilization of the easily oxidizable salts of physostigmine salicylate and epinephrine hydrochloride in eye drops is accomplished by adding antioxidants (sodium sulfite, sodium metabisulfite, etc.).

Prolongation of the therapeutic action of eye drops. The disadvantage of many drugs used in the form of aqueous solutions is a short period of their therapeutic action.

In order to prolong the action of eye drops, attempts were made to replace water with other solvents with viscosity, which slows down the rapid leaching of medicinal substances from the conjunctival sac. As such components previously used oils (refined sunflower, peach or apricot), tragakant and other substances. But for various reasons they did not receive distribution. High refractive index, chemical instability limited their application.

More effective prolongators for eye drops - synthetic hydrophilic high-medical compounds. SPh XI indicates that for the prolongation of the action of medicinal substances used in eye drops, cellulose derivatives may be included in the solvent.

Isotonicity Many eye drops cause discomfort during instillation (burning or pain). In most cases, the discomfort is due to the disparity between the osmotic pressure and the pH value of the eye drops with the osmotic pressure and the pH value of the tear fluid. Eye drops should be isotonic us lacrimal fluid man and respond to the osmotic pressure of sodium chloride solutions at concentrations of 0.9 (0.2% (0.7-1.1%) that is approximately 286 mOsm / kg. In some cases, permitted the use of hypertonic or hypotonic solutions, which should be indicated in their own articles.

Depending on the magnitude of the osmotic pressure, eye drops can be divided into 3 groups:

1. Eye drops, the osmotic pressure of which is lower than 0.7% of the equivalent concentration of sodium chloride - hypotonic solutions, must be compounded by the calculated amount of sodium chloride. It is especially important that the washings for the eyes be isotonic.

2. Eye drops, the osmotic pressure of which is higher than 1.1% of the equivalent concentration of sodium chloride, and not isotonized, because they are hypertonic.

3. Eye drops, the osmotic pressure of which is in the range of 0.7-1.1% of the equivalent concentration of sodium chloride, and not isotonic because there is isotonic.

Eye drops are not isotonic if colloidal medicinal substances are prescribed (Collargol, protargol), because isotonizing substances, being strong electrolytes, can cause coagulation.

Sodium chloride, sodium sulfate, sodium nitrate, boric acid, glucose are used to isotonize eye drops, taking into account their compatibility with medicinal substances. Boric acid for isotoning is advisable to use in the manufacture of solutions of drugs that are salts of strong acids and weak bases, because it not only suppresses their hydrolysis, but also provides a preservative effect. Sometimes it is advisable to apply glucose for isotoning, because it is compatible with a large number of medicinal substances.

Isotonization of eye drops of sodium chloride, sodium sulfate and sodium nitrate is carried out by a pharmacist without a doctor's instructions, and boric acid and other substances only by agreement with a doctor.

The isotonic concentration of eye drops can be calculated by the same methods as in solutions for injection.

Lack of mechanical inclusions. Eye drops in the form of aqueous solutions of medicinal substances should be carefully filtered after production, as the presence of suspended particles, hair, etc. may damage the cornea and mucous membranes of the eyes.

Eye drops in pharmaceutical conditions are filtered through paper filters with ashless filter paper, does not change during sterilization. When making eye drops in large volumes (Intra drug preparations), they can be filtered through a No. 3 glass filter or membrane - with simultaneous sterilization (solution loss is 0.5%).

When mass production of eye drops in pharmacies, it is advisable to use devices for their filtration and subsequent packaging.

Technology eye drops. Taking into account the requirements for eye drops, their technology is similar to the technology of injection solutions.

All dosage forms for the treatment of eye diseases are prepared under aseptic conditions in compliance with the requirements of the current technical and technical documentation for sanitary treatment in pharmacies. But since aseptic manufacturing conditions do not ensure complete sterility of drugs, eye drops and lotions of heat-stable substances must be sterilized.

It should be noted that eye drops must not only be sterile, but also be kept sterile during their use.

Common in the manufacture of ophthalmic and injectable dosage forms isotonization, stabilization, sterilization and preservation.

Of great importance for eye drops is the observance of the accuracy of the concentration of solutes. These requirements arise due to the fact that eye drops are prescribed in small quantities.

In the manufacture of eye drops, and, mainly, during filtration, significant losses of substance occur due to its adsorption on filter materials (through a dry simple filter - up to 4.7%, and through a folded one - up to 3%), as well as due to dilution the original solutions when filtering them through paper filters, pre-washed with water.

In order to minimize the loss of drug substance in the manufacture of eye drops, use the following techniques.

1. The drug substance, soluble in water, is dissolved in a part (half amount) of the solvent and the solution is filtered into a vial for tempering through a folded filter and cotton wool rinsed with sterile water for injection, and then the filter is washed with the amount of solvent remaining.

2. 2. In cases when there is insufficient half the amount of solvent to dissolve the drug substance, the substance is dissolved in the entire prescribed amount of solvent and filtered into a measuring cylinder through a dry filter and cotton wool, and the amount of water that was not enough is added through the same filter and cotton wool to the required amount volume of solution.

3. If dry medicinal substances are prescribed in the amount of less than 0.05 g, then their concentrated solutions are used. In this case, the calculated amount of concentrated solutions and water is measured in a vial for tempering, observing the conditions of asepsis.

Eye ointments (UNGUENTA OPHTALMICA SEU OCULENTA)

Eye ointments are designed for application to the conjunctiva of the eye tab for the lower eyelid with special spatulas. The composition of ointments varied. Often there are ointments with antibiotics, sulfa drugs, mercury oxide, etc. Apply eye ointment for anesthesia, the expansion or contraction of the pupil, a decrease in inflammatory processes and a decrease in intraocular pressure.

The conjunctiva of the eye is a very delicate sheath, therefore eye ointments are divided into a separate group and additional requirements are imposed on them:

- Eye ointments should be prepared under aseptic conditions;
- The ointment base should not contain any impurities, should be neutral, sterile, evenly distributed over the mucous membrane
- Medicinal substances in eye ointments should be in the optimum degree of dispersion to avoid damage to the mucous membrane;
- Ophthalmic ointments should be easily and arbitrarily distributed over the moist mucous membrane.

The range of bases used for eye ointments is small and expands very slowly. Most often used Vaseline varieties "for eye ointments." It is sufficiently resistant to the effects of the environment, indifferent to many medicinal substances, has no irritating properties. And yet, as an independent basis, it is not entirely convenient, as it does not mix well with the tear fluid.

If the recipe does not specify a base, then in the absence of an approved NTD for this recipe, in accordance with StPh XI, a base consisting of 10 parts of anhydrous lanolin and 90 parts of Vaseline (“For eye ointments”) that do not contain reducing substances is used.

Technology of eye ointments

The technology of eye ointments is similar to the technology of conventional ointments, but with observance of the conditions of asepsis. All auxiliary materials, ointment bases, medicinal substances that withstand high temperatures, cans for dispensing are sterilized by the methods specified in the StPh XI.

An important factor in the manufacture of eye ointments (as well as dermatological) is to achieve the optimal degree of dispersion of medicinal substances administered. The required dispersion of substances is achieved by pre-dissolving or thoroughly rubbing them with a small amount of liquid, coming to the base.

Substances soluble in water (salts of alkaloids, Novocain, Protargol, Collargol, Resorcinol, Zinc Sulfate, etc.) are dissolved in a minimal amount of freshly made sterile water for injection, and then mixed with an ointment base. To speed up the dissolution of protargol, it is advisable to pre-moisten with a few drops of glycerin.

Substances that are insoluble or sparingly soluble in water and in the base (mercury oxide is yellow, kalomel, xeroform, zinc oxide, copper citrate, etc.), are introduced into the composition of eye ointments in the form of fine powders after thorough grinding with a small amount of liquid paraffin, glycerin , water or part of the molten base, if the drug substances more than 5%. The choice of fluid depends on the base used.

Substances soluble in the base are dissolved in a liquid suitable for the base or in a part of the molten base, if there are more than 5%.

Own technology of eye ointments. Prescription eye ointments varied. These are mainly two-phase and more complex dispersed systems.

QUALITY CONTROL, STORAGE AND VACATION OF EYE MEDICINE FORMS

For dispensing and storage of eye drops, use bottles of neutral glass, sealed with rubber stoppers under running in aluminum caps. Such packaging with repeated use can lead to microbial contamination, since the opening of the vials immediately leads to a violation of their sterility. Packaging for eye drops should provide sterility and be comfortable to use. These requirements are met by special bottles with pipettes made of polyethylene, mounted in a screw cap. The presence of a standard pipette allows you to accurately and easily dispense solution.

Eye drops, prepared in a pharmacy, are decorated with a basic pink label with the words “eye drops” and the additional “Store in a cool, dark place”, “Sterile” or “Prepared aseptically”.

Ophthalmic ointments are packed in 10.0 g of dry sterilized BVS cans and sealed with plastic caps that are screwed on and sterilized with parchment pads. Ophthalmic ointments are stored in accordance with the physicochemical properties of the substances in their composition at a temperature not exceeding 25 ° C or in a refrigerator (3-5 ° C) for 10 days. The shelf life of pilokarpin ointments 1%, 2% and thiamine 0.5%, 1% at a temperature of 3-5 ° C is 30 days.

Eye ointments are made with the labels “Full-time ointment”, additional “Keep in a cool, dark place”, “Prepared aseptically”.

Evaluation of the quality of eye drops, lotions and ointments is carried out in accordance with the regulatory documentation, that is, check the recipe, passport, packaging, design, color, absence of mechanical inclusions, deviation in volume (solutions) or mass (ointment). Eye ointments are checked for the same indicators as dermatological ointment.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkiv, "Original", 2006
- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

Additional

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.

- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украïри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П.

Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.

- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.
- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980
- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua

- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristics of ophthalmic dosage forms	Define the concept of ophthalmic dosage forms	1, 3, 4, 5, 6, 7.
2	Requirements for ophthalmic dosage forms	What are the main requirements for ophthalmic dosage forms (drops and ointments)	1, 3, 4, 5, 6.
3	Basic technological operations for the preparation of ophthalmic dosage forms.	What are the main technological stages of preparation of ophthalmic dosage forms	1, 2, 3, 4, 5.
4	Quality assessment, rules of packaging, design and storage of ophthalmic dosage forms	What are the NTD and quality indicators of ophthalmic dosage forms	1, 2, 3, 4, 5.

8. Materials for self-control.

8.1. Questions for self-control.

1. Characteristics of ophthalmic dosage forms (drops, lotions, washes, ointments, inserts, films); requirements to them according to the State Pharmacopoeia of Ukraine and other regulatory documentation.
2. Eye drops as a dosage form. Requirements of the State Pharmacopoeia of Ukraine for eye drops, their implementation in a pharmacy.
3. Isotoning of eye drops, lotions, washes. Prolongation of eye drops. Principles of stabilization of eye drops. Purpose and characteristics of preservatives used in the manufacture of eye drops.
4. The main technological stages of preparation of eye drops. Features of technology of eye drops depending on physicochemical properties of medicinal substances. The use of concentrated solutions in the manufacture of eye drops.
5. Rules for preparing eye lotions and washes; ways to ensure their quality.
6. Methods of sterilization of eye drops.

7. Characteristics of mild dosage forms; requirements of the State Pharmacopoeia of Ukraine to eye ointments, their implementation in a pharmacy. Requirements for the bases used for the preparation of eye ointments.
8. The main technological stages of preparation of eye ointments. Technology of eye ointments and features of introduction of zinc sulfate, resorcinol, kolargol and protargol into their composition.
9. Assessment of the quality of ophthalmic dosage forms, closure, registration for release and storage in accordance with the requirements of the State Pharmacopoeia of Ukraine and other regulations.

8.2. Test tasks for self-control.

1. The pharmacist prepared eye drops containing riboflavin, potassium iodide and ascorbic acid. Specify the method of administration of potassium iodide:
   A. Add aseptically after sterilization.
   B. Dissolve in a solution of riboflavin.
   C. Add last to the stand.
   D. Dissolve in purified water, sterilize.
   E. Place first in the vial.
2. The pharmacy received a prescription for the preparation of eye drops containing 1% pilocarpine hydrochloride. What substance did the pharmacist use to ensure isotonicity?
   A. Sodium chloride.
   B. Boric acid.
   C. Glucose.
   D. Sodium nitrate.
   E Sodium sulfate.
3. Pharmacist-technologist accepted a prescription for eye drops with adrenaline hydrochloride. What properties of adrenaline hydrochloride must be taken into account in the technology?
   A. Thermolability.
   B. Solubility in water.
   C. Low solubility in water.
   D. Thermal stability.
   E. Volatility.
4. For the preparation of eye drops use a solution-concentrate of riboflavin (1: 5000). Indicate how much solution should be measured if 0.001 riboflavin is prescribed?
   A. 5 ml.
   B. 2 ml.
   C. 3 ml.
   D. 4 ml.
   E. 1 ml.
5. The pharmacy received a prescription:

Rp .: Solutionis Zinci sulfatis 0.25% 20 ml
Sodium sulfatis q. s.,
Ut fiat solutio isotonica
Yes. Sign.

A Grind dry matter in 10 ml of water for injection, filter into a dispensing container through a sterile pre-washed folded filter and cotton wool, rinse the filter with the remainder of the water for injection.

B. Dissolve dry matter in 20 ml of water for injections, filter into a dispensing container through a sterile pre-washed folded filter and cotton wool.

C. Dissolve the dry matter in 20 ml of water for injections, filter into a container for release through a sterile dry folded filter and cotton wool.

D. Dissolve dry matter in a 20 ml water for injections into a vial.

E. Grind dry matter in a sterile mortar with a small amount of water for injections, add the rest of the water, transfer to a container for release.

6. The pharmacist should prepare 10.0 g of eye ointment base. What amounts of lanolin and vaseline were used for this purpose?

A. 1.0 g of anhydrous lanolin and 9.0 g of vaseline.
B. 1.0 g of anhydrous lanolin and 29.0 g of vaseline.
C. 12.0 g of anhydrous lanolin and 18.0 g of vaseline.
D. 27.0 g of anhydrous lanolin and 3.0 g of vaseline.
E. 10.0 g of anhydrous lanolin and 20.0 g of vaseline.

7. Oxygen ointment with norsulfazole sodium is prescribed in the prescription. Specify the optimal ointment base:

A. Alloy of vaseline with lanolin (9: 1).
B. Oil-water emulsion base.
C. Alloy of vaseline with paraffin (6: 4).
D. Alloy of vaseline with lanolin (7: 3).
E. Vaseline alloy with paraffin (8: 2).

8. Specify the substance necessary for isotoning of eye drops with chloramphenicol:

A. Sodium chloride.
B. Analgin.
C. Potassium iodide.
D. Ascorbic acid.
E. Glucose.

9. The patient must prepare eye ointment from pilocarpine hydrochloride. How to introduce pilocarpine hydrochloride into its composition?

A. Dissolve in sterile purified water.
B. Rub with sterile Vaseline oil.
C. Rub with a sterile base.
D. Rub with sterile Vaseline.
E. Dissolve in molten base.

10. For the preparation of eye ointments in the pharmacy use Vaseline grade "for eye ointments". Indicate how it differs from ordinary Vaseline?

A. Lack of reducing substances.
B. No irritant effect.
C. Resistance to the environment.
D. Indifference.
E. Color and odor.

11. A pharmacy received a prescription for preparing eye ointment on a vaseline-lanolin basis. Specify in what ratio the pharmacist should prepare an ointment base.

9: 1
1:1
5: 1
6-4
7: 3

12. The pharmacy received a prescription for the preparation of eye drops containing protargol. Specify the substance that the pharmacist chose to dope-isolate eye drops.

Do not isotonic
sodium chloride
sodium nitrate
sodium sulfate
boric acid

13. A pharmacist prepared eye drops containing silver nitrate. Does he need to take the substance to ensure isotonicity?

Sodium nitrate
sodium chloride
boric acid
glucose
sodium sulfate

14. For the manufacture of eye drops using a solution of riboflavin concentrate (1: 5000). Specify the amount of solution that needs to be measured, if 0.001 riboflavin is prescribed in the recipe:

5 ml
2 ml
3 ml
4 ml
1 ml

15. The prescription prescribed eye ointment with norsulfazol sodium. Specify the optimal ointment base:

Alloy vaseline with lanolin (9: 1)
IV type emulsion base
Alloy vaseline with paraffin (6: 4)
Alloy vaseline with lanolin (6: 4)
Alloy vaseline with paraffin (8: 2)

16. A pharmacist must prepare eye drops with pilocarpine hydrochloride. Specify optimal isotonizing agent:

Sodium chloride
sodium sulfate
glucose
boric acid
sodium nitrite

17. The patient needs to prepare eye drops with riboflavin. Does the substance need to be incorporated into the solution to ensure its isotonicity in the absence of instructions in the recipe?

Sodium chloride.
Sodium sulfate.
Acid boron hydrochloric
Glucose.
Sodium nitrate.

18. The patient needs to prepare eye drops with prolonged sodium sulfacyl. What substance can I recommend to the doctor to prescribe in the composition of the drops in order to increase the duration of their action?

Polyvinyl alcohol.
Gelatin.
glucose
Polyethylene oxide-400.
Sodium chloride.

19. Patient prepared eye ointment. How should a pharmacist introduce mercury oxide yellow into its composition to ensure an optimum degree of dispersion?

Grind with sterile vaseline oil.
Grind with a sterile ointment base.
Pre-dissolve in purified water.
Pre-dissolve in ethyl alcohol.
Add to sterilized grounds.

20. The patient needs to prepare an eye ointment with pilocarpine hydrochloride. How should a pharmacist introduce pilocarpine hydrochloride?

Dissolve in sterile purified water.
Grind with sterile vaseline oil.
Grind with a sterile base.
Grind with sterile vaseline.
Dissolve in melted base.

Topic 15 «Children's and geriatric medical forms»**– 4 hours.**

1. Relevance of the topic:

Ophthalmic dosage forms are allocated in a special group in connection with the method of their use. The famous Soviet ophthalmologist, academician V.P. Filatov wrote: "It can be said without exaggeration that the organ of sight is the most precious among the human sense organs."

Currently, in the treatment and prevention of different diseases, solutions for instillation, ointment, tablets, lamellae, Injection medication, as well as using contact lenses and electrophoresis are used for local application. It is difficult to find a child of the first year of life who would not receive one or another medical treatment. The frequency of taking medicines increases with age. Medicines for children include medicines approved for use in children's practice in age appropriate doses and dosage forms that provide a therapeutic effect and easy to use. Geriatric pharmacy studies the specifics and possibilities of medical care for the old age people, develops on basic principles of the technology of geriatric dosage forms, and provides information on the rational pharmacotherapy of geriatric patients.

2. Specific objectives:

• Contents of general articles of the State Pharmacopoeia of Ukraine (Powders made in a pharmacy) (State Pharmacopoeia of Ukraine 2.0 "Soft drugs manufactured in pharmacies, "Suppositories and pessaries manufactured in pharmacies", "Liquid dosage forms for external use", «Liquid dosage forms for oral use", the main provisions of the standard and orders of the Ministry of Health of Ukraine, prescribing (order of 19.07.05 № 360), manufacture and release of extemporaneous dosage forms (orders dated 17.10.12 № 812, dated 07.09.93 № 197), provision of sanitary and hygienic conditions for the manufacture of drugs (order dated 15.05.06 № 275).

• Features of work with toxic, narcotic, potent substances, checking therapeutic doses, comparing them with the maximum therapeutic single and daily doses, checking compliance with a single release of narcotic drugs and similar substances to the maximum allowable amount per prescription.

• Equipment and principle of operation of small mechanization.

• The main provisions of safety and pharmaceutical order in the pharmacy.

• Physico-chemical properties of the used ingredients, general rules of aseptic production of dosage forms, their packaging and labeling.

3. Materials for pre-classroom training of students.

3.1. Basic basic knowledge, skills, abilities that are necessary for independent study and mastering of the topic and which are based on interdisciplinary connections:

№	Discipline	**Know**	**Be able**
1.	2.	**3.**	**4.**
I	1. Biology	Features of structure, function, interaction of human organs and systems.	Define the various processes that take place in the human body.
	2. Chemistry (inorganic, organic)	Characteristics of chemical elements.	Give definitions, write formulas and chemical reactions, calculate the concentration of solutions.
	3. Physical and colloid chemistry.	Solubility of solids and liquids in liquids. Raoul's law. Extraction. Buffer solutions.	Carry out fractional distillation. .
	4. Latin language	Basics of grammar.	Be able to write Latin names of drugs and medicines.
	5. Pharmacy technology of drugs	Technology of preparation of various dosage forms. Rules for the introduction of drugs and excipients in the dosage form.	Choose the best option of technology and according to it to prepare a drug with a gradual assessment of quality;
II.	***The following disciplines*** 1. Organization and economics of pharmacy.	General technology of soft dosage forms for external use	Carry out calculations of medicinal, auxiliary substances.
	Tech industrial production of drugs	Soft Drug Technology	Technological stages of manufacturing soft medicinal
	Biopharmacy	The technological process of making soft drugs.	Prepare soft drugs for external use, taking into account the physico-chemical properties of the ingredients.
III	***Intersubjective integration*** Injection eye medicinal forms	Preparation of Ointments	Calculate the amount of drugs and auxiliaries

4. Questions for independent work in preparation for the lesson

-Factors affecting the stability of drugs with antibiotics.

-General rules for the preparation of liquid and solid drugs for children and eldery.

-Characteristics of the bases for the preparation of ointments and suppositories and the rules for the introduction of antibiotics into them.
-Assessment of quality, registration for delivery and storage of medicines in accordance with the regulatory and technical documentation.
-Calculate the amount of drugs and excipients for the preparation of children's and geriatric dosage forms.
-Select and justify the optimal technology of children's and geriatric dosage forms in accordance with the prescription, as well as the method of sterilization, if necessary.

5. Content of the topic.

Children's and geriatric dosage forms

The child's body has specific features that determine its special sensitivity to medicines and a peculiar reaction of the body to their introduction, which results in the development of toxic or undesirable side effects. Drug therapy in childhood differs significantly from adult treatment not only quantitatively, but also qualitatively.

Anatomical and physiological features of the child's body require the creation of medicinal forms with high bioavailability, pharmacotherapeutic effectiveness and minimal side effects.

Among other physiological factors affecting the pharmacokinetics of medicinal substances, the age of children is of great importance. Special attention should be paid to the use of medicines for premature children, in whom the period of adaptation to independent life lasts much longer.

The period of childhood is characterized by rapid growth, weight gain of the child, as well as intensive water exchange. Therefore, it is important to correctly determine the dosage. It is advisable to use medicinal products in the range of minimum and average therapeutic doses and, if possible, in short courses. The dose is selected strictly individually.

Periods of childhood:
1. Neonatal period – the first 28 days of life.
2. Chest - up to 1-1.5 years.
3. Preschool - up to 7 years old.
4. School age - up to 17 years old.

Newborn children are characterized by rapid penetration of drugs into organs and tissues, and the increased permeability of the mucous membrane of the digestive organs can increase and accelerate the absorption of drugs in the gastrointestinal tract. In view of the functional immaturity of the newborn, it is necessary to avoid prescribing medicinal substances that have an inhibitory effect or cause damage to the respiratory center. It is not recommended to prescribe salicylates, tetracycline, kanamycin, neomycin, polymyxin, drugs of the morphine

group, phenacetin, antipyrine, indomethacin, etc. to newborns. Due to increased skin permeability, menthol, potassium permanganate, anesthesin, tar should be used with caution. It is not recommended to use boric acid as an ineffective antiseptic that has a toxic effect.

The period of infancy is characterized by rapid growth, weight gain of the child, as well as intensive water exchange. During this period, it is necessary to be especially careful when using medicines for children under the age of 3 months. It is important to correctly determine the dosage. It is advisable to use medicinal products in the range of minimum and average therapeutic doses and, if possible, in short courses. In children of the first three months of life, the dose of medicinal substances should be 1/3 or 1/2 of the dose of children older than 3 months of life. The dose is selected strictly individually.

In the preschool and school periods, it is important to correctly choose the method of administration and the dosage form, taking into account the weight and age of the child, the nature of the disease and the physicochemical properties of medicinal substances. In recent years, the rectal administration of drugs has been widely used, which relieves the problem of taste and smell, and also contributes to the reduction of side effects and especially allergic reactions. At an early age, children often use the injection of drugs, the advantage of which is the speed of the onset of the therapeutic effect, the completeness of the absorption of medicinal substances, the possibility of regulating the content of the medicinal substance in the bloodstream. However, this method has serious drawbacks: a painful factor, damage to the neuromuscular apparatus, high concentrations of drugs that can cause intoxication with rapid administration of the drug. Based on this, oral medication is preferred. When taken orally, the taste and smell of the medicinal product are important. Bitter, sour, salty, unpleasant-looking and smelling medicines cause negative emotions in children, which can sharply reduce the therapeutic effect of medicines. Therefore, children's dosage forms must be adjusted. But it is necessary to remember that the excessive and illegible addition of correctors can lead to a decrease in the therapeutic activity of children's medicines.

Peculiarities of dosage of medical drugs for children

The question of choosing the dose of drugs for children is one of the most difficult in pediatric pharmacology. The main task is to determine such a dose that would maintain a stable therapeutic concentration in the body. Many of the proposed formulas and coefficients were calculated to find the optimal options for converting the mass of an adult to the mass of a child.

Children are more sensitive than adults to some substances and less sensitive to others. The basis of this provision is the conclusions of Mole (1963) regarding the sensitivity of children to medical drugs.

The dosage of children's medicinal forms is carried out taking into account a number of factors, which include:

• pharmacokinetics and pharmacodynamics of medicinal products;

• age and weight of the child;
• nature and severity of the disease;
• condition of the liver, kidneys, heart;
• individual sensitivity of the child;
• living conditions of the child, peculiarities of nutrition;
• climatic and geographical factors
• medical history.

Two methods have long been used to determine drug doses in pediatrics:

• Empirical - the necessary dose of the drug was calculated for children of different age groups based on the effect observed from the introduction of the drug in a certain dose.

• Using coefficients

• Using special formulas.

The dose of the drug for children is reduced from the adult dose according to age. It is not accurate enough, since children of the same age have different body weights, living conditions, food, etc.

In accordance with this method, children are prescribed:

up to 1 year - 1/24 and 1/12 of the adult dose;

• from 1 year to 2 years - 1/12;
• from 2 years to 4 years - 1/6;
• from 4 years to 6 years - 1/4;
• from 6 to 7 years old - 1/3;
• from 7 to 14 years old - 1/2;
• from 14 to 18 years old - 3/4;

Special formulas can be used to calculate the dose of the medicinal product:

$$\text{Children's dose} = \frac{\text{adult dose} \cdot \text{child's body mass}}{70}$$

$$\text{Children's dose} = \frac{\text{adult dose} \bullet \text{child's age in years}}{\text{child's age in years} + 12}$$

Using the following formula, you can determine the percentage of the drug from the adult dose, which is taken as 100%.

Child's dose=(child's age (in years)·5 (constant))

To determine the dose of sedatives and narcotics drugs:

$$\text{Child's dose} = \frac{\text{B}\ (4 \bullet \text{a}) + 20}{100}$$

where B – adult dose;

a – child's age in years.

Basic requirements for medicines for children:

- high therapeutic efficiency;

- the minimum number of side effects;

- microbiological cleanliness;

- ease of use;

- dosage accuracy.

The production of dosage forms for newborns and children up to one year old in a pharmacy is carried out in aseptic conditions (or using a laminar box) in accordance with the requirements of current regulatory documents. Children's dosage forms are prepared according to the general rules of the technology of the corresponding dosage forms.

Liquid dosage forms. All types of liquid oral dosage forms (solutions, mixtures, drops, infusions, decoctions, suspensions, emulsions) are widely used in children's practice. But in liquid medicinal forms, like in no other form, such properties of the drug as taste, smell are revealed, which are often the cause of many complications during pharmacotherapy. The attention of researchers of many countries is now directed to the elimination of unpleasant taste and smell, giving medicines an attractive appearance. One of the specific features of liquid dosage forms for children lies in the creation of medicines with an improved taste. Another feature is the selection of solvents and auxiliary substances used for the preparation of liquid dosage forms. Currently, liquid dosage forms for children are usually made using the same substances as dosage forms for adults. At the same time, age-related pharmacology dictates the need to choose suspending, emulsifying agents and other fillers taking into account the specifics of the child's body.

Solutions for internal use are prepared by mass method without adding stabilizers or conservants. Solutions for internal use are filtered, poured into neutral glass containers, closed with rubber stoppers and metal caps for break-in. Sterilize with saturated steam under pressure at a temperature of 120 °C. In oil solutions for treating the skin of newborns, oils are used: peach, olive, sunflower and petroleum jelly. Oils and oil solutions are released in a release container at 180 °C for 30 minutes, hermetically sealed with rubber stoppers for running-in. Store for 30 days at room temperature. Solutions for external use, containing thermolabile substances, are prepared in sterile purified water and poured under aseptic conditions into a sterile container for dispensing. Solutions for injections are prepared in accordance with the requirements of the SFU and other current regulatory documents.

Rectal dosage forms for children. Rectal dosage forms for children are developed in the form of suppositories, rectal capsules and rectal ointments. They should also have multiple age dosages. Rectal dosage forms are quite convenient to use in children's practice. However, it is more natural for the body to receive

medicines through the mouth, and not through the rectum. Medicinal components of rectal dosage forms in a much higher concentration immediately enter the blood of the child. The therapeutic effect increases, but at the same time the probability of side effects increases. Rectal dosage forms are better to use in those cases when a very young child will not be able to swallow the medicine and when it is necessary for it to take effect immediately.

When making children's suppositories, the same bases are used as for adults. It is not recommended to use polyethylene oxide and gelatin-glycerin bases due to their burning and dehydrating effects on the mucous membrane.

Medicinal substances of various pharmacological groups are widely used in the form of children's suppositories: hormones, vitamins, antibiotics, sulfonamides, antispasmodics, analgesics, antipyretics, tranquilizers, antiallergic drugs, etc. With indisputable valuable properties, suppositories as a medicinal form have their specific disadvantages:

- relatively high consumption of molding material (base)

- the need to strictly observe the storage conditions (environmental temperature, humidity);

- clearly expressed dependence of absorption processes of medicinal substances on their physical and chemical properties and the nature of the base;

- difficulties in varying dosages of medicines;

- the psychological side of the issue: not all children are able to come to terms with taking this medicinal form.

Quality control of medicines

All dosage forms manufactured for children, especially for infants, are subject to full chemical control.

In the absence of a pharmacist-analyst on the staff of the pharmacy, the head of the pharmacy is obliged to ensure full chemical control of all liquid medicinal forms for internal use intended for newborn children. In the absence of methods of quantitative analysis, they should be verified by qualitative analysis. As an exception, it is allowed to manufacture complex medicinal forms that do not have methods of qualitative and quantitative analysis for babies in the presence of an analyst or pharmacist-technologist "Under observation".

When controlling medicinal forms for children, special attention is paid to medicinal forms used in ophthalmic practice, containing narcotic and poisonous substances, as well as solutions for medicinal enemas. When dispensing medicines for children, parents are drawn to the time and features of their administration, as well as storage conditions.

Problems and ways of improving medicines for children

In order to improve children's dosage forms, it is necessary to expand scientific research work on the creation of new medicines for children, to increase the range of highly effective auxiliary substances (solubilizers, corrective substances, bases for suppositories), to develop special types of packaging for children's dosage forms (caps for vials that difficult to open, packaging for one-time use, which make it possible not to break the tightness and maintain the sterility of the drug throughout the period of use).

The efforts of scientific and industrial institutions should be aimed at creating drugs that are convenient to use, that minimally traumatize the psyche of the child, have a pleasant taste, smell, attractive appearance, and at the same time provide the maximum therapeutic effect with a minimum of side effects and meet the requirements to children's medicinal forms.

It is necessary to develop solid dosage forms for children in several dosages. They should have a streamlined shape and be covered with slippery shells. It is allowed to apply dividing lines, which facilitate the crushing of the dosage form into parts.

Solutions for injections in ampoules and vials should also have several dosages in order to ensure convenience in use and reduce losses of medicines during use.

Modern achievements of pediatrics, pharmaceutical technology and biopharmacy allow solving issues related to the development of children's dosage forms at a high scientific level.

The development of pharmaceutical care for geriatric patients remains a problematic issue of modern medicine and pharmacy.

Dosage forms used in geriatric practice

Geriatric pharmacy studies the specifics and possibilities of medical care for the elderly and senile, develops the basic principles of the technology of geriatric dosage forms, and provides information on the rational pharmacotherapy of geriatric patients.

An important problem of pharmacotherapy of geriatric patients with complex chronic pathology is the interaction of drugs. The presence of several diseases at the same time, the chronic course and the severity of the pathological process require the simultaneous appointment of drugs of different pharmacotherapeutic groups for patients of this age category, the number of which reaches 8-10 drugs per patient. As a result of the drug interaction, the toxicity may increase or the pharmacological activity of the interacting drugs may decrease, and side reactions may develop.

Geriatric drugs are biologically active substances or combinations of medicinal substances that have a general stimulating effect on the aging body, contribute to the normalization of impaired metabolism and functions, tone the condition in the presence of nephrotic syndrome and increase the trophic function of the body.

Geriatric drugs are divided into two large groups: drugs that are used for an acute pharmacological test, and drugs that are prescribed for the prevention of premature aging.

The main groups of drugs used in geriatrics are cardiotonic drugs (cardiac glycosides), antianginal drugs (nitrates), antiarrhythmic drugs, calcium channel blockers, hypotensive drugs, diuretics, analgesics, antibiotics, psychotropic drugs (neuroleptics and antidepressants).

Each group of drugs has its own peculiarities of dosage and use in geriatric practice.

Cardiac glycosides. The principle of slow digitization works in geriatrics. Initial and maintenance doses should be 1/3 or 1/2 lower than for adults. Contraindications are general.

Diuretics When prescribing these drugs, one should focus on the diuretic effect, which is achieved and removed at the onset of refractoriness, and not on the generally accepted dosage. The best effect when prescribing small doses of diuretics and slow-acting drugs. You should also not forget about potassium. It should be used with caution in case of fresh thrombosis, hypochloremia and hypokalemia.

Antianginal. It should be used with caution in combination with intravenous nitroglycerin, it gives "stealing".

There are several principles of application for this group of drugs:

1. Individual selection

2. Minimal doses

3. Reasonable combinations

4. Prevention of phenomenal withdrawal and the development of tolerance

5. Consideration of possible side effects

6. Prescribing geriatric drugs, K drugs, vitamins and anabolic steroids

7. Systematic reception, taking into account daily dynamics

NSAIDS They are prescribed in reduced dosages taking into account the condition of the liver and kidneys. Contraindications, systematically monitoring

the blood picture and the condition of the gastrointestinal tract, necessarily after meals.

Antibiotics. Given the slowed biotransformation and elimination in geriatric patients, which contributes to toxic reactions and allergies. Therefore, the doses are average. At the same time, a hidden deficiency of vitamins is revealed, candidiasis is more common. Antibiotics are prescribed only according to strict indications. It is also necessary to monitor and avoid exceeding course doses.

Vitamin therapy. In the practice of a geriatrician, course therapy with vitamins in medical doses with a gradual transition to the level of physiological needs is more often used. It is most expedient to use complex vitamin preparations.

Until now, there is no single coordinated system of medical, social and pharmaceutical care for the elderly in our country. In the new economic conditions, when there is a critical shortage of funds for health care and social protection of the population, the issue of forming a state system of geriatric care is particularly difficult.

Considering the fact that geriatric patients belong to the category of patients with a low level of ability to pay, the issue of their pharmaceutical supply becomes an acute cornerstone in the path of drug availability. While in a number of European countries reimbursement of the cost of medicines is provided for all persons over the age of 65, in our country the issue of discounted or free dispensing of medicines to the elderly remains unresolved.

A feature of geriatric practice is the individual selection of the dose of individual drugs for an individual person with a clear separation of time, method of application, interaction with food, and other factors. At the same time, it should be remembered that the higher the patient's age, the more often the side effects of drugs appear.

Rectal dosage forms. Medicinal substances that enter the patient's body through the gastrointestinal tract lose their activity due to the action of hydrochloric acid and enzymes, in addition, they begin to act no earlier than 20 minutes after ingestion. Drugs administered in this way pass through the liver, are inactivated and have a negative effect on this organ.

Some medicines damage the mucous membrane of the stomach and intestines.

If the drug is injected into the rectum, it bypasses the liver, and its bioavailability is equal to that when injected directly into a vein or artery.

Rectal suppositories begin to exert their therapeutic effect earlier, as they are absorbed into the bloodstream faster, this is due to the peculiarities of the blood supply of the terminal part of the alimentary canal. There are a lot of arteries and

veins here. The supply of medicinal substances is carried out not only through the blood, but also through the lymphatic system of this area.

Liquid dosage forms. When creating liquid medicinal forms for geriatric practice, only harmless excipients, mostly natural products, are used. Their number should be justified, optimally providing the necessary therapeutic effect and stability of the medicine. For coloring, harmless dyes approved for medical practice should be used. Corrective substances should give the medicine a pleasant taste and smell and not reduce its activity and stability, but it should contain as few different chemicals as possible.

The volume of the liquid containing the medicine in the package should not be too large - 2.5-10 ml is enough, that is, the amount of the drug for the minimum course of treatment. It is also necessary to create LF of prolonged action.

Soft dosage forms are prepared according to the general rules of preparation in pharmacy conditions. When making ointments for the elderly, if there are no other instructions in the recipe, use a sterile eye base consisting of a mixture of 10 parts of anhydrous lanolin and 90 parts of petroleum jelly "For eye ointments".

Packaging of geriatric dosage forms is carried out according to general rules. For example, suppositories, depending on the substances from which they are made, are packed in wax paper, film combined materials with aluminum foil or paper. Since elderly patients have to prescribe several drugs at the same time, the doctor must constantly think about the interaction of drugs and their possible incompatibility. As a result, the simultaneous appointment of several drugs can significantly change the final effect of the drug in the elderly compared to younger patients.

6. Literature for students

Basic:

- 1. O.I. Tikhonov, T.G. Jarnykh "Technology of Drugs", textbook for universities, see. Vinnytsya, 2016
- 2. A.I. Tikhonov et al. "Practice on pharmacy technology", sch. Allowance for Higher Educational Institutions, Kharkiv, "Original", 2016
- 3. Technology of medicines. Educational and methodical manual: A manual for higher education institutions / O. I. Tikhonov, P. A. Logvin, S. O. Tikhonova, A. V. Mazulin, T. G. Yarnykh, O. S. Shpichak, O. M. Kotenko; Edited by O. I. Tikhonov - Kharkiv: NFaU; Original, 2009. - 432 pp.
- 4. Technology of medicines: Textbook / O. S. Marchuk, N. B. Androschuk - Kyiv: Medicine, 2008. - 488 p.
- 5. AI Tikhonov, T.G. Yarnykh "Technology of medicines", a textbook for higher educational establishments, Kharkiv, "Original", 2006

- 6. Workshop on pharmacy technology of medicines; For the stud Farmac Higher Teach Institutions / O. I. Tikhonov, TG Yarnyh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.
- 7. Допоміжні речовини у виробництві ліків : навч. посіб. для студ. вищ. фармац. навч. закл. / О. А. Рубан, І. М. Перцев, С. А. Куценко, Ю. С. Маслій ; за ред. І. М. Перцева. – Х. : Золоті сторінки, 2016. – 720 с.
- 8. Сучасні фармацевтичні технології : навч. посіб. до лабораторних занять магістрантів денної, вечірньої та заочної форми навчання спеціальності 8.110201 «Фармація» / під ред. О. А. Рубан. – Х. : Вид-во НФаУ, 2016. – 256 с.

Additional

- Математичне планування експерименту при проведенні наукових досліджень в фармації / Т. А. Грошовий, В. П. Марценюк, Л. І. Кучеренко та ін. – Тернопіль : ТДМУ Укрмедкнига, 2008. – 367 с.
- Нормативно-технічна документація та валідація виробництва. Матеріальний баланс : Навчально-метод. реком. для аудит. та позааудит. роботи студ. спец. «Фармація» денної та заочної форми навчання / Д. І. Дмитрієвський, Г. Д. Сліпченко, І. М. Грубник, Д. В. Рибачук. – Х. : Вид-во НФаУ, 2008. – 45 с.
- Технологія ліків. Навчально-методичний посібник: Навч. посіб. для студ. вищ. навч. зал./О.І. Тихонов, П.А. Логвин, С..О. Тихонова, О.В. Базулін, Т.Г. Ярних, О.С. Шпичак, О.М.Котенко; за ред.. О.І. Тихонова, –Х.: Оригінал, 2009.-432 с.
- Фармацевтична енциклопедія / Голова ред. ради та автор передмови В. П. Черних. – 3-тє вид., переробл. і доповн. – К.: «МОРІОН», 2016. – 1952 с.
- Encyclopedia of Pharmaceutical Technology: 3-d Ed. / ed. by J. Swarbrick. – New York ; London : Informa Healthcare, 2007. – 4128 p.
- European Pharmacopoeia 8.0 [8th edition] / European Directorate for the Quality of Medicines & HealthCare. – Strasbourg, 2013. – 3638 p.
- Handbook of Pharmaceutical Excipients, 6th edition / R. C. Rowe, P. J. Sheskey, M. E. Quinn. – Pharmaceutical Press and American Pharmacists Association, 2009. – 521 p.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 1. – 1128 с.
- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2014. – Т. 2. – 724 с.

- Державна Фармакопея України / Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів» – 2-е вид. – Харків: Державне підприємство «Український науковий фармакопейний центр якості лікарських засобів», 2015. – Т. 3. – 732 с.
- Про затвердження Інструкції із санітарно-протиепідемічного режиму аптечних закладів : наказ МОЗ України від 15.05.2006 р. № 275 // Офіційний вісник України від 2006. № 47.
- Про затвердження Інструкції по приготуванню в аптеках лікарських форм з рідким дисперсійним середовищем : наказ МОЗ України від 07.09.93 № 197 // Відомості Верховної Ради України, 1993.
- Про затвердження Правил виписування рецептів та вимог-замовлень на лікарські засоби і вироби медичного призначення, порядку відпуску лікарських засобів і виробів медичного призначення з аптек та їх структурних підрозділів, інструкції про порядок зберігання, обліку та знищення рецептурних бланків та вимог замовлень: наказ МОЗ України від 19.07.2005 р. № 360 // Офіційний вісник України. – 2005. – № 37. – 22 с.
- Про затвердження правил виробництва (виготовлення) лікарських засобів в умовах аптеки : Наказ МОЗ України від 17.10.2012 № 812 // Офіційний вісник України від 23.11.2012 № 87.
- Про лікарські засоби: закон України від 4.04.96 № 123/96 // Відомості Верховної Ради України. – 1996. – .№ 123.
- Стандарт МОЗ України «Вимоги до виготовлення нестерильных лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.5 : 2015 // За ред. проф. О. І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 109 с. (Затверджено наказом МОЗ Украіри № 398 от 01.07.2015 р.).
- Стандарт МОЗ України «Вимоги до виготовлення стерильных і асептичних лікарських засобів в умовах аптек» СТ-Н МОЗУ 42 – 4.6 : 2015 // За ред. проф. О.І. Тихонова і проф. Т.Г. Ярних. – Київ, 2015. – 76 с. (Затверджено наказом МОЗ України № 398 от 01.07.2015 р.).
- Технологія виготовлення порошків : навч. посібник / Л. Л. Давтян, Р. С. Коритнюк, О. І., А. О. Дроздова, І. О. Власенко, З. В. Маленька, В. П. Попович, В.В. Гладишев, С. М. Мусоєв, Т. Ф. Оліфірова, Л. І. Вишневська, О. М. Глущенко, О. О. Хомич; за ред. Л. Л. Давтян, Р. С. Коритнюк.. – К.: «Освіта України», 2016. – 141 с.
- Zujkina S.S. The pharmacotechnological studies of the phytopecies composition for the complex therapy of mastopathy / S.S. Zujkina, L.I. Vishnevska // Вісник фармації. – 2017. – № 2 (90). – С. 43-47.
- Богуцька, О.Є. Основні напрямки вирішення проблеми фармацевтичних несумістностей / О. Є. Богуцька // Сучасні досягнення фармацевтичної технології та біотехнології : збірник наукових праць. – випуск 2. – Харків. : Вид-во НФаУ, 2017. – С. 29–31.

- Половко Н.П. Оцінка біофармацевтичних факторів при розробці та виробництві нових лікарських засобів/Н.П. Половко, Л.І.Вишневська, О.С.Шпичак // Сучасні досягнення фармацевтичної технології і біотехнології : збірник наукових праць, випуск 2. – Х.: Вид-во НФаУ, 2017. – С. 155-160.
- Перспективи створення нових оригінальних препаратів на основі субстанцій рослинного походження / О. А. Рубан, С. А. Малиновська, Мурад Аль-Тавайті, С. І. Мазурець // Фітотерапія. – 2012. – №2. – С. 63–65.
- Murachanian, D. Two-Piece Hard Capsules for Pharmaceutical Formulations / D. Murachanian // Journal of GXP Compliance. 2010. Vol. 14. P. 3142.
- Patel H. New pharmaceutical excipients in solid dosage forms – A review / H. Patel, V. Shah, U. Upadhyay // Int. J. of Pharm. & Life Sci. – 2011. – Vol. 2. – P. 1006–1019.
- Recent Trends of Treatment and Medication Peptic Ulcerative Disorder / D. Bhowmik, Chiranjib, K. K. Tripathi [et al.] // International Journal of PharmTech Research. – 2010. – Vol. 2. – P. 970–980

- **Information resources**
- Лекційні матеріали, методичні розробки для семінарських занять та самостійної роботи на кафедрі технології ліків:
- Наукова бібліотека НФаУ: Режим доступу : http://dspace.ukrfa.kharkov.ua; http://lib.nuph.edu.ua
- www.moz.gov.ua – офіційний сайт Міністерства охорони здоров'я України
- nuph.edu.ua – офіційний сайт Національного фармацевтичного університету
- library@nuph.edu.ua – сайт бібліотеки НФаУ
- Сайт кафедри ЗТЛ НФаУ. – Режим доступу: ztl.nuph.edu.ua.
- Сайт кафедри Технології ліків ОНМедУ http://info.odmu.edu.ua/chair/drugs/files/195/ua
- Сайт дистанційного навчання НФаУ : сторінка кафедри ЗТЛ – [Електроний ресурс]. – Режим доступу: http://pharmel.kharkiv.edu/moodle/course/index.php?categoryid=154
- fp.com.ua – сайт журналу «Фармацевт практик»
- www.provisor.com.ua – офіційний сайт журналу «Провізор»
- http://compendium.com.ua/ − станом на 10.10.2016 р.
- Державний реєстр лікарських засобів України. − [Електроний ресурс]. – Режим доступу: http://www.drlz.com.ua/ − станом на 10.01.2017 р.
- База даних «Еквалайзер» ТОВ «Бізнес-Кредит» – [Електроний ресурс]. – Режим доступу: http://eq.bck.com.ua/ − станом на 20.09.2016 р.

7. Orienteering card for self-study of a student with using the literature on the topic:

№№ P	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristics of children's dosage forms	Give a description of medicines for children, describe the features of the children's body, which determine the ways of intriduction of medicines	1, 3, 4, 5, 6, 7.
2	Requirements for children's dosage forms	What are the main requirements for children's dosage forms	1, 3, 4, 5, 6.
3	Periods of childhood and peculiarities of dosage of forms for children	Name the main periods of childhood and the dosage characteristics for a certain age	1
4	Technology of preparation of liquid, soft and solid medicinal forms for children	What are the main technological stages of preparation of dosage forms	5
5	Problems of improving medicinal forms for children	Describe the problems of improvement that arise in the process of preparing medicines for children.	6
6	Characteristics of geriatric dosage forms	Give a description of medicines for old people, describe the features of the old man's body, which determine the ways of intriduction of medicines	5
7	Technology of preparation of liquid, soft and solid medicinal forms	What are the main technological stages of preparation of dosage forms	6
8	Quality assessment, rules of packaging, design and storage of children's and geriatric medicinal forms	Name the NTD and quality indicators of dosage forms with antibiotics (liquid, soft and solid dosage forms).	4

8. Materials for self-control.

8.1. Questions for self-control.

1. Specify the periods of childhood, and especially of the child's body, which determine the ways of introducing medicines.
2. Selection of doses of active substances, taking into account the age of children, for medicinal preparations.
3. Checks of doses of poisonous, potent medicinal substances in children's medicines.
4. Characteristics of correctors used for the manufacture of medicines for children.
5. Features of manufacturing solid, liquid and soft medicinal forms for children.
6. Requirements set forth by regulatory documentation for children's medicinal forms.
7. Quality control of children's medicinal forms, their preparation before release, storage features.

8. Causes of incompatibility in children's dosage forms.
9. Problems and ways of improving medicines for children.
10. Anatomical and physiological features of the body of elderly people. Peculiarities of the action of medicinal substances in the aging body.
11. Peculiarities of prescription, dosage and dispensing of drugs used in geriatric practice.
12. Modern problems of creating medicines for the elderly. Biopharmaceutical aspects of geriatric dosage forms.
13. Geriatric dosage forms - rectal and liquid dosage forms. Packaging of geriatric medicinal forms.
14. Ways to prevent unwanted complications and errors in medication dosing in geriatric practice.

8.2. Test tasks for self-control.

1 The pharmacist prepared the children's ointment in aseptic conditions, specify the medicinal substance prescribed in the prescription:
A. Benzylpenicillin sodium salt.
B. Bismuthi subnitras.
C. Analgin.
D. Cuprum sulfate.
2. While preparing this dosage form, the pharmacist dissolved the medicinal substance in half the amount of purified water, filtered it through a pre-washed filter and cotton wool into a bottle for dispensing, washed the filter with the remaining water. Indicate for which pediatric or geriatric dosage form the specified technology is rational:
A. Eye drops.
B. Suspension.
C. Emulsion.
D. Mixture.
E. Sirups.
3. The pharmacy prepares geriatric eye drops with antibiotics. With which of the listed antibiotics can eye drops be sterilized?
A. Levomycetin.
B. Erythromycin.
C. Neomycin.
D. Benzylpenicillin sodium salt.
E. Streptomycin sulfate.
4. In which capsules should powders containing coloring substances be packed?
A. Gelatin capsules.
B. Parchment capsules.
C. Paper capsules.
D. Wax capsules.

E. Cellophane capsules.
5. The pharmacist must prepare the powder according to the prescription:
Rp. Codeini phosphatis 0.01
Phenobarbital 0.05
Extr. Belladonna 0.01
Ac. acetylsalicylic acid 0.25
D.t.d. No. 6
S. 1 powder twice a day
Specify the required amount of thick belladonna extract to prepare the prescribed amount of powders:
A. 0.06.
B. 0.12.
C. 0.13.
D. 0.14.
E. 0.01.
6. In the event that a visitor to the pharmacy has forgotten the name of the drug made from the fruits of rose hips with choleretic action for adults and children from 12 years of age, the pharmacist can offer:
A. Holosas.
B. Vitamin syrup.
C. Arfazetin.
D. Kanefron.
E. Lipochromin.
7. The pharmacy received a prescription for adults:
Rp.: Extracti Belladonnae 0.2
Analgini 1.0
Solutionis Calcii chloridi 2% 200 ml
Misce.Da . Signa. 1 table each. l. 3 times a day
What amount of concentrated calcium chloride solution 20% should be used?
A. 20 ml.
B. 4 ml.
C. 5 ml.
D. 10 ml.
E. 40 ml.
8. The pharmacist prepared Lugol's solution for adults and children. Indicate how he dissolved iodine:
A. Dissolved in a saturated solution of potassium iodide
B. Dissolved in hot water.
C. Dissolved in alcohol.
D. Dissolved in a dilute solution of potassium iodide.
E. Dissolved in cold water.
9. The pharmacist prepared the dosage form of the following prescription for geriatrics:

Rp: Sol. Acidi acetici 3% 100ml
Da. Signa. For wiping.
Specify the amount of standard pharmacopoeial liquid and water:
A. 10 ml and 90 ml.
B. 3 ml and 100 ml.
C. 3 ml and 97 ml.
D. 15 ml and 85 ml.
E. 10 ml and 100 ml.
10. The pharmacist prepared a 2% solution of cholargol. Indicate which technology the pharmacist chose:
A. Dissolved when rubbing with water in a mortar.
B. Dissolved in a dispensing bottle in purified water.
C. Poured on the water surface and left until completely dissolved.
D. Dissolved in hot water in a stand.
E. Dissolved when rubbed with alcohol in a mortar.