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 _

METHODOLOGICAL DEVELOPMENT TO PRACTICAL CLASSES 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 of the lesson№17: «Soft medicinal forms. Liniments. Ointments are homogeneous» - 4 hours

1. Actuality of the topic: Medicinal forms: liniments - one of the oldest dosage forms, have not lost their value now.
The scope of application of drugs in the form of soft dosage forms is constantly expanding. 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. The foregoing necessitates the study of this topic.

2. Objectives of the lesson:
2.1 General objectives
Learn how to prepare homogeneous, heterogeneous and combined ointments, evaluate their quality and arrange for the release.
2.2 Educational goals:
Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.
2.3 Specific objectives:
-know:
• the content of the article SPhU "Liniment";
• characteristics of liniments as disperse systems and dosage forms;
• carry out the main technological operations for the preparation of varieties of various sizes (weigh, measure, mix, grind, dissolve, emulsify).
• rules for the preparation of homomegenic and heterogeneous liniments;
• standard and complex recording of liniment, their technology;
• assessment of the quality of liniments in accordance with the requirements of the Global Fund and relevant instructions.
2.4 Based on theoretical knowledge of the topic:
-able to:
• Evaluate the correctness of prescribing recipes, taking into account the compatibility of ingredients.
• Use the SPh, other regulatory documentation and reference books to find the necessary information on the preparation liniment.
• Calculate the percentage of soluble and insoluble in the base and water ingredients included in the recipe, in order to select a rational technology liniment.
• Calculate the amount of drugs and excipients for the preparation of a drug.
• Select and justify optimal technology liniments by individual registrations.
• To carry out the main technological operations for the preparation liniments (weigh, crush, measure, dissolve, fuse, emulsify, mix).
• To carry out quality control of cooked liniments clog and arrange them for release.
• Fill in the passport of the written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	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 of soft dosage forms for external use	Carry out calculations of medicinal, auxiliary substances
Industrial Medicine Technology	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.
3. *Intra-subject integration* Injection solutions and eye drops	Preparation of liniments	Calculate the amount of drugs and auxiliaries

4. Subject content:

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. A typical example of liniment-solution is rubbing turpentine complex:

Example

Rp.: Chloroformii 10.0
Olei helianthi
Olei Therebinthinae aa 20.0
Misce. Da. Signa. rub in a sore joint

technology:

Liniment-solution, which includes a potent, photosensitive substance - chloroform, odorous - turpentine, and light-sensitive - sunflower oil. All three liquid components are soluble in each other.

20.0 g of sunflower oil is weighed into a dry tared cup for dispensing orange glass, then (without removing from the balance) 10.0 g of chloroform and last of 20.0 g of turpentine. Corked, shaken up to uniformity and make out to holiday.

PWC

Date	No recipe
Olei Helianthi	20.0
Chloroformii	10.0
Olei Therebinthinae	20.0
m total = 50.0	_____
cooked	(signature)
checked	(signature)

Example 2:

Rp .: Mentholi 2.0
Camphorae 3.0
Olei Helianthi 80.0
Methylii salicylatis 5.0
Misce. Da. Signa. rub in a sore joint

technology:

Liniment-solution, which consists of volatile, odorous substances - menthol and camphor, forming a eutectic mixture, odorous, volatile, light-sensitive substance - methyl salicylate, light-sensitive - sunflower oil.

Dry substances (menthol, camphor) are readily soluble in sunflower oil, however, despite the formation of eutectic mixtures, they should be dissolved alternately or in separate portions of solvent.

In a dry glass for tempering from dark glass, 2.0 g of menthol is placed, the container and 80.0 g of sunflower oil are weighed out, dissolved (it is possible, when heated in a warm water bath). After the menthol is completely dissolved, 3.0 g camphor is added and dissolved. At last, 5.0 g of methyl salicylate is added. Corked, shaken and make out for holiday.

To liniment and in -The solution also includes masses that melt at body temperature. For example, iodine-chloroform paraffin liniment - Rosenthal paste.

Example 3:

Rp.: Iodi 0.3
Paraffini 15.0
Spiritus aethylici 95% 10 ml
Chloroformii 80.0
Misce. Da. Signa. for warm dressings

technology:

Liniment-solution at the time of preparation and use, which consists of two and potent and photosensitive and substances - iodine and chloroform. Iodine is slowly soluble in alcohol, well - in chloroform, therefore, it is better to dissolve it in chloroform. Paraffin is dissolved in chloroform when heated. Chloroform mixes well with alcohol.

0.3 g of iodine, weighed, are placed in a dry tumbler. wow on a parchment circle, add 15.0 g of finely ground paraffin, tare and weigh 80.0 g of chloroform. Then tightly closed with a stopper and heated in a warm water bath (temperature 40-50 ° C) to dissolve. After cooling, add 10 ml of 95% alcohol.

Cork th are y s shake until homogeneous. They are issued for leave with a signature with additional labels “Before use, heat in warm water”, “Store in a cool dark place”, “Apply with a net or dots”.

Heated chloroform when dissolving paraffin must be very carefully, not tightly covering the glass so that the vial does not break. The patient should be warned that before applying the liniment should be heated in warm water, opening the lid until the paraffin is completely dissolved. Apply to the skin this drug should

be in the form of a mesh or dots, and not over the entire surface, as the paste of Rosenthal - liniment annoying action and, if rubbed into the skin, causes severe burns.

When preparing this drug, you can use ready 10% - at the first solution of iodine in 95% ethyl alcohol (if available at the pharmacy). In this case, paraffin is dissolved in chloroform in a glass for tempering (when heated), and then, after cooling, 7 ml of 95% ethyl alcohol and 3 ml of 10% iodine solution are added. The composition of the paste of Rosenthal may include various medicinal substances, for example:

Example 4:

Rp.: Iodi 1.0
Kalii io didi 2.0
Paraffini 20.0
Spiritus aethylici 70% 20 ml
Chloroformii 130.0
Misce. Da. Signa. for warm dressings

technology:

As is known from the previous material, iodine is well soluble in aqueous solutions of potassium iodide with the formation of a complex compound, which is well soluble in alcohol. Therefore, the technology of liniment in this recipe will be as follows.

In a dry glass for tempering from dark glass, paraffin is dissolved in chloroform by heating. Potassium iodide is dissolved in a support in 5.8 ml of distilled water, iodine is dissolved in the obtained saturated solution of potassium iodide. 14.6 ml of 95% alcohol are added, transferred to a glass for tempering with a chloroform paraffin solution, sealed, shaken and arranged for tempering.

If other medicinal substances, for example, novocaine, menthol, atropine sulfate, are additionally included in the paste of Rosenthal, they are administered according to the general rules: dissolved in the solvent in which they are better soluble: novocaine, atropine sulfate - in water menthol - in alcohol, and then mixed with other components.

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.

Example 5:

Rp.: Xeroformii
Picis liquidae Betulae aa 3.0
Olei Ricini 100.0
Misce. Da. Signa. For wounds

technology:

Liniment suspension, in which th enters the odorous substance - tar and insoluble but in the basis, odorous, photosensitive - xeroform (Vishnevsky liniment). For grinding xeroform as a suitable liquid, it is advisable to use tar (less viscous but substance than castor oil). 3.0 g weighted are placed in the mortar. wow on manual xeroform scales, ground in a dry form. Then add half the amount of tar (1.5 g) (measure out drops) and crush xeroform according to the rule on. With stirring, add the remaining 1.5 g of tar and in parts 100.0 g of castor oil (previously weighed into a glass for tempering). Transferred to the glass for the holidays, clog and make out.

Balsamic liniment according to Vishnevsky is sometimes called Vishnevsky's ointment, which is connected with the method of using this drug - it is not rubbed into the skin, like most liniments, but smeared or applied to wounds using a sterile dressing.

In recipe liniment and According to Vishnevsky, possible replacements: xeroform - on dermatol, tar - on Shostakovsky balsam (in and n and l and n), castor oil go - fish fat.

Example 6:

Rp.: Xeroformii 3.0
Vinilini (Balsami Schostakovsky) 6.0
Olei Ricini 100.0
Misce. Da. Signa. For wounds

technology:

Vinyline (polyvinylbut and Lovia ether) is a thick viscous liquid of a specific smell, practically insoluble in water, mixes well with oils. Preparation of the drug in this recipe logical previous recipe.

Currently, Vishnevsky liniment is prepared mainly in the factory. To increase stability during storage (prevention of xeroform sedimentation), 5% of aerosil is introduced into its composition (proposed by M. T. Alyushin).

Example 7:

Rp.: Iodoformii 1 0.0
Glycerini 45.0
Spiritus aethylici 95% 45 ml
Misce, fiat linimentum
Da.Signa. for rubbing

technology:

Liniment-suspension of insoluble in alcohol and glycerin aromatic substances - iodoform. Vegetable iodoform in dry form, after which add about 4.0-6.0 g of glycerin, previously cured in the vial (45.0 g), carefully triturated and add the rest to glycerin.

Transferred from the mortar to the vial for tempering. The rest of the suspension is washed off with 45 ml of alcohol in a bottle and arranged for dispensing.

Example 8:

Rp .: Zinci oxydi

Talci a — a 5.0
Amyli
Olei Ricini a — a 10.0
Olei Hel ianthi 70.0
Misce, fiat linimentum
Da.Signa. for leg bandages

Technology:

Liniment-suspension, containing medicinal substances, insoluble in greasy oils. Into the mortar, place the powdered substances in the order of prescription, rub, add about 10,0 g of sunflower oil (from a release large-bowl bottle, in which 70,0 g of sunflower oil is weighed in advance), and thoroughly chop until a fine slurry is obtained. Then in 2-3 doses add the remaining oil and mix, occasionally removing the mass from the walls of the mortar and the filler of the celluloid plate. In a blank leave bottle weigh 10,0 g of castor oil, add it to the mortar and mix until homogeneous mass is obtained. Ready liniment is transferred to the holiday bottle and are issued to leave.

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.

Example 9:

Rp .: Olei Helianthi 74.0
Solution Ammonia caustici 25 ml
Acid Oleinic 1.0
Misce Da Signa for rubbing

Technology:

Emulsion line-type M / V, which includes a fragrant liquid, - a solution of ammonia. An emulsifier is an ammonium oleate, which is formed as a result of neutralization reaction. Emulsion is formed easily when shaking two fluids with an emulsifier, so there is no need to cook in a mortar.

In a glass for leave we weigh 74,0 g of sunflower oil, add 1,0 g of oleic acid (drops) and mix. Then add 25 ml of ammonia solution, clamping and shaking. Make up for leave.

The liniment is unstable and is preparing for a short time. When stored, the oleate of ammonium is converted into an amide of oleic acid (an emulsifier of the second kind), the emulsion phase is converted and it thickens. Such a release line is not subject to. M. T. Alyushin offered to replace sunflower oil with ammonium liniment and polydyethyl siloxane liquid - esilon-4. Ammonia liniment, cooked on esilon and-4, stable throughout the year.

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.

Example 10:

Rp .: Luminescent Ammonia 50.0
Menthol 0.5
Misce Da Signa rub the back

Technology:

Combined liniment emulsion-solution, which includes fragrant, volatile substances - a solution of ammonia and menthol; two viscous liquids - sunflower oil and oleinic acid.

Menthol is well soluble in oil, therefore, it needs to be introduced into the oil phase until an emulsion is obtained.

In a glass for leave from dark glass, place 0,5 g menthol, tarot and weigh 37,0 g of sunflower oil, dissolve. Add 0.5 g of oleic acid, dissolve, add 12.5 ml of ammonia solution, clog and energize h but shake. Examples of combined liniments are lineints of syntomycin (1%, 5% and 10%), streptocide (5%) and levomycetin (1%).

Example 11:

Rp .: Laevomycetini 1.0
Ole Ricini 20.0
Emulsion 9.0
Thymol 0.15
Seine Acid Salicylic 0,125
Aquae purificatae ad 100.0
Misce Da Signa for dressings

Technology:

Combined liniment: emulsion-suspension-solution. Castor oil with water and emulsifier (using emulsifier No. 1 Urymova) form an emulsion. Levomitsetin - not soluble in water or in oil, forms a suspension. Timol (or salicylic acid) is administered as a preservative. Because protection from microbial pollution necessary for the aqueous phase, the preservative is more rationally dissolved in water.

For preparation, castor oil is fused with an emulsifier No. 1, then, with intense stirring, add a solution of preservative in warm water and emulsify. Levomitsetin is crushed by the rule of Deryagin and injected into a ready-made emulsion. Since the composition contains an antibiotic (levomitsetin), it is cooked in aseptic conditions. As an emulsifier, you can also use tween-80 or emulator T-2.

By the difficult cases of making liniments is the following record:

Example 12:

Rp .: Novocaine 0.5
Chloroformium 10.0
Menthol 0.3

Beeline Helianth 30.0
Sol Ammonia caustici 10 ml
Misce Da Signa For viable

Technology:

Combined liniment: emulsion-solution, which consists of two potent light-sensitive substances - novocaine and chloroform; fragrant, volatile - menthol and ammonia solution. Sunflower oil with ammonia solution forms an emulsion.

Emulsifiers are ammonium salts of free fatty acids of sunflower oil. Since free fatty acids in oils are a bit, the emulsion is formed coarse disperse.

The difficult situation is the introduction of novocaine. It is not soluble in oils, well soluble in water. However, in an aqueous solution of ammonia, salt is added her Novocaine salts are distinguished quaternary and ammonia and basis novocaine, insoluble in water, but well soluble and in chloroform

In a glass for dropping out of dark glass in sunflower oil oh my dissolve menthol. In the stand in the solution of ammonia dissolve novocaine. The basis of novocaine , which was formed dissolve in chloroform and add in a glass for leave, clog, vigorously shake and draw up to leave.

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.

Example 1:

Rp.: Anasthesin 0.25
Menthol 0.1
Vaseline 20.0
Misce fiat unguentum
Da Signa for rubbing

Technology:

Ointment - solution, to warehouse which one are included medical substancessoluble in Vaseline, but form at mixing eutectic and alloy and, no dissolved and in vaseline. Therefore, in this case, a consistent dissolution of substances in the basis is required. In a molten vaseline, dissolve anesthezine first, and then menthol, and then stir until the ointment is completely cooled.

When cooking ointments-solutions based on recipes, in order to avoid the loss of time for the fusion of the bases and the dissolution of medicinal substances, it is advisable to use pre-prepared semi products ointments and concentrates, diluted with the base according to the requirements of the recipe.

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.

Example 2:

Rp.: Naphthalan liquide raffinaat 70.0
Paraffin 18.0
Petrolat 12.0

Misce fiat unguentum
Da Signa For bandages

Technology:

Melt petroleum jelly (Tplav 60-62 ° C), to the resulting melt, while stirring, add paraffin (Tplav 50-54 ° C), and in the naphthalan state. Alloys are mixed in a warm mortar until it is completely cooled.

Control panel
Date Recipe No.
Petrolat 12.0
Paraffin 18.0
Naphthalan liquid raffinati 70.0
m common = 100.0
Prepare: (signature)
Checked out: (signature)

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.

6. Materials of methodical provision of classes

6.1. Task for self-checking of the initial level of knowledge-skills

Tests with answers

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

6.2 Information needed for knowledge-skills development can be found in the textbooks:

A) Basic

1. Aseptic dosage forms: Extemporal formulation: Methodical recommendations / O.I.Tihonov, L.V.Bondareva, T.G.Yarnykh, N.F.Orlovetska and others; Ed. OI Tikhonov and TG Yarnyh. - X .: View of NFaU; Original, 2005. - 184 p.

2. Solid dosage forms: Extemporal formulation: Methodical recommendations / O.I.Tihonov, L.V.Bondareva, T.G.Yarnykh, N.F.Orlovetska and others; Ed. OI Tikhonov and TG Yarnyh. - X .: View of NFaU; Original, 2003. - 176 pp.

3. Soft dosage forms: Extemporal formulation: Methodical recommendations / O.I.Tihonov, L.V.Bondareva, T.G.Jarnykh, N.F.Orlovetska, and others; Ed. OI Tikhonov and TG Yarnyh. - X .: View of NFaU; Original, 2003. - 128 p.
4. Liquid dosage forms: Extemporal formulation: Methodical recommendations / O.I.Tihonov, L.V.Bondareva, T.G.Yarnykh, N.F.Orlovetska and others; Ed. OI Tikhonov and TG Yarnyh. - X .: View of NFaU; Original, 2005. - 160 p.
5. Practicum on pharmacy technology of medicines; for studio Pharmacist higher tutor institutions / O. I. Tikhonov, T. G. Yarnykh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.

B) additional literature:

1. Dictionary-Directory for Pharmacy Specialists in Management and Economics, ed. prof. Chernykh V.P. // Kharkiv: Publishing House of the National Academy of Sciences of Ukraine "Golden Stays" - 2001 - 281 p.
2.

6.3. Orienteering card for self-study with literature on the topic.

№№ pp	Main tasks	Instructions	Answers (literature)
1	2	3	4
1	Characteristic liniments	Give a definition of the concept liniment	3, 5
2	Cooking technology liniments	What are the main technological stages of cooking? liniments	3, 5
3	Quality assessment, packing, design and storage rules liniments	Name the NTD and Quality Score liniments	3, 5

7. Materials for self-control of the quality of preparation

A. 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.

B. Tests for self-control with benchmark answers.

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

B. Tasks for self-control with answers

Task 1

Take: methyl salicylate 5,0
Whipped oil 10,0
Sunflower oil 5,0
Mix up Give it
Mark Grinding for the feet.
Situation. The student placed in a glass for leave (weighed) 10.0 grams of whitened oil and added 5.0 grams of methyl salicylate. Measuring the cylinder was measured 5 ml of sunflower oil and added to the solution of methyl salts and citrate in the oil of Belene. Everything was thoroughly mixed. Evaluate its actions.

Problem 2
Take: Flaxen Oil
Water of lime equals 20,0
Mix up Give it Mark Friction.
Situation. Since the linen oil does not mix with water (there is no emulsifier), the student decided not to cook the dosage form. Evaluate its actions.

Problem **3**

Take: Novocaine 0,2
chloroform
Bilberry oil is equal to 10.0
Ammonia solution 15 ml
Mix up Give it Mark Rub on the joints of the hands.

Situation. The student placed in the glass for release ingredients in the order indicated in the recipe. Arranged for a vacation. What mistakes did the student make when making liniment?

Problem **4**

Take: phenol 0.5
Olive oil 0,3
Pork fat 20,0
Mix to leave the ointment.
Give it Mark Apply to affected areas of the skin

Situation. The student mixed the pork fat with olive oil, then with the help of a normal chopper, he added 18 drops of liquid phenol. Give a critical assessment of this technology.

Problem **5**

Take: Naphthalanum ointment 20,0
Paraffin 3.0
Vaseline 20,0
Mix to leave the ointment.
Give it Mark Lubricate the affected areas of the skin.

Situation. The student weighed in a porcelain cup 20.0 g of vaseline and added 3.0 g of paraffin. The mixture was placed on a hot water bath. To the molten base added 20.0 g of naphthalanum ointment, got mixed up and moved in the ointment jar, cork. Check out the appropriate labels. Evaluate the actions of the student when making this record.

8. Materials for classroom self-study:

8.1 List of educational individual practical tasks to be performed during practical classes:

A set of individual tasks

1. Take:	Anesthetic in 0.5 Chloroform in 10.0 Oils sunflower seeds 25.0 Mix. Give it mark. Wipe out and in patient joint	2. Take:	Chloroform Sunflower oil Methylsalic acid and 10% citrate Mix up Give it mark To rub in pain.
3. Take:	Camphor and 1.0 Menthol in 2.0 Methylsalicylic acid in 10.0 Turpentine oil 15,0 Mix. Give it mark. Wipe out and in the shin .	4. Take:	Chloroform is 15.0 Tincture peppercorn 20 ml Ethyl alcohol 10 ml Methylsalylate and 15,0% of silicate Mix up Give it Mark Rub on the knee joint.
5. Take:	20% solution of novocaine 20 ml Anhydrous lanolin 10.0 Sunflower oil is about 70.0 Mix up Give it Mark Rub in rheumatic pain	6. Take:	Anesthesin in 0.5 Zinc oxide in Krohmal by 2.0 Sunflower oil 40,0 Mix up Give it mark Apply on the skin of the face
7. Take:	Chloroform 10.0 Novokayin 0,3 Menthol 0.5 Ammonia solution 10 ml Sunflower oil 30,0 Mix up Give it Mark For rubbing.	8. Take:	Tar Xerox forms u by 3.0 Castor oil 100.0 Mix. Give it Mark. Balsam lineament by Vishnevsky.
9. Take:	Methyl salicylate in 20.0 Tincture of pepper pods 40 ml Oils sunflower seeds 40.0 Mix. Give it mark. Wipe out and with pains	10. Take:	Iod 0.3 Chloroform 80.0 Ethyl alcohol 10 ml Paraffin 15.0 Mix up Give it Mark Apply as a grid with pains.
11. Take:	Naphthalain oil Zinc in oxide Talc	12. Take:	Chloroform 80.0 Terpentine oil Sunflower oil by 10.0

	Castor oil by 10.0 Mix up Give it Mark Rub in the sick spot.		Mix up Give it Mark Rub in the forearm.
13. Take:	Benzyl benzoate 15.0 Soap medical 2.0 Waters purified to 100.0 Mix up Give it Mark Rub 2 times a day.	14. Take:	Mercury amidocloride Acid salicylic on 0,7 Glycerin Peach Peanut Oil 2.5 Mix up Give it Mark To remove dark spots on the skin.
15. Take:	Chloroform is 80.0 Terpentine oil Sunflower oil by 10.0 Mix up Give it Mark Rub in the forearm.	16. Take:	Anesthetic in 0.2 Phinyl salicylate in 1.0 Vasilas oil new Oils sunflower seeds by 25.0 Mix. Give it mark. For compress in at beaten and joints .

9. Instructive materials for mastering professional skills, skills:

9.1. Method of work execution, stages of execution.

Write down and arrange the recipe according to the requirements of the Order of the Ministry of Health of Ukraine No. 360 dated July 19, 2006. Describe the medicinal product. Describe the optimal version of the technology of combined ointments with theoretical justification, taking into account the physical and chemical properties and the percentage of medicinal substances. Give a rating of quality. Specify the preparation of the drug for leave. Write the passport of written control.

10. Materials for self-control of mastering the knowledge, skills, skills provided by this work.

Give a critical assessment of the technologist's actions when preparing the dosage form with the following words:
Take: Ointment Naftalan 20,0
Paraffin 3.0
Vaseline 20,0
Mix to leave the ointment.
Give it Mark Lubricate the affected areas of the skin.
The student weighed in a porcelain cup 20.0 g of vaseline and added 3.0 g of paraffin. The mixture was placed on a hot water bath. To the molten basis added 20.0 g of oil of oil, mixed and the resulting ointment transferred into a jar, plugged. Check out the appropriate labels. Evaluate the actions of the student when making this record.

11. The theme of the next lesson: «Heterogeneous ointments»

Topic of the lesson№18: «Heterogeneous ointments». – 4 h

1. Relevance Topics: Medicinal forms: ointment - are widely used in medical practice. ointment relate to numbers the ancients medicinal forms, find wide application at life, on different productions, at cosmetics and medicine with protection purpose skin hands and open parts 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 s and pharmacological activity. The foregoing necessitates the study of this topic.

2. Objectives of the lesson:

2.1 General objectives

Learn to cook homo gene and suspension ointments, evaluate their quality and make out for the holidays.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

- Characteristic homogeneous and suspension ointments and general rules for their preparation.
- Stages of the technological process of preparation of ointments, taking into account the physico-chemical properties of medicinal substances.
- Preparation of ointments with the use of intra-pharmaceutical preparations (concentrates and semi-finished products).
- The main rheological characteristics as indicators of the quality of ointments.
- Biopharmaceutical aspects of ointments. The principle of selection of grounds for medical purposes ointments.
- Quality control methods homogeneous and suspension ointments, their storage and clearance to leave in accordance with the requirements of the State Pharmacopoeia, other regulatory.
- Areas of improvement homogeneous and suspension extemporal preparation.

2.4 Based on theoretical knowledge of the topic:

-able to:

- Evaluate the correctness of prescription recipes, taking into account the compatibility of ingredients homogeneous and suspension ointments.
- Use the SPh, other regulatory documentation and reference books to find the necessary information on the preparation homogeneous and suspension ointments.

- Calculate the percentage of soluble and insoluble in the base and water ingredients included in the recipe, in order to select a rational technology homogeneous and suspension ointments.
- Calculate the amount of drugs and excipients for the preparation of a drug.
- Select and justify optimal technology homogeneous and suspension ointments by individual registrations.
- To carry out the main technological operations for the preparation homogeneous and suspension ointments (weigh, crush, measure, dissolve, fuse, emulsify, mix).
- To carry out quality control of the prepared ointments, to cork and arrange them for release.
- Fill in the passport of the written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	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	Determine the molar mass, the concentration of the substance solutions.

	liquids.	
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 of soft dosage forms for internal use	Carry out calculations of medicinal, auxiliary substances
Industrial Medicine Technology	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.
3. ***Intra-subject integration*** Injection solutions and eye drops	Preparation of ointments	Calculate the amount of drugs and auxiliaries

4**. Subject content:**

Ointment - soft dosage form intended for application to the skin, wounds or mucous membranes. Ointments consist of base and medicinal substances, g and globally distributed in n y.

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.

Example 3:

Rp.: Unguenti Streptocidi 3% 10.0
Da. Signa. lubricate the wound ***technology:***

This is a suspension ointment with a solids content of less than 5% (3%). Streptocide (0.3 g) as substances in, hard crushed crushed in the presence of a few drops of alcohol or ether, and then triturated with a few drops (0.15 g) of vaseline oil and the resulting pasty mass in 2-3 steps, add petroleum jelly with constant stirring until a homogeneous mass is obtained.

PPK

Date	No recipe at
Streptocidi	0.3
Olei Vaselini gtts IX	
Vaselini	9.7
m total =	10.0
Prepared	(signature)
Checked	(signed)

Example 4:

Rp.: Re sorcini	0,4
Vaselini ad	10.0

Misce, fiat unguentum

Da. Signa. apply on the affected skin

technology:

Suspension ointment with a water-soluble drug as but is introduced by type of suspension. First, resorcinol is triturated with a few drops (0.2 g) of vaseline oil, then petrolatum is added to the total mass of ointment (10.0 g) and triturated to homogeneity.

Example 5:

Rp.: Unguenti Xeroformii 100.0

Da. Signa. Ointment for dressings

technology:

For the preparation of this ointment should take 10.0 xeroform and 90.0 vaseline. In a mortar, the xeroform is ground first, dry, and then with half the amount (5.0 g) of molten vaseline. After this, the remaining petroleum jelly is added in several stages with careful rubbing.

Example 6:

Rp.: Zinci oxydi 10.0

Vaselini 90.0

Misce fiat unguentum

Da. Signa. apply on the affected skin

technology:

Zinc ointment (SPhX, p. 737). In a mortar, 10.0 g of zinc oxide is ground (not pressing the pestle very much), then half is added to the amount (5.0 g) of molten vaseline, and then the remaining petroleum jelly is added in several stages during grinding.

Example 7:

Rp.: Unguenti Acidi salicylici 2% 100.0

DS Apply to the affected skin.

payment:

PWC (back side)

Salicylic acid 2.0 g

Vaseline oil 1.0 g - 23 cap.

Vaseline 100.0- (2.0 + 1.0) = 97.0 g

Technology.

In a mortar, place 2.0 g of salicylic acid, carefully triturate with 23 drops (1.0 g) of vaseline oil to form a thin pulp. 97.0 g of petrolatum is added to the resulting mass in several stages and mixed until homogeneous.

The finished ointment is transferred to a jar for the holidays, corked, pasted the number of the recipe and filled in the front side of the CPD.

PWC (front side)

date No recipe

Acidi salicylici 2.0

Olei Vaselini gtts. XXIII (1.0 - 23 cap.)
Vaselini 97.0 _____ _____
m = 100.0
Prepared (signature)
Checked (signed)

Registration for the vacation. Labels: "Ointment", "Keep in a cool place", "Keep in a dark place", "Keep away from children."
Application. With dermatitis.

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.

Example eight:
Rp.: Acidi salicylici 0.4
Zinci oxydi
Amyli aa - 5.0
Vaselini 10.0
Misce, fiat pasta
Da. Signa. lassar paste

technology:

Zinc oxide, salicylic acid and starch do not dissolve in water and petrolatum. Salicylic acid, when rubbed, forms dust that irritates mucous membranes.

Vaseline is melted in a boiling-water porcelain dish in a water bath. In a heated mortar (up to 50 ° C) crushed zinc oxide, mixed with salicylic acid and part of the melted vaseline (5.0 g). Starch is added in portions to the semi-laid mass (starch paste can form starch paste when mixed with hot petroleum jelly), then the remaining molten petroleum jelly is mixed and mixed until a homogeneous mass is formed.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. 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

2 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

3 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

4. 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

5. 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

6 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

7 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

8. 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

9. 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

10. 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

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

1. Aseptic Dosage Forms: Thermal Formulation Methodical Recommendations / O.I. Tikhonov, L.V. Bondareva, T.G. Yarnikh, N.F. Orlovetska, and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.
2. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
3. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
4. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
5. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. vishch. forever mortgage / O. I. Tikhonov, T. G. Yarnikh, V. O. Sobolova, and others; For ed. O. I. Tikhonov. - H .: View of the NFAU: the Golden Side, 2002. - 256 p.

B) additional literature:

1. Dictionary-Directory for Pharmacy Specialists in Management and Economics, ed. prof. Chernykh V.P. // Kharkiv: Publishing House of the National Academy of Sciences of Ukraine "Golden Stays " - 2001 - 281 p.

6.3. Orienteering card for self-study with literature on the topic.

№№ PP.	Main tasks	Instructions	Answers (literature)
1	2	3	4
1	Characteristics of ointments	Give a definition of ointment	3,5
2	Technology of preparation ointments	What are the main technological steps of cooking ointments?	3,5
3	Evaluation of quality, packing rules, design and storage of ointments	Name the NTD and quality indicators of ointments	3,5

7. Materials for self-control of the quality of preparation

A. Questions for self-control

1. Definition of ointments, their classification and requirements to them.
2. Classification of bases for ointments. Characteristics of the differential bases.
3. Requirements for ointment bases. Characteristics of hydrophobic and hydrophilic bases.
4. Characteristics of homogeneous ointments, rules of their preparation.
5. Characteristics of suspension ointments and general rules of their preparation.
6. The peculiarity of the preparation of suspension ointments depending on the percentage content of the solid phase.
7. Use of ointment concentrates in ointment technology. Means of small mechanization in technology of ointments.
8. Certified suppository ointment.
9. Paste, their classification. Features of the preparation of the dermis like that them and protective pastes.
10. Evaluation of the quality of ointments in accordance with the requirements of normative and technical documentation.

B. Tests for self-control with benchmark answers.

1 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

2. 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

3. The pharmacy got different bases for ointments. What kind of ointment bases are PEO?

A. * Hydrophilic
B. Fatty
C. Silicones
D. Differential
E. Hydrocarbon

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

4 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

5. 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

6. 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

7. 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

8. 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%

9. 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

10. 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

8. Materials for classroom self-study:

8.1 List of educational individual practical tasks that must be performed during the practical training:

A set of individual tasks

1. Take:	Streptocide in 1.0 Zinc in oxide in 2.0 Lanolin at anhydrous 4.0 Vaseline at 20.0 Mix to get ointment. Give it Mark. To apply on is amazed and sites skin	2. Take:	Zinc in oxide 2.5 Talka 5.0 Vaseline oil Dermatol by 2.0 Vaseline 20.0 Mix to get an ointment. Give it Mark For use in dentistry
3. Take:	Streptocide in 3.0 Bismuth basic nitrate Acids it's boring to her by 2.5 Lanolin at anhydrous 30.0 Vaseline and well 20.0	4. Take:	Dermatol in Zinc oxide by 0.5 Lanolin at anhydrous 10.0 Vaseline at 20.0 Shay media, in order to get

	Shay media, in order to get ointment. Give it Mark. Grease are amazed skin areas		ointment. Give it Mark. To apply on is amazed and sites skin
5. Take:	Acids of benzoin 2.0 Acid salicylic Castor oils by 3.0 Vaseline 12.0 Mix to get an ointment. Give it Mark Tamashevsky Ointment For the removal of foot warts	6. Take:	Acids benzoin her Resorcinol in by 15.0 Vazel and ne to 100.0 Zm and Shay, in order to get ointment. Give it Mark. Andrew Asyana's Ointment. Against fungal ointment
7. Take:	Bismuth or drafts in basic 0.5 Zinc in oxide y starch th by 5.0 Vaseline at 10.0 Shay media, in order to get ointment. Give it Mark. Put on are amazed sites skin	8. Take:	Acids salicylic acid 0.4 Zinc in oxide in starch th by 5.0 Vaseline at 10.0 Shay media, in order to get ointment. Give it Mark. Pasta Lasara. Rub in in the foot and
9. Take:	Ethacridine in lactate in 0.2 Xerox at 0.5 Vaseline at 20.0 Shay media, in order to get ointment. Give it Mark. Ointment for hands	10. Take:	Streptocide in 0.5 Acids salicylic acid 0.3 Vaseline at 20.0 Shay media, in order to get ointment. Give it Mark. Ointment for hands
11. Take:	Xerox at 1.0 Zinc oxide y 5.0 Lanolin at anhydrous 10.0 Vazel and ne 20.0 Shay media, in order to get ointment. Give it Mark. Inflicts and on the skin	12. Take:	Zinc oxide 2.5 Talka 2.5 Vaseline oil 2.0 Dermatol at 2.0 Vaseline 20.0 Mix to get an ointment. Give it Mark For use in dentistry

9. Instructive materials for mastering professional skills, skills:

9.1. Method of work execution, stages of execution.

Write down and arrange the recipe according to the requirements of the Order of the Ministry of Health of Ukraine No. 360 dated July 19, 2006. Describe the medicinal product. Describe the optimal version of the technology of combined ointments with theoretical justification, taking into account the physical and chemical properties and the percentage of medicinal substances. SPh Give a rating of quality. Specify the preparation of the drug for leave. Write the passport of written control.

10. Materials for self-control of mastering the knowledge, skills, skills provided by this work.

The pharmacist has prepared a prescription drug:
Take: Zinc Oxide
Krohmal by 10.0
Vaseline 20.0
Mix to form a paste.
Give it Mark Apply to affected areas of the skin
Indicate which feature of the drug technology:
Answer. In a warmed mortar, zinc oxide is melted, add starch and mix thoroughly.

11. The theme of the next lesson: «Combined ointments. Creams. Gels»

Topic of the lesson№19: «Ointments combined. Creams. Gels» - 4 h

1. Relevance Topics: soft dosage forms: 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. Objectives of the lesson:

2.1 General objectives

Learn to cook emulsion and combined ointments, to evaluate their quality and make out to leave.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

- Characteristic emulsion and combined ointments and general rules for their preparation.
- Stages of the technological process of cooking emulsion and combined ointments, taking into account the physico-chemical properties of medicinal substances.
- Cooking emulsion and combined ointments with the use of intra-pharmaceutical preparations (concentrates and semi-finished products).
- Quality control methods emulsion and combined ointments, their storage and clearance for the release according to the requirements of the State Pharmacopoeia, other regulatory.
- Areas of improvement emulsion and combined ointments Extemporal preparation.

2.4 Based on theoretical knowledge of the topic:

-able to:

- Evaluate the correctness of prescription recipes, taking into account the compatibility of ingredients emulsion and combined ointments.
- Use the SPh, other regulatory documentation and reference books to find the necessary information on the preparation emulsion and combined ointments.
- Calculate the percentage of soluble and insoluble in the base and water ingredients included in the recipe, in order to select a rational technology emulsion and combined ointments.
- Calculate the amount of drugs and excipients for the preparation of a drug.

- Select and justify optimal technology emulsion and combined ointments by individual registrations.
- To carry out the main technological operations for the preparation emulsion and combined ointments (weigh, crush, measure, dissolve, fuse, emulsify, mix).
- To carry out quality control of the prepared ointments, to cork and arrange them for release.
- Fill in the passport of the written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

c	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	To carry out elemental analysis and identification of organic compounds.

	methods of their analysis.	
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 of soft dosage forms for internal use	Carry out calculations of medicinal, auxiliary substances
Industrial Medicine Technology	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.
3. ***Intra-subject integration*** Injection solutions and eye drops	Preparation of ointments	Calculate the amount of drugs and auxiliaries

4. Subject content:

Ointment - soft dosage form intended for application to the skin, wounds or mucous membranes. Ointments consist of base and medicinal substances, g and globally distributed in n y.

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.

Example 1:
Rp.: No vocaini 1.0
Kalii iodidi 0,5
Lanolini
Vaselini aa 5.0
Misce, fiat unguentum
Da. Signa. lubricate damaged skin
Payment: Emulsion ointment type B / M with highly soluble substances.
The composition of the ointment spelled ingredients, very soluble in water.
Purified water (with water lanolin):
100% - 5.0
30% - x x = 1.5 ml (30 drops)
Anhydrous lanolin 5.0 - 1.5 = 3.5 g
technology:
Novocain and potassium iodide are placed in a mortar and dissolved in 1.5 ml of water, which is part of aqueous lanolin (30%), replacing it with anhydrous lanolin after appropriate calculations. Then add 3.5 g of anhydrous lanolin and emulsify the aqueous solution of drugs. Vaseline is added to the resulting emulsion and mixed until homogeneous.

PWC
Date No recipe
Novocaini 1.0
Kalii iodidi 0,5
Aquae purificatae 1,5 ml (gtts XXX)
Lanolini anhydrici 3,5
Vaselini 5.0
m total = 11.5 _____
Prepared (signature)
Checked (signature)

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.

Example 2:

Rp.: Kalii carbonatis 1.0
Natrii tetraboratis 0,5
Olei Vaselini 15.0
Stearini 10.0
Aquae purificatae 70 ml
Misce, fiat unguentum
Da. Signa. Protective ointment

technology:

In a warm aqueous solution of potassium carbonate and sodium tetraborate, a thin stream of oil with stearin is added with constant stirring. This forms potassium stearate and simultaneously thickens the mass. After homogenization in a mortar, a soft ointment is obtained, it has an alkaline reaction, which, when rubbed into the skin, is well and easily absorbed into the stratum corneum of the epidermis.

After evaporation of the aqueous phase on the skin remains a thin film (soap-oil), impermeable to organic solvents, resins, varnishes, served as the basis for its use as a protective ointment.

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.

Example 3:

Rp.: Ephedrini hydrochloridi 1.0
Mentholi 0.15
Protargoli 1.0
Lanolini 2.0
Vaselini 8.0
Misce, fiat unguentum

Da. Signa. Nose ointment

technology:

The composition of the ointment includes ephedrine hydrochloride and protargol, soluble in water, form an ointment-emulsion, and menthol, soluble in the base, which forms an ointment-solution (in an amount up to 5%).

First, it is advisable to prepare an ointment solution, and then ointment - emulsion.

Given that it is undesirable to dissolve protargol and ephedrine hydrochloride together (the effect of the electrolyte on a colloidal solution), the ointment is prepared as follows. In a mortar, triturate 0.15 g of menthol with a few drops of vaseline oil (0.15 g) and mix with a portion of vaseline. The resulting mixture is pushed to the spout of the mortar. Ephedrine hydrochloride is added to the mortar and dissolved in ½ part of water (6 drops), which is part of aqueous lanolin (30%).

The resulting solution is emulsified with a part of anhydrous lanolin, mixed with menthol solution in petroleum jelly and pushed to the spout of the mortar.

Then protargol is triturated from 6 drops of glycerin, dissolved in water, left (6 drops), E mulgin the remaining amount of lanolin, mixed with the content of the mortar and the rest of vaseline until a homogeneous mass.

Example 4:

Rp.: Eph edrini hydrochloridi	0,1
Dimedroli	0,2
Mentholi	0.3
Zinci oxydi	2.0
Lanolini	8.0
Vaselini	20.0

Misce, fiat unguentum

Da. Signa. Nose ointment

technology:

Combined ointment: with respect to menthol - ointment-solution, ephedrine hydrochloride and dimedrol (soluble in water) - ointment emulsion, zinc oxide (insoluble in water or base) - ointment suspension with a solids content of more than 5%.

In a porcelain evaporating dish, about 1 / 3-1 / 4 parts are melted in a water bath; vasers on at a temperature not higher than 50 ° With and dissolve 0.3 g of menthol. Put 2.0 g of zinc oxide into a warm dry mortar and carefully triturate with a small amount (≈1.0 g) of menthol solution in petrolatum, then add the remaining menthol solution in petroleum jelly and mix to the absence of individual visible particles of zinc oxide.

The resulting mass is removed celluloid p with t in Coy from the walls of the mortar and placed on the edge of the mortar (or shifted to the nozzle). 0.1 g of ephedrine hydrochloride and 0.2 g of dimedrol are placed in a freed mortar and dissolved in 2.4 ml of water (30% - at water lanolin). 5.6 g of anhydrous lanolin is

added to the solution and mixed until complete absorption of the liquid phase. The resulting emulsion is thoroughly mixed with previously prepared ointment-suspension and remained vaseline to obtain a homogeneous mass of light yellow color with a characteristic smell of menthol.

Example 5:

Rp.: Streptocidi 0.5
Bismuthi subnitratis 1.0
Basis polyaethylenoxydi 10.0
Misce, fiat unguentum
Da. Signa. dermatological ointment

technology:

Combined ointment: ointment-solution (with respect to streptotsid) and ointment-suspension (with respect to bismuth basic nitrate). Streptocide is dissolved in polyethylene oxide base, which is an alloy of PEO-1500 and PEO-400 in a ratio of 3: 7. The base is fused in a porcelain dish on a water bath, streptocid is dissolved in the alloy. In a pre-heated mortar, bismuth nitrate of the basic is first ground in a dry state, and then a part of the streptocide solution in the molten base. Gradually add the rest of the solution in parts and mix until cooling.

The official copy of camphor ointment (DF IH, Art. 721) is slightly modified: according to FS 42-751-73, paraffin is added to its composition.

Example 6:

Rp.: Camphorae 10.0 seu 10.0
Vaselini 60.0 5 4.0
Paraffini - 8.0
Lanolini anhydrici 30.0 28.0
Misce, fiat unguentum
Da. Signa. For rubbing s in the shoulders e

technology:

Anhydrous lanolin and vaseline are melted (according to the alloy rule) in a water bath and in the resulting ro melt cooled to 45-50 ° C, dissolve the camphor (volatile substance) and stir until cooled. The technology of this ointment with paraffin is similar.

Ointment is a combined system: ointment, alloy and ointment solution.

Example 7:

Rp.: Sol.Retinoli acetatis oleosae 3.44% 100.0
Lanolini
Vaselini ana 50.0
M., f. ung ".
DS Lubricate the skin once a day.

technology:

In a mortar placed 100.0 g of a solution of retinol acetate oily 3.44% and mixed with 50.0 g of lanolin. 50.0 g of petroleum jelly is added to the mixture in several steps and thoroughly mixed until homogeneous.
The finished ointment is transferred to a jar for the holidays, corked, pasted the recipe number and filled in the front side of the CPD.

PWC(front side)
Date No recipe
Sol. Retinoli acetatis oleosae 3.44% 100.0
Lanolini 50.0
Vaselini 50.0
m = 200.0
Prepared (signature)
Checked (signature)

Registration for the vacation.
Labels: “Ointment”, “Keep in a cool place”, “Keep in a dark place”, “Keep away from children”.

QUALITY ASSESSMENT OF OILS

The quality of the prepared ointments is evaluated in the same way as other dosage forms, that is, they check the documentation (recipe, passport), packaging, design, absence of delamination and mechanical inclusions, deviations in weight. The determination of authenticity is carried out visually in appearance and organoleptic characteristics (smell, color, etc.), Dependent on the properties of medicinal substances entering the ointment and on the used ointment bases. The uniformity of ointments is determined by the size of the particles of the solid phase.

Determining the pH of ointments is necessary to control the stability of medicinal substances and bases during storage. A pH shift indicates a change in the physicochemical properties of the latter.

An important criterion for the quality of ointments are indicators of structural-mechanical (rheological) properties. The consistency of ointments affects the processes of their preparation and packaging, the spread of ointments and the release of medicinal substances from them.

One of the important factors on which consistency depends is the maximum shear stress, which characterizes the ability of an ointment to exert some resistance during spreading and estrusion (the ability to be squeezed out of tubes, dispensers, etc.).

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. 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

2. 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

3. 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

4. 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.

5. 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

6. 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

7. 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

8. 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

9. 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

10. 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

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

1. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.
2. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
3. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
4. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.

5. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

1. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU "Golden Pages" - 2001 - 281 p.

6.3. Orientation map regarding independent work with literature on the topic of employment.

№№ P	Main tasks	directions	answers (Literature)
1	2	3	four
1	Ointment characteristic	Define the concept of ointment.	3, 5
2	Technology of preparation of ointments	What are the main technological stages of preparation of ointments?	3, 5
3	Quality assessment, rules for packaging, processing and storage of ointments	What are the NTD and quality indicators ointments	3, 5

7. Materials for self-quality training

A. Questions for self-control

1. Definition of ointments, their classification and requirements for them.
2. Classification bases for ointments. Characteristics of diphilic bases.
3. Requirements for ointment bases. Characteristics of hydrophobic and hydrophilic bases.
4. Ointment emulsion. Cooking rules. Official formulations of emulsion ointments;
5. The use of ointment concentrates in the technology of ointments. Means of small mechanization in the technology of ointments.
6. Methods and rules for the introduction of medicinal substances in the preparation of combined ointments. Evaluation of the quality of ointments.
7. Characteristics of combined ointments and general rules for their preparation;
8. Technological stages of preparation of combined ointments, taking into account the physico-chemical properties of medicinal substances;
9. introduction to the ointment of protargol, collargol, tannin, zinc sulfate, resorcinol, extracts of different consistency.
10. rheological characteristics as indicators of the quality of ointments;
11. Evaluation of the quality of ointments in accordance with the requirements
12. Rules of packaging and design for the holidays.

B. Tests for self-control with response standards.

1. 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

2 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

3. 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

4. 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

5. 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

6 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

7. 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.

8. 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

9. 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

10. 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

C. Tasks for self-control with answers

The tasks deal with the technology of polydisperse ointments. .

1. Take: Zinc Sulphate
Anestezina equally by 0.2
ichthyol 1.0
Vaseline 8.0
Mixture to get an ointment.
Give. Mark. Lubricate the affected skin.

Situation. The student weighed into the mortar all the incoming ingredients in the order prescribed in the recipe, mixed, designed to leave. Rate the correctness of his actions. Mistakes made when preparing the combined ointment?

2. Take: Menthol
streptocide
Protargola equally by 0.2
Vaseline 1 0.0
Mixture to get an ointment.
Give. Mark. Ointment for the nose.
Situation. The student chopped menthol, streptotsid, protargol with a few drops of vaseline oil, added vaseline in parts, mixed. Rate the situation. Student violated the rules for the introduction of medicinal substances in the basis?

8. Materials for classroom self-preparation:
8.1 The list of educational individual practical tasks that must be performed during the practical lesson:
A set of individual tasks

1. Take:	Ephedrine hydrochloride 0.3 protargol Glycerin 1.0 Menthol 0.2 Lanolin 3.0 Vaseline 10.0 Mix to get ointment Give. Mark . Nose ointment	2. Take:	Novocain 0,5 Tannin 0,2 Lanolin 3.0 Vaseline 10.0 Mix to get ointment Make a mark. Lubricate the affected skin
3. Take:	Potassium iodide 2.5 Sodium thiosulfate B, 05 Water purified 2.2 ml Anhydrous lanolin 6.75 Emulsion base 13.5 Mixtures to get ointment Make a mark. Rub into the sore joint	4. Take:	Ephedrine hydrochloride 0.5 Extract of belladonna 0,25 Diphenhydrate 0.3 Zinc Oxide 1.0 Lanolin 5.0 Vaseline 20.0 Dare to get ointment Make a mark. lubricate the affected areas
5. Take:	Novocain 0.25 Sulfur 1.0 tannin 0.3 Lanolin 5.0 Vaseline 20.0 Mix to get ointment Make a mark. Ointment for dressings	6. Take:	Dimedrol Novocain 0.25 Anesthesin 0.5 Lanolin 5.0 Vaseline to 50.0 Mix to get ointment Make a mark. Apply to the affected skin.
7.	Ephedrine hydrochloride	8.	Ephedrine hydrochloride 0.2

Take:	Diphenol 0.3 Norsulfazole 0.5 Menthol 0.1 Vaseline 0.1 Lanolin 5.0 Mix to get ointment Make a mark. Nose ointment	Take:	Novocain 0,5 Antipyrine Menthol 0,1 Vaseline Lanolin at 5.0 Mix to get ointment Make a note: For the treatment of Renitis
9. Take:	Extract of belladonna 0,25 Diphenhydrate 0.3 Zinc Oxide 1.0 Lanolin 5.0 Vaseline 20.0 Mix to get ointment Make a mark. Lubricate the affected skin	10. Take:	Diphenhydramine 0.1 streptocid Norsulfazol 0.3 Menthol 0.1 Lanolin 5.0 Vaseline 10.0 Make a mark to get the ointment Make a mark. Rub into the affected skin
11. Take:	Solution of epinephrine hydrochloride 0.1% 5 ml Antipyrine 0.5 Menthol 0.1 Bismuth subnitrate 0.3 Lanolin Vaseline 5.0 Mix to get ointment Make a mark. Enter 3 times a day.	12. Take:	Menthol 0.1 Protargol 0.5 Zinc Oxide 1.0 Lanolin 5.0 Vaseline 15.0 Mix to get ointment Make a mark. Ointment for the nose.
13. Take:	Ephedrine hydrochloride 0.2 Solution of epinephrine hydrochloride 0.1% 0.5 ml Diphenhydramine 0.15 Novocain 0,5 Antipyrine Menthol 0,1 Vaseline Lanolin 5.0 Mix to get ointment Make a mark. Ointment Shapiro. For the treatment of rhinot	14. Take:	Diphenhydrate 0.3 Anesthesin 1.5 Menthol 0.2 Liquids of Burov 10 ml Lanolin 15.0 Vaseline 10.0 Mix to get ointment Make a mark. lubricate the skin
15. Take:	Diphenhydramine 0.1 Mesatoan 0.3 Anesthesin 0.5 Sulfadimine 0.5 Menthol 0.2 Lanolin 4.0	16. Take:	Camphor 0.3 dermatol ichthyol 1.0 each Lanolin Vaseline 10.0 Mix to get ointment

	Vaseline 6.0 Mix to get ointment Make a mark. Nose ointment		Make a mark. Apply to the affected skin.
17. Take:	Motherwort tincture Valerian tincture 2 ml Water cleaning 10 ml Anhydrous lanolin Peach oil to 30.0 Mix to get ointment Make a mark. Apply to the affected skin.	18. Take:	Diphenhydrate 0.3 Sunflower oil 10.0 Water opening 10 ml Lanolin 10.0 Mix to get ointment Make a mark. Apply to the affected skin.

9. Instructive materials for mastering professional skills, skills:

9.1. Methods of work, stages of implementation.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of combined ointments with theoretical justification, taking into account the physicochemical properties and the percentage of medicinal substances. Give an assessment of quality. Specify clearance of the drug before the holidays. Write a passport control written.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

Rate the situation. Student violated the rules for the introduction of medicinal substances in the basis? Mistakes made?

Take: phenol at
Menthol equally by 0.05
glycerol 1.0
Zinc oxide 0.5
Lead water 6 ml
lanolin 2.0
Vaseline 10.0
Mixture to get an ointment.
Give. Mark. Foot Ointment

Situation. The student weighed 0.05 g of phenol and the same menthol into the mortar, mixed it with 1.0 g of glycerin, added 0.5 g of zinc oxide, added vaseline base with lanolin and at the end lead water 5 ml. Issued to leave.

11. The topic of the next lesson: «Suppositories. Making suppositories by rolling out. Sticks. Pills»

Topic of the lesson№20: «Suppositories. Production of suppositories by a method of pumping. Sticks. Pills» -4 h

1. Relevance Topics: The rectal route of drug administration is becoming more widespread in the treatment of many diseases. Suppositories in pediatric and geriatric practices are particularly promising, when using medications, the absorption of which is difficult when administered per os and in other ways. 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. Objectives of the lesson:

2.1 General objectives

Learn to prepare suppositories, evaluate their quality and arrange for the holiday.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

- Characteristics of suppositories as a dosage form and as disperse systems. Classification suppositories. Requirements of the State Pharmacopoeia to them.
- Methods for prescribing suppositories; check doses of toxic and potent drugs in them.
- Basics for suppositories - a brief description; classification of bases for suppositories, requirements reach to them.

2.4 Based on theoretical knowledge of topic:

-able to:

- Evaluate prescription accuracy and check doses of poisonous and potent drugs in suppositories.
- Use the SPh and other regulatory documentation and reference books to find the necessary information on the preparation of suppositories.
- Calculate the number of medicinal and excipients for the preparation of suppositories.
- Choose and justify the best technology option, taking into account the properties of the ingredients that make up the recipe, and the equipment used for this.

3. Materials for classroom self-preparation (interdisciplinary integration).

C	Know	Be able to
1. Prev Latin tongue	The basics grammar. Spelling Latin names of medicinal and chemical substances, medicinal plants, families and raw	Assess the correctness of the recipe design.

	materials plant and animal origin. Recipe.	
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. Subject content:

Suppositories - solid at room temperature and such that the dosage forms melt or dissolve at body temperature.

The name "suppositories" is a collective term assigned to a group of dosage forms intended for easy introduction into body cavities, natural channels and pathological openings.

Lat *suppositorius* means fake, derived from supponere - enclose.

Depending on the site of administration, suppositories are distinguished:

- rectal (suppositoria rectalia suppositories), intended for administration to the rectum;

- vaginal (balls - suppositoria vaginalia), intended for insertion into the vagina;

- bacilli (bacilli) intended for insertion into fistula passages, ureter, cervical canal, auditory canal, etc.

Suppository basics

For the preparation of suppository dosage forms should be used bases that have specific features. The following requirements are imposed on suppository bases:

- must be sufficiently rigid at room temperature and melt (or dissolve) at a temperature not higher than 37 ° C, that is, they must have the ability to drastically change from solid to liquid, bypassing the softening stage - a greasy stage, have sufficient viscosity, no odor , ensure maximum contact between medicinal substances and mucous membrane

- must be chemically and pharmacologically indifferent, do not possess irritating effects and do not change under the influence of external factors (light, heat, moisture, oxygen of the air, microorganisms)

- should easily take the appropriate form, be mixed with the maximum amount of medicinal substances, not interact with them and be stable during storage;

- should easily release medicinal substances, promote the manifestation of their pharmacological action, depends on the properties of the basics, and the method of introduction of medicinal substances into the base;

- must have appropriate rheological parameters and optimal structural and mechanical properties.

prescription suppositories

Suppositories are prescribed in recipes in two ways: distribution and separation. The separation method of prescribing is used extremely rarely.

1. *distribution method* - the number of medicines prescribed per candle or ball and gives an indication of how much they need to be prepared. The number of basics indicate (qs) or indicate its number.

For example:

Rp.: Tannini 0.2
Amyli 0,3
Olei Cacao 2.0
Misce, fiat suppositorium
Da tales doses No. 10
Signa. 1 candle 2 times a day
or:

Rp.: Anaesthesini 0.05
Xeroformii 0.1
Olei Cacao qs,
ut fiat globulus vaginalis
Da tales doses № 6
Signa. 1 ball 2 times at day

2. *separate method* - the number of medicines is prescribed for the whole mass and an indication is given of how many candles or balls to prepare from this mass.

For example:

Rp.: Tannini 2.0
Amyli 3.0
Olei Cacao 20.0
Misce, fiant suppositoria No. 10
Signa. 1 candle 2 times a day

3. The number of drugs in the sticks prescribed similar to candles kam and balls kam, However, the number of the base is not indicated, but the dimensions (length and diameter) of the rods and their number.

For example:

Rp.: Iodoformii 0.1
Olei Cacao qs,
ut fiat bacillus longitudine 5 sm
et diametro 5 mm

Da tales doses №6
Signa. enter into the ureter 1 stick 2 times a day

Suppository technology

Suppositories have both homogeneous and heterogeneous dispersed systems, so the main technological task is to disperse 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 mass of the candle in the recipe is not specified, then in accordance with the instructions of SPh XI they are prepared weighing 3.0 g. In children's practice, the mass 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 m. 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.

The introduction of medicinal substances in suppositories depends on the nature of the base, the amount and physicochemical properties of the medicinal substances, and, above all, on their solubility in the base.

Hydrophobic bases. How hydrophobic and the basics and use cocoa butter, alloys of cocoa butter with paraffin and hydrogenated fats, vegetable and animal hydrogenated fats, solid fats A and B, lanol, alloys of hydrogenated fats with wax, hard paraffin and other bases permitted for medical use.

Hydrophilic bases. How hydrophilic and the basics and use gelatin-glycerin and soap-glycerin gels, polyethylene oxide alloys and in various molecular weights and other permitted for use substances.

The process of absorption of drugs from these bases occurs regardless of their melting point, since the absorption is due only to the rate of diffusion of drugs from the base and the rate of dissolution of the bases. These bases can be used for cooking candles, balls and sticks by casting only.

Introduction to hydrophobic bases.

1. Medicinal substances soluble in the base (camphor, chloral hydrate, phenol, phenyl salicylate, thymol, anesthesin, etc.), Depending on their amount, dissolve in part or all of the liquid base. If these substances are introduced in large quantities, then eutectic alloys with a lower melting point are formed. Stronger reduce its chloral hydrate, camphor and phenol. In these cases, it is necessary to add substances in the amount of 4-5% by weight of the fatty base, which increase the melting point of the mass to 36-37 ° C. Such seals are paraffin wax, spermaceti, etc. If phenol is included in the suppository, it is taken in crystalline form and dissolved in part of the molten fatty base (in order to avoid cauterizing action).

It should be noted that the method of dissolving medicinal substances in the molten base suggests the following pouring of the molten mass into forms. When preparing suppositories by the method of manual formation (rolling out), it is inconvenient.

2. Medicinal substances soluble in water (salts of alkaloids, resorcinol, chinosol, Novocain, e takridine lactate, protargol, collargol, tannin, etc.) and prescribed in an amount of up to 5%, first dissolved in a few drops of water, glycerin or, in extreme cases, alcohol or triturated with the indicated liquids, and then emulsified and mixed with the base. Dissolution facilitates the even distribution of small doses of drugs in the base, improves the conditions of absorption or provides a quick local action.

Anhydrous lanolin is used as an emulsifier (emulsion type B / M), which is added in minimal quantities to eliminate the formation of a mass of ointment consistency. If the above-mentioned medicinal substances in undissolved form are mixed directly with the fatty base (which is fundamentally possible due to its high viscosity), then their smallest particles become covered by the fatty shell, and the process of absorption proceeds very slowly. With the introduction of drugs into the fatty base in the form of an aqueous solution without an emulsifier, a difficult-to-form mass is formed, which easily disintegrates during operation.

If there is a lot of soluble substance (more than 5%) and it requires a significant amount of solvent, it is thoroughly triturated in a mortar, first in a dry form, then with a small amount of water (that is, it is introduced without dissolving the substance), and then the base is added in parts. Collargol, protargol and tannin are always administered only in the form of aqueous or water-glycerin solutions, regardless of their number.

3. Medicinal substances insoluble neither in base nor in water (xeroform, dermatol, streptocid, bismuth basic nitrate, theophylline, zinc oxide, osarsol, etc.) are incorporated into the composition in the form of a fine powder. In the preparation of suppositories by the method of pouring the substance, it is first crushed to the maximum degree of dispersion (the exact dosing in suppositories and therapeutic activity essentially depend on this), then parts of the melted base are crushed (according to the rule of Deryagin) and the resulting mixture is added with constant stirring until molten, half-frozen base. Then the mass is poured into the appropriate form.

4. Medicinal substances in the form of liquids (ichthyol, balsams, naphthalan oil), which have adhesive properties, are injected directly by mixing with the crushed fatty base without the addition of a plasticizer. Liquid ingredients that do not contain volatile substances can be condensed by evaporation at the lowest possible temperature.

5. Thick extracts (for example, belladonna extract, etc.) Injected into the suppository mass after premixing with an equal amount of alcohol. in - water-glycerin mixture (1: 6: 3) or in the form of a ready solution (1: 2).

Preparation of suppositories by rolling out.

Preparation of suppositories by rolling out method includes several stages:

- preparation of the base
- introduction account Arsk substances and obtain suppository mass,
- dosing
- suppository formation,

· packaging and design.

Thermolabile substances should be added to the floor. at cold Jen grounds before pouring it into the mold.

When preparing suppositories using the method of but I heard ki, depending on the quantity medicinal substances are administered in two ways:

· If they are registered in small quantities, i.e. up to 0.1 g per candle, they are first triturated with a few drops of fatty oil (peach, almond, etc.), and then mixed with the ground base.

· If these medicinal substances are prescribed in large quantities, that is, more than 0.1 g per candle, then they are thoroughly crushed and mixed with a part of the molten or finely grated base, and then its residue is added. Direct mixing of crushed medicinal substances with the entire base does not ensure uniform distribution of bulk solids in a thick base.

Example 1:

Rp.: Dimedroli
Papaverini hydrochloridi aa - 0.05
Novocaini 0.15
Olei cacao qs
Misce, fiat suppositorium
Da tales doses No. 10
Signa. 1 candle per night

analysis:

Rectal suppositories of the type of emulsion B / M, which include potent medicinal substances, are well soluble in water.

Checking single and daily doses of potent substances (Dimedrol, papaverine hydrochloride, novocain) is carried out by comparing them with the highest single and daily doses for use.

To prepare suppositories with the number 10 should be weighed:

Dimedrol 0.5 g, papaverine g and drochloride at 0.5 g, Novocain 1.5 h

Since the amount of the base is not indicated in the recipe, it is calculated based on the fact that the mass of one suppository th must be 3.0 g . So, cocoa butter should be taken:

30.0 - (0.5 + 0.5 + 1.5) = 27.5 h

technology:

Medicinal substances are placed in the mortar (according to the rule for the preparation of powders), crushed they are first dry, then about 1 ml (20 drops) is added. The waters are purified. and (based on the solubility of medicinal substances) and triturated to dissolve.

The resulting solution is mixed with a portion of the crushed cocoa butter, gradually adding the rest of its amount. If necessary, add anhydrous lanolin (about 0.5 g). Mix to obtain a homogeneous mass, behind the walls of the mortar, which is weighed. The mass is marked on the back of the recipe and in the passport of the written control. A rod is formed from the mass, it is divided into 10 portions and a

candle is rolled out from each portion. To control multiple doses weighed, the deviations in the mass should not exceed ± 5%. Suppositories should be the same shape, length and thickness.

PWC

Date No recipe
Dimedroli 0,5
Papaverini hydrochloridi 0.5
Novocaini 1.5
Aquae purificatae gtts XX (1 ml = 20 cap.)
Olei Cacao 27.5
Lanolini a nhydrici 0,5
Massae suppositoriorum 31.5

3.1 Number 10
Prepared (Signature)
Checked (signed)

Example 2:

Rp.: Theophyllini 0,2
Olei Cacao 1.5
Misce, fiat suppositorium
Da tales doses No. 10
Signa. 1 candle 2 times a day

technology:

Suppositories of the type of suspension, which include a medicinal substance, which is practically insoluble in water and base.

First, theophylline (2.0 g) is crushed in a mortar, mixed with a portion of the crushed or melted base (1.0 g), the rest of the cocoa butter is gradually added and crushed until a homogeneous suppository mass is obtained. To add plasticity, add anhydrous lanolin. The resulting suppository mass is metered, form candles, pack and make out to leave.

Example 3:

Rp.: Chlorali hydrate 0,5
Cerae flavae 0.25
Olei cac ao 2,0
Misce, fiat suppositorium
Da tales doses № 6
Signa. 1 candle for the night

technology:

Suppositories of the type of solution, which include a potent drug substance, soluble in the base and forms with it a eutectic mixture.

Pre-check a single dose of a potent substance.

In an evaporation cup, 1.5 g of wax is fused with 1.5 g of cocoa butter (NOT overheating!). In a mortar, triturate with 3.0 g of chloral hydrate and dissolve in the

alloy. Add cocoa butter and knead. The mass is transferred to waxed paper, turned into a dense ball, weighed. From the resulting mass of candles prepared by the method described above and make out for vacation.

QUALITY ASSESSMENT AND STORAGE OF SUPPOSITORIES

The quality of cooked Tori Tori 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 must meet 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 range indicated by the HFCs. The deviation in the mass of individual candles should not exceed ± 5%.

Ready suppository dosage forms must have a certain rigidity to ensure their use, otherwise they are unsuitable, as they can be deformed in the hands of the patient to their use.

For suppositories prepared on hydrophobic bases, determine the melting point .

For suppositories prepared on hydrophilic bases, determine the time of dissolution.

The introduction of drugs in hydrophilic bases.

1. Medicinal substances soluble in water or glycerin are first dissolved in a portion of the water or glycerin intended for the preparation of the base, and then added to the base melted, ready for pouring into the mold.

2. Medicinal substances, insoluble in either water or glycerol, are first triturated with a portion of glycerol into a thin suspension, and then added to the finished, molten base before pouring into the molds.

3. Medicinal substances, well soluble in a polyethylene oxide base, collagen gels, 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 mixed into the whole mass and poured into molds.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. The mass of one vaginal suppository should be within:

A. From 1.0 g to 3.0 g
B. From 1.0 g to 4.0 g
C. From 1.0 g to 5.0 g
D. 1.5 g to 3.0 g

E. * From 1.5 g to 6.0 g

2 A pharmacist prepares vaginal suppositories. Specify what should be the mass of the vaginal suppository, if it is not listed in the recipe:

A. 3.0 g
B. 2.5 g
C. * 4.0 g
D. 2.0 g
E. 1.5 g

3 Which of the following vaginal dosage forms are made in pharmacy practice?

A. * pessaries
B. Vaginal tablets
C. Vaginal capsules
D. Vaginal foams
E. Tablets for the preparation of vaginal solutions and suspensions

4. The doctor prescribed pessaries and did not indicate their mass. Specify the mass with which the pessaries should be prepared:

A. 3.0
B. * 4.0
C. 1.5
D. 0.5
E. 6.0

5. The doctor prescribed rectal suppositories and did not indicate their mass. Specify the mass with which it is necessary to prepare suppositories:

A. 4.0
B. 1.0
C. * 3.0
D. 5.0
E. 2.0

6. The recipe does not indicate the form of rectal suppositories. What is the best form to prepare suppositories?

A. Cylindrical
B. pessary
C. spherical
D. * torpedo
E. Ovoid

7. In the manufacture of rectal suppositories, the pharmacist adhered to the specified mass and shape. Specify the maximum diameter of the candles can be made:

A. * 1.5 cm
B. 2.0 cm
C. 0.5 cm
D. Up to 4 cm
E. Arbitrary

8. Specify the hydrophilic base, which is used to prepare suppositories:

A. * Polyethylene oxide
B. Cacao butter
C. hydrogenated fats
D. Witepsol
E. Lanoleva

9. The pharmacist needs to prepare 10 rectal suppositories based on cocoa butter, each of which contains 0.2 g of anestezin. Specify the amount of base to use:
A. 10.0 g
B. * 28.0 g
C. 30.0 g
D. 40.0 g
E. 37.5 g

10. 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 purified water, glycerin or triturated with the indicated liquids, emulsified and mixed with the base.
B. Protargol is dissolved in part of the molten base, and then mixed with the rest of the base.
C. Protargol dissolved in its melted base
D. Protargol is introduced into the composition of the hydrophobic mass in the form of fine powder.
E. Protargol is ground with a few drops of fatty oil, and then mixed with ground base.

11. In the manufacture of suppositories by rolling out after the introduction of chloral hydrate into cocoa butter, the suppository mass became viscous and began to spread. Does the substance need to be added to the suppository mass to restore the density and plasticity?
A. * Wax
B. Glycerol
C. Purified water
D. Dimexide
E. Starch

12. The pharmacy received a prescription for making cocoa butter based balls. Manufacturing method you need to choose with this?
A. Casting
B. * Download
C. Pressing
D. Granulation
E. Draining

13. The pharmacist prepares the balls on a fat basis by downloading. Specify the basis to be used:
A. * Cacao butter
B. Butyrol
C. Vaseline

D. Sebuvinol
E. Witepsol
14. For the preparation of suppositories by the method of manual formation (download) use the basis:
A. Witepsol
B. Confectionery fat
C. Lanolev basis
D. * Cacao butter
E. Solid fat on palm kernel
15. After the introduction of medicinal substances into the cocoa butter, the suppository mass disintegrated. Does the substance need to be added to the suppository mass to provide plasticity?
A. Vaseline
B. Paraffin
C. Glycerol
D. Wax
E. * Anhydrous lanolin
16.The pharmacy prepares rectal suppositories with 0.1 g of euphyllin by download method. Specify the number of bases for 10 suppositories:
A. 19.5 g
B. 28.0 g
C. * 29.0 g
D. 30.0 g
E. 30.5 g
17. What role does anhydrous lanolin in the suppository mass in the manufacture of suppositories by rolling out?
A. * Plasticizer
B. Solvent
C. Preservative
D. solubilizers
E. emollients
18. The pharmacist needs to prepare suppositories using the rolling-out method, which include quinine hydrochloride in an amount of less than 5%. Specify a rational way of introducing the substance into the base:
A. Grind dry and mix with cocoa butter
B. Dissolve in melted cocoa butter
C. * Dissolve in the minimum amount of purified water and add cocoa butter
D. Mix with glycerin and add to cocoa butter
E. disperse with vaseline oil and then mix with base
19. The pharmacist prepares suppositories by rolling out with novocaine in an amount up to 5%. Specify a rational way of introducing the substance into the base:
A. Dissolve in the minimum amount of castor oil
B. Dissolve in the minimum amount of alcohol-water-glycerin mixture

C. Dissolve in melted base
D. * Dissolve in the minimum amount of purified water
E. Dissolve in ethyl alcohol

20 A pharmacist prepares suppositories with streptocid on a polyethylene oxide basis. Specify a rational way of introducing the substance into the base:

A. Dissolve in melted base
B. Vegeted and mixed with base
C. Grind with a small amount of purified water
D. * Type in suspension
E. Mix with Vaseline Oil

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

1. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.
2. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
3. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
4. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
5. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

1. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU “Golden Pages” - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№ № P	Main tasks	directions	answers (Literature)

1	2	3	4
1.	suppository characteristic	Define the concept of a suppository.	3, 5
2	Characteristics of the suppository basics	What are the main technological features of the preparation of suppositories on different bases?	3, 5

7. Materials for self-quality training

A. Questions for self-control

1. Characterization of suppositories as a dosage form and dispersion system. Requirements for suppositories.
2. Classification of suppositories.
3. Methods for prescribing suppositories; checking doses of poisonous, narcotic and potent drugs in them.
4. Classification and characterization of suppository bases; requirements for them. Warehouses of suppository bases.
5. Characteristics of hydrophobic bases;
6. Characteristics of hydrophilic bases;
7. Suppository base compositions
8. The definition of suppositories according to the Global Fund XI, their classification and requirements for them;

B. Tests for self-control with response standards.

1. For the patient you need to prepare glycerin suppositories. Specify the components that are included:
   A. Glycerin, sodium carbonate
   B. Glycerin, sodium bicarbonate
   C. Glycerin, stearic acid
   D. * Glycerin, sodium carbonate, stearic acid
   E. Sodium bicarbonate, stearic acid, glycerin
2. Specify the composition of gelatin-glycerin base according to the requirements of the DF:
   A. * Gelatin 1 hour, Glycerol 5 hours, Waters purified 2 hours
   B. Gelatin 1 h., Glycerol 2 h., Purified Water 5 h.
   C. Gelatin 2 hours, Glycerol 2 hours, Purified Water 5 hours
   D. Gelatin 5 h., Glycerol 1 h., Purified Water 2 h.
   E. Gelatin 5 h., Glycerol 2 h., Purified Water 1 h.
3. The disintegration time for hydrophilic suppositories should be no more than:
   A. 20 minutes.
   B. 30 min.
   C. 45 min.
   D. 2 hours.
   E. * 1 hour

4. Full deformation time for suppositories in a lipophilic base should be no more than:

A. 5 minutes.
B. 10 min.
C. * 15 minutes.
D. 20 min.
E. 25 min.

5. Specify the parameter determined to establish the quality of suppositories on a hydrophobic basis in accordance with the requirements of the DF of Ukraine:

A. * Melting temperature
B. Boiling temperature
C. Freezing point
D. Temperature of cure
E. Temperature limits of distillation

6. Specify the parameter defined to establish the quality of suppositories on a hydrophilic basis in accordance with the requirements of the DF of Ukraine:

A. * Time of dissolution
B. Full freezing time
C. Boiling time
D. Distillation time
E. Melting time

7. The pharmacist needs to prepare suppositories on a gelatin-glycerin basis. Specify the technology base for such suppositories:

A. * Purified water is added to the gelatin and left to swell for 30-40 minutes. After that, glycerin is added and, with stirring, heated in a water bath until a transparent homogeneous mass is formed.
B. Gelatin is dissolved in hot water, glycerol is added and mixed.
C. Gelatin is dissolved in glycerin, add purified water, mix
D. Water is mixed with glycerin and gelatin is dissolved in the resulting mixture.
E. Gelatin is dissolved in a minimum amount of ethyl alcohol, add purified water and glycerin

8. The amount of the base should be used to prepare suppositories according to the recipe:

Rp.: Anaesthesini 0.1
Xeroformii 0.5
Olei Cacao qs ut fiant suppositorium
Da tales doses number 10.
Signa. 1 candle per day rectally

A. * 24.0
B. 25.0
C. 30.0
D. 36.0
E. 40.0

9. A pharmacist prepares suppositories with chloral hydrate. What is the peculiarity of preparing suppositories with this medicinal substance?

A. * For large quantities, you must additionally enter the seal.
B. It is always necessary to add anhydrous lanolin.
C. Always in the form of an aqueous solution
D. soluble in alcohol-water-glycerin mixture
E. Always in suspension.

10. For the preparation of suppository dosage forms that do not require special preparation conditions, it is advisable to use as a basis:

A. * Polyethylene oxide base
B. Cacao butter
C. Lazopol
D. gelatin-glycerin base
E. Soap-glycerin base

C. Tasks for self-control:

Problem number 1

The pharmacy received a prescription with a prescription suppository for a 2-year-old child, which contains 0.5 analgin and 1.5 bases for each suppository. Assess the correct dosage of the ingredients and make corrections if necessary.

Problem number 2

The pharmacist, preparing the suppository with novocaine and streptocide, carefully rubbed the powders in a dry form and mixed them with the base. Rate the correctness of his actions.

8. Materials for classroom self- preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1. Take:	Belladonna Extract 0.015 Novocain 0.2 Adrenaline Hydrochloride Solution (1: 1000) 3 drops Cocoa butter as needed Mixture to form suppository Give such doses number 12 Mark. 1 candle 2 times a day.	2. Take:	chloral hydrate Sugar to 1.0 Cocoa Butter 2.0 Mixture to form suppository Give such doses number 10 Overrun On 1 candle at epileptic seizures.
3. Take:	Dimedrol 0.1 Papaverine hydrochloride 0.05	4. Take:	Osarsola 0.2 boric acid Glucose at 0.25

	Novocain 0.25 Cocoa butter as needed Mixture to form suppository Give such doses number 10 Overrun On 1 candle for the night.		Cocoa Butter 4.0 Mixes to form a ball Give such doses number 6 Mark. 1 ball 2 times a week.
5. Take:	anesthesin Novocaina 1.0 each dermatol 0.5 Basics enough to form suppositories number 12 Give. Mark. 1 candle per day.	6. Take:	chloramphenicol 0.1 Boric acid 0.2 Basics of fat as needed Mixture to form a stick 5 cm long and 4 mm in diameter Give such doses number 10 Mark. 1 stick to the urethra 2 times a day.
7. Take:	Quinine hydrochloride 0.2 Boric acid 0,25 Cocoa Butter 2.0 Mixes to form a ball Give such doses number 12 Mark. 1 ball for the night.	8. Take:	Ethacridine lactate 0.01 Basics of fat as needed Mixture to form a stick with a length of 6 cm and a diameter of 3 mm Give such doses number 5 Mark. 1 stick in the urethra at night.
9. Take:	Novocain 0.25 Dimedrol 0.1 Adrenaline Hydrochloride Solution 0.1% 5 drops Cocoa Butter 3.0 Mixture to form suppository Give such doses number 10 Mark. 1 candle 2 times a day.	10. Take:	xeroform 0,2 Cocoa Butter 2.0 Mixture to form a stick 4 cm long and 3 mm in diameter Give such doses number 10 Mark. 1 stick for the night.
11. Take:	Belladonna Extract 0.015 anesthesin 0.25 chloramphenicol 0,2 Novocain 0.1 Cocoa butter as needed Mixture to form suppository Give such doses number 10 Mark. On 1 candle for the night.	12. Take:	dermatol 0,2 Cocoa butter as needed to form a stick with a length of 10 cm and a diameter of 4 mm Give such doses number 6 Mark. For 1 stick for the night in the urethra.
13. Take:	Belladonna Extract 0.015 ichthyol Xeroform 0,1 Cocoa butter 1.5 Mixture to form suppository	14. Take:	streptocide 0.1 norsulfazol 0.15 Cocoa butter as needed to form a stick 5 cm long and 3 mm in diameter Give such doses number 20

	Give such doses number 12 Mark. On 1 candle for the night.		Mark. 1 stick 4 times a day.
15. Take:	furatsilina 0.02 Citric acid 0.05 Cocoa Butter 2.0 Mixes to form a ball Give such doses number 10 Mark. 1 ball for the night.	16. Take:	ethacridine lactate Novocain 0.01 each Cocoa butter as needed to form a stick with a length of 6 cm and a diameter of 4 mm Give such doses number 10 Mark. 1 stick 3 times a day.
17. Take:	Platyfillina gidrotartrat 0,005 Papaverine hydrochloride 0.01 Dibazol 0,02 anesthesin 0.1 Cocoa butter as needed Mixture to form suppository Give such doses number 20 Mark. 1 candle 3 times a day.	18. Take:	sulfadimesine 0.03 Ethacridine lactate 0.02 Cocoa butter as needed to form a stick 4 cm long and 3 mm in diameter Give such doses number 20 Mark. 1 stick 4 times a day.
19. Take:	Belladonna Extract 0.015 analgin 0.5 Cocoa butter 1.5 Mixture to form suppository Give such doses number 20 Mark. 1 candle 3 times a day.	20. Take:	Novocain 0.01 Basics of fat as needed Mixture to form a stick with a length of 6 cm and a diameter of 3 mm Give such doses number 5 Mark. 1 stick in the urethra at night.

9. Instructive materials for mastering professional skills, skills:

9.1. Methods of performing work, stages of implementation.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the holidays. Write a passport control written.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

Situational task.

The pharmacy has a prescription, in which the doctor did not determine the amount of cocoa butter on one a candle. A pharmacist prepared rectal suppositories weighing 4.0. Or he acted correctly?

11. The topic of the next lesson: «Production of suppositories by pouring»

Topic of the lesson№21: «Production of suppositories by pouring method»-4 h

1. Relevance Topics: 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. Objectives of the lesson:

2.1 General objectives

Learn to prepare suppositories, evaluate their quality and arrange for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

- Characteristics of suppositories as a dosage form and as dispersed systems. Classification suppositories. Requirements of the State Pharmacopoeia to them.
- Characterization of the technological stages of the preparation of suppositories by the method of Leuban.
- composition and properties of the official suppository bases used for pouring;
- the value of the replacement ratio of medicinal substances when using hydrophobic and hydrophilic bases in the casting method;
- composition of gelatin-glycerin and soap-glycerin bases for suppositories;
- characterization of the technological stages of the preparation of suppositories by casting;
- rules for the management of medicinal substances with different physicochemical properties as a basis for using the casting method.
- criteria for assessing the quality of suppositories (size, shape, absence of inclusions, deviation from the average mass, time of complete deformation, etc.) In accordance with the requirements of the Global Fund and relevant instructions.

2.4 Based on theoretical knowledge of the topic:

-able to:

- Evaluate prescription accuracy and check doses of toxic and potent drugs in suppositories.
- 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.
- Calculate the number of medicinal and excipients for the preparation of suppositories.

- Select and justify the best technology option, taking into account the properties of the ingredients that make up the recipe, and the equipment used for this.
- To carry out the main technological operations for the preparation of suppositories by the method of pouring (weigh, crush, dissolve, mix).
- Assess the quality of the prepared suppositories.
- Pack and arrange the drug for the holidays. Write a passport to the written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

c	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**. Subject content:**

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.

For example, the replacement ratio of bismuth nitrate basic on a fatty basis is 4.8. This means that 4.8 g of bismuth nitrate basic occupy the same amount Volume, as well as 1.0 g of fatty basis.

Turnover the replacement rate (1 / Hedgehog) call the amount of fatty basis, as but replaces one weight part of the drug substance. That is, the amount of fatty basis equivalent in volume to 1.0 g of the drug substance.

For example, the inverse replacement ratio of bismuth nitrate basic on a fatty basis is 0.21. This means that 0.21 g of the fat base occupies a volume equal to the volume of 1.0 g of bismuth basic nitrate. When calculating the amount of basis, it is more convenient to use the inverse replacement rate.

Example 1:

Rp.: Osarsoli 0.2
Acidi borici 0,1
Glucosi 0.3
Butyroli qs
Misce, fiat suppositorium
Da tales doses №12

Signa. 1 candle for the night

Rectal suppositories, which include the drug poisonous substance - osarsol, as well as other substances that are not soluble in the base - boric acid and glucose, prescribed in an amount of more than 5%. Checking single and daily doses of Osarsol is carried out by comparing them with the highest single and daily doses for oral administration.

calculation: Osarsol at 0.2 • 12 = 2.4 g
Acid and boric 0.1 • 12 = 1.2 g
Glucose and 0.3 • 12 = 3.6 g
The number of suppository bases calculated on the basis of the fact that the form for casting allows you to get suppositories on a fat basis weighing 2.0 g
Using the replacement rate, make the calculation of the basics:
Osarsol 2.4: 1.45 = 1.66 2.4 • 0.69 = 1.66
Boric acid 1.2: 1.6 = 0.75 1.2 • 0.625 = 0.75
Glucose 3,6: 1,23 = 2,92 3,6 • 0,81 = 2,92
Thus, butyrol need to take:
2.0 • 12 - (1.66 + 0.75 + 2.92) = 18.67 g.

technology:

Osarsol is obtained on demand by a pharmacist. Substances thoroughly crushed in dry form in accordance with the rules of the preparation of complex powders. Then grinding continue part of the base melted (approximately 4.0 g according to the Deryagin rule).

The resulting mixture is transferred from the mortar to a porcelain cup to the remaining amount of the melted base, mixed thoroughly to evenly disperse the crushed substances.

Drink the mass quickly poured into pre-lubricated with soapy alcohol and chilled forms, placed in a refrigerator for 15-20 minutes. After cooling, with a knife, a frozen mass that protrudes from the cells of the mold, the latter is unscrewed, the suppositories are taken out, wrapped and decorated for release.

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.

Record these candles is given in DF IX.

Example 2:

Rp.: Acidi ste but rinici 5.0
Natrii carbonatis 2.0
Glycerini 60.0
ut fiant suppositoria number 20
Signa. 1 candle per night

In addition, these candles can be discharged in this way:
Rp.: Suppositoria Glycerini 3.0
Da tales doses № 20
Signa. 1 candle per night
Gelatin-glycerin base compared with fat has a higher density (1.15), therefore, with the same mass takes less volume. In this regard, when preparing suppositories in gelatin-glycerin base, it should be taken more than fat, considering that its density is 1.21 times higher than fat (1.15 / 0.95).

Example 3:

Rp.: Protargoli 0.1
Massae gelatinosae qs
Misce fiat globulus vaginalis
Da tales doses No. 10
Signa. 1 ball 3 times a day

calculation:

Vaginal suppositories on gelatin-glycerin basis with protected colloid. If the nest of the form holds 4.0 g of the fat base, then to obtain 10 balls, it would be necessary to have 40.0 g (4.0 • 10), and a gelatin-glycerin base: 40.0 • 1.21 = 48.4 m In this case, the replacement rate is not taken into account, since the protargol is prescribed less than 5%.
R ozrahunk Gelatin at
1.0 g - 8.0 g basics and
x = 6.05 g
x g - 48.4 g basics and
Water and eyes th 6.05 x 2 = 12.1 ml
GL and cerin at 48.4 - (6.05 + 12.1) = 30.25 g

technology:

Gelatin is placed in a weighted porcelain cup, filled with water and allowed to swell for 30-40 minutes. Then, glycerin is weighed into a cup with swollen gelatin and heated in a water bath until gelatin is completely dissolved. Add water to the required mass.

1.0 g of protargol is placed in a porcelain dish, ground with 6-8 drops of glycerin and dissolved in 4-6 drops of water. The amount of water and glycerin taken into account when preparing the gelatinous mass. A solution of protargol is added, stirring, into a warm gelatin-glycerin mass and the resulting homogeneous mixture, devoid of air bubbles, is poured into pre-prepared forms smeared with vaseline oil. Place in the freezer of the refrigerator for 10-15 minutes. The frozen balls are released by releasing the form elements.

PWC

Date No.й	recipe at
Gelatinae	6.05
Aquae purificatae	12.1 ml
Glycerini	30.25
Massae gelatinosae ad	48.4

Stargoli 1.0
Massae suppositoriorum 49.4
4.94 number 10
Prepared (signature)
Checked (signed)

Example 4:

Rp .: Zinci oxydi 0.25
Acidi borici 0.1
Massae gelatinosae q. s.
Misce, fiat pessarium
Da tales doses Number 10
Signa.1 pessary at night

calculation:

Suspension vaginal suppositories on gelatin-glycerin basis with the content of insoluble substances more than 5%.

The volume of the nests of the form provides the output of pessaries on the basis of fat weighing 4.0 g.

Since the replacement coefficients for medicinal substances are calculated for the fatty basis, it is advisable to carry out the calculation of the latter, and then transfer them to a gelatin-glycerin basis.

To prepare 10 pessaries only from the fatty base (without medicinal substances), it was necessary to take 40.0 m. Given the volume of 2.5 g of zinc oxide, the mass of the fatty base must be reduced, taking into account the corresponding replacement rates of the medicinal substances.

Using the inverse replacement rate (1 / Egg) for zinc oxide, equal to 0.25, find the required amount of the base:

$40.0 - (0.25 \cdot 10) \cdot 0.25 = 39.375 \approx 39.4$ m

To switch from a fatty base to a gelatin-glycerin one, multiply the mass of a fatty base by a conversion factor of 1.21: $39.5 \cdot 1.21 = 47.674 \approx 47.7$ g (gelatin 5.96 g of water 11.92 ml of glycerin 29, 8 g).

The introduction of boric acid into the gelatin-glycerin base does not make a practical impact on the volume, since it is prescribed in an amount of up to 5%.

technology:

Crumbled gelatin is placed in a pretreated cup, poured with water and allowed to swell for 30-40 minutes.

Glycerin is then added (leaving a portion to dissolve the boric acid and grinding the zinc oxide), the mixture is heated in a water bath, stirring until a homogeneous mass is formed.

In a jar with a slight heat dissolve the boric acid in glycerin. In a mortar, zinc oxide is ground in a dry form, then with a solution of boric acid in glycerol, the resulting mixture is added to the prepared base and mixed. The finished suppository mass is weighed (water is added) and poured into molds smeared with

a thin layer of vaseline oil. Cooked pessaries are placed in cardboard boxes and drawn up for vacation.

When calculating the amount of gelatin-glycerin base, you can use the so-called transition module, which is the ratio of the density of the fatty base to the density of the gelatin-glycerin base: 0.95: 1.15 = 0.826.

For the gelatin-glycerin base, the replacement rate is used, which is derived by multiplying the replacement rate of the fat base by the transition module.

Thus, the replacement ratio of gelatin-glycerin bases Hedgehog / h = Hedgehog • 0.826.

So for example, if Hedgehog for ichthyol is 1.1, then hedgehog / h - 1.1 • 0.826 = 0.908 ≈ 0.91.

Example 5:

Rp.: Sulfadimethoxini 0,2
Basis polyaethylenoxydi qs
Misce, ut fiat suppositorium
Da tales doses № 20
Signa. one candle each morning and evening

calculation:

Rectal suppositories on a hydrophilic basis, which include a potent substance soluble in the base - sulfadimethoxin.

Check single and daily doses of sulfadimethoxine. The volume of the nest form gives candles on a fat basis of 2.0 g. The content of the medicinal substance is 10%.

The calculation of the amount of polyethylene oxide bases is carried out taking into account the replacement rate. The density of the polyethylene oxide base is higher than the fatty one, therefore, when pouring out suppositories, it must be taken more (similar to gelatin-glycerin base).

To prepare 20 candles from a pure fatty basis, it is necessary to take 2.0 • 20 = 40.0 m. Given the inverse replacement rate (1 / Egg) for sulfadimethoxine, the required amount of fatty basis is calculated and then transferred to the Polyethylene oxide basis, using the conversion factor (1.21):

[40.0 - (0.2 • 20 • 0.74)] • 1.21 = 44.82 ≈ 44.8 g

technology:

44.8 g of base are melted in a porcelain dish and 4.0 g of sulfadimethoxin is dissolved in it with stirring. Next, the cold mass is poured into cooled forms, pre-lubricated with vaseline oil. The form for 10-15 minutes is placed in the fridge, after which the ready candles are taken out, wrapped and made out for leave.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. A pharmacist prepares casting vaginal suppositories. Specify a hydrophilic base that he can use:

A. Cacao butter
B. Witepsol
C. * Polyethylene oxide
D. Solid fat
E. Butyrol

2 The pharmacist prepares suppositories on the basis of fat by the method of pouring. Specify the basis to be used:

A. * Butyrol
B. Vaseline
C. Cacao butter
D. Wax
E. Spermaceti

3 The pharmacist needs to prepare 10 rectal suppositories based on cocoa butter, each of which contains 0.2 g of anestezin. Specify the amount of base to use:

A. 10.0 g
B. * 28.0 g
C. 30.0 g
D. 40.0 g
E. 37.5 g

4. The pharmacist needs to prepare suppositories with novocaine based on cocoa butter. Specify the optimal method of introducing novocaine:

A. Introduce Novocain in the form of fine powder
B. * Enter Novocain in the form of an aqueous solution
C. Grind Novocain parts of the molten base
D. Grind novocaine in the presence of a volatile liquid
E. Grind novocaine with a related liquid

5. A pharmacist needs to prepare suppositories using the butyrolu-based pouring method. Specify a rational way to prepare the mold for casting:

A. * Smeared with soapy alcohol.
B. Oiled with castor oil
C. Smear alcohol-water-glycerin mixture
D. Oiled Vaseline Oil
E. Lubricated with salicylic alcohol

6 The pharmacist prepares the suppositories by casting. What factor should be used to calculate the amount of gelatin-glycerin base?

A. Increase in volume
B. * Conversion factor
C. Water absorption coefficient
D. Isotonic coefficient
E. Substitution rate

7 The pharmacist prepares the suppositories by casting. What is the ratio of the transition from fatty bases to gelatin-glycerin?

A. * 1.21
B. 1.20
C. 1.31
D. 1.11
E. 1.25

8. A pharmacist prepares rectal suppositories with cocoa butter which contain dimedrol in an amount of less than 5%. Specify a rational way of introducing the substance into the base:

A. * dissolved in purified water
B. dissolved in olive oil
C. dissolved in melted cocoa butter
D. dissolve in vaseline oil
E. dissolved in alcohol

9. Pharmacist prepared suppositories by casting. What coefficient did he use when calculating the gelatin-glycerin basis?

A. * Transition rate
B. Increase volume
C. Water absorption coefficient
D. Isotonic coefficient
E. Substitution rate

10. For the patient prepare urethral sticks. Specify what parameters the doctor must specify in the prescription for the pharmacist to calculate the amount of the basis.

A. Diameter, length and number of sticks.
B. Diameter and number of sticks.
C. The number and length of sticks.
D. The diameter of the sticks and the appearance of the base.
E. Type of base and number of sticks.

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

1. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.
2. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
3. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed.

OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
4. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
5. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

1. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU "Golden Pages" - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	suppository characteristic	Define the concept of a suppository.	3, 5
2	Technology of preparation of suppositories by pouring	What are the main technological stages of the preparation of suppositories by the method of pouring?	3, 5
3	Quality assessment, rules for packaging, processing and storage of suppositories	What are the NTD and suppository quality indicators	3, 5

7. Materials for self-quality training

A. 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.

B. Tests for self-control with response standards.

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

C. Tasks for self-control with answers:

Problem number 1

A suppository prepared with a pharmacist with a dry extract of a belladonna and a collargol had non-uniform color and blotches of dark color. What explains this phenomenon or let this drug go to the patient?

Problem number 2

The pharmacist, preparing 30 balls of quinine with hydrochloride boric acid, opened the ingredients in 5 ml of purified water, then poured into a solution of 3.0 water lanolin and added cocoa butter. Rate the correctness of his actions.

Problem number 3

Perizor, a technologist after controlling the suppository of morphine hydrochloride, designed them with the label "External" and put it on the turntable for dispensing the prepared dosage forms. Rate the correctness of his actions.

Problem number 4

The pharmacist, preparing balls with osarsol, boric acid and glucose, mixed the powdered substances in a mortar in the order of their prescription, added a small amount of water for dissolution, then added crushed cocoa butter. Assess the correctness of their chosen technology.

8. Materials for classroom self-preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1.	Osarsol 0.3	2.	Osarsol at 0.25

Take: 	streptocid Acids boric 0.3 each The basics Zhirovo nd asneeded Mix it up to get sve chku Give such doses number 12 Mark . 1 candle on nights	Take: 	Acids boric Glucose 0.3 The basics polyethylene oxide how much need to Mix it up to get sve chku Give such doses by number 20 Mark . 1 candle per night
3. Take: 	Menthol 0.03 Dermatol at 0.04 Zinc oxide 0.03 The basics Giraud in th how much need to Mix to obtain a candle Give such doses number 20 Mark . 1 candle 3 times a day	4. Take: 	Acids stearic 5.0 On th three bicarbonate 2.0 Glycerol 60.0 Mix to obtain a candle number 24 Mark . 1 candle in the morning and in the evening
5. Take: 	Extract belles 0,015 Dermatol 0.3 Butyrol how much need to Mix to obtain a candle Give such doses number ten Mark . 1 candle in the morningand in the evening	6. Take: 	Protargol 0.1 Gelatinous - glycerin the basics how much need to Mix to get the ball Give such doses number 12 Mark . 1 ball at night
7. Take: 	Papaverine hydrochloride Caffeine benzoate sodium on 0,1 Butyrol how much need to . Mix to obtain a candle Give such doses number ten Mark . 1 candle 2 times a day	8. Take: 	Zinc oxide Bismuth nitrate basic 0.15 Butyrol how much need to Mix to obtain a candle Give such doses number 20 Mark . 1 candle per night
9. Take: 	Anesthesin 0.1 Solution adrenaloid rod core - chlorides at 0 to 1% I, the aplu Dermatol 0.12 Camphor 0.25 Butyrol how much need to Mix to obtain a candle Give such doses number ten Mark . 1 candle per night	10. Take: 	Extract of belladonna 0.015 anesthesin Analgein 0.5 Fundamentals Fat as needed Mix to get a candle Give such doses of 10 Mark. 1 candle per night
11. Take: 	Anesthesin 0.1 menthol Dermatol on 0,04 Zinc oxide 0.02 Butyrol how much need to Mix to obtain a candle Give such	12. Take: 	Extract of belladonna 0.015 Phenol 0.014 Fundamentals Fat as needed Mix to get a candle Give such doses of 10 Mark. 1 candle per night

	doses number 6 Mark . 1 candle per night		
13 . take it	Extract of belladonna 0.015 Analgein 0.5 Fundamentals Fat as needed Mixture to get a candle Give such doses number 10 Mark. 1 candle per night	14 .take it	Platifilin hydrotartrate 0,005 Papaverine hydrochloride 0.01 Anesthesin 0.15 Dibazol 0.02 Butyrol how much need to Mix to obtain a candle Give such doses number ten Mark . 1 candle per night
15 . take it	Anesthesin 0.1 menthol Dermatol on 0,04 Zinc oxide 0.02 Butyrol how much need to Mixture to obtain a candle Give such doses number 6 Mark . 1 candle per night	16.take it	Acid and with tearinovaya 5.0 Sodium bicarbonate 2.0 Glycerol 60.0 Mix to obtain a candle number 24 Mark . 1 candle per night
17 . take it	Quinine hydrochloride 0, 06 Tannin 0.015 Gelatinous in - glycerin the basics how much need to Mix to get the ball Give such doses number 6 Mark . 1 ball at night	18.take it	Protargol 0.1 Gelatin in about - glycerine th the basics how much need to Mix to get the ball Give such doses number 12 Mark . 1 ball 3 times a day
19 . take it	Streptocide 0.25 The basics polietilenoksidno th how much need to Mixture to obtain a candle Give such doses number 20 Mark . 1 candle per night	20.take it	Analgein 0.5 Extract of belladonna 0.015 Gelatin-glycerin base as needed Blends to get a candle Give such doses of the number 5 Mark. 1 candle at takla

9. Instructive materials for mastering professional skills, skills:

9.1. Methods of performing work, stages of implementation.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the holidays. Write a passport control written.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

Calculate how much *fat* base is needed:
1. for the manufacture of 120 candles containing 0.25 analginu, if the form gives candles with a fat base weighing 3.8 (1 / Hedgehog analgin = 0.79),
2 for the manufacture of 120 candles containing 0.25 boric acid, if the form gives candles with a fatty basis weighing 3.2 (1 / hedgehog boric acid = 0.625),
3 for the manufacture of 100 candles containing 0.2 zinc oxide i 0.15 dermatol, the shape gives candles with a fat base mass of 3.1 (1 / hedgehog zinc oxide = 0.25, 1 / hedgehog dermatol = 0.38),

Calculate how much *gelatin-glycerin* base is needed:
one. for the manufacture of 120 balls containing 0.2 zinc oxide, if the form gives balls with a fat base mass of 2.2 (1 / hedgehog zinc oxide = 0.25),
2 for the manufacture of 100 balls containing 0.3 xeroform, if the form gives balls with a fat base mass of 3.6 (1 / Hedge xeroform = 0.21),
3 for the manufacture of 100 balls containing 0.2 alumi-cali alum, if the form gives balls with a fat basis weighing 2.4 (1 / hedgehog alumi-cali alum = 0.56),

The standard solution to the problem.
Calculate how much of the fat base is needed to make 100 candles containing 0.2 xeroform and 0.1 tanin each, if the shape gives candles from a fat base weighing 3.1 (1 / Hedgehog xeroform = 0.21, 1 / Hedgehog tannin = 0.90).

% Dry substances 3.1 - 100%
0.3 - x x = 9.7% 5%
Fat base: 100 · 3.1 - (100 · 0.2 · 0.21 + 100 · 0.1 · 0.90) = 296.8

11. The topic of the next lesson. «Requirements for the manufacture of sterile and aseptic medicines in pharmacies. Solutions for injection»

Topic of the lesson№22: «Requirements for the manufacture of sterile and aseptic medicines in pharmacies. Solutions for injection»-4 h

1. Relevance Topics: 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. This explains the need to study this topic.

2. Objectives of the lesson:

2.1 General objectives

Learn how to prepare injectable solutions that do not require stabilization, but require aseptic and sterile manufacturing conditions in pharmacies, evaluate their quality and prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• 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.

2.4 Based on theoretical knowledge of the topic:

-able to:

• Use the State Pharmacopoeia of Ukraine, analytical and regulatory documentation to find the necessary information on the preparation of solutions for injection.
• Provide sanitary and hygienic conditions for aseptic preparation of solutions for injection.
• Evaluate the correctness of prescriptions and check the doses of toxic and potent substances in injectable solutions.
• Calculate the amount of drugs and excipients for the solution for injection.
• Choose the best technology based on the physicochemical properties of the ingredients and available equipment.
• Carry out the main technological operations for the preparation of injection solutions (weigh, dissolve, filter, control for the absence of mechanical impurities, hermetically sealed, draw up for sterilization, sterilize).

• Follow safety rules when working with devices for filtering, sterilizing and checking the purity of injectable solutions).
• Use small mechanization in the preparation of injectable solutions (bactericidal lamps, filter unit, sterilizers, devices for closing vials, etc.).
• To control the quality of prepared solutions, to close and issue medicines before release.
• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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	To carry out elemental analysis and identification

	compounds and the main methods of their analysis.	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 of liquid dosage forms for injection	Carry out calculations of medicinal, auxiliary substances and water for injections
Industrial Medicine Technology	Injectable solution technology	Technological stages of preparation of solutions for injection
Biopharmacy	Technological process of preparation of parenteral medicines	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. *Intra-subject integration* Injection solutions	Preparation of Injection solutions	Calculate the amount of drugs and sterile water

4. Subject content:

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.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests (without answers)

1. What is a shelf-live for sterile solutions for injections prepared and closed by aluminum cup in pharmacy?

A). 10 days
B). 1 month
C). 2 month
D). 5 days
E). 3 month

2. A pharmacist prepared a solution for injections. What the method of sterilization of tableware is used for preparation of aseptical medicines?
A). Dry air
B). Tindalization
C). Fluid vapour
D). Chemical substances
E). UV-rays

3). What the method used for the control of parameters while sterilizing by autoclave?
A). Thermo-tests
B). Stabilizers
C). Buffer solutions
D). Isotonic agents
E). Antioxidants

4. A chemist"s shop prepares solution for injections. When should it be checked for the absence of mechanical inclusions?
A). Before and after sterilization
B). Before filtration
C). Before chemical analysis
D). After registration for dispensing
E). Before and after packing

5. A pharmacist prepares a solution for injections. What amount of the bottle should be checked for the absence of mechanical inclusions?
A). 50% of all bottles
B). All bottles (100%)
C). 75 % of all bottles
D). 25 % of all bottles
E). 10 % of all bottles

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

6. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.

7. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.

8. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
9. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
10. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

2. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU "Golden Pages" - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№ № P	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, 5
2	Technology of preparation of solutions for injection	What are the main technological stages of the preparation of solutions for injection?	1, 5
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, 5

7. Materials for self-quality training

A. 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.

8. Materials for classroom self-preparation:
8.1 List of educational individual practical tasks that must be performed during the practical lesson:
A set of individual tasks

1. Take	Analgin solution 25% 100 ml Sterilize! Give. Indicate: for intravenous drop infusion.	2. Take	Calcium chloride solution 10% 100 ml Sterilize! Give. Indicate: 5 ml intravenously
3. Take	Sodium bicarbonate solution 3% 100 ml Sterilize! Give. Indicate: 2 ml intravenously.	4. Take	Sodium chloride solution 10% 100 ml Sterilize! Give. Indicate: 10 ml intravenously
5. Take	Calcium chloride solution 5% 100 ml Sterilize! Give. Indicate: 10 ml intravenously	6. Take	Sodium bromide solution 50% 10 ml Sterilize! Give. Indicate: 10 ml for intravenous infusion
7. Take	Potassium chloride solution of 10% 100 ml Sterilize!	8. Take	Calcium gluconate solution 10% 100 ml Sterilize! Give. Indicate: 10 ml intravenously.
9. Take	Calcium gluconate solution 10% 1000 ml Sterilize! Give. Indicate: 1 ml intramuscularly.	10. Take	Pyridoxine hydrochloride solution 5% 20 ml Sterilize! Give. Indicate: 2 ml intramuscularly.
11. Take	Platiphylline hydrotartrate solution 30% 0.2 ml Sterilize! Give. Indicate: 1 ml subcutaneously.	12. Take:	Magnesium sulfate solution 10% 100 ml Sterilize! Give. Indicate: 5 ml intravenously.
13. Take	Magnesium sulfate solution 20% 1000 ml Sterilize! Give. Indicate: 5 ml intravenously.	14. Take	Potassium chloride solution 0.5% 100 ml Sterilize! Give. Indicate: for intravenous

			infusion
15. Take	Calcium chloride solution 0.5% 1000 ml Sterilize! Give. Indicate: for intravenous infusion	16. Take	Papaverine hydrochloride solution 2% 100 ml Sterilize! Give. Indicate: for intravenous infusion
17. Take	Diphenylhydramine solution 50% 1 ml Sterilize! Give. Indicate: 1 ml intramuscularly.	18. Take	Sodium chloride solution 10% 100 ml Sterilize! Give. Indicate: 10 ml intravenously.
19. Take	Sodium bicarbonate solution 5% 1000 ml Sterilize! Give. Indicate: for intravenous drop infusion.	20. Take	Sodium chloride solution 0.9% 100 ml Sterilize! Give. Indicate: 10 ml intravenously.

9. Instructive materials for mastering professional skills, skills:

9.1. Methods of performing work, stages of implementation.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

10.1. Describe the injectable solutions technology, quality assessment, registration of its release with full theoretical basis of sterilization regime choice based on the physicochemical properties of pharmaceutical substances.

Rp. Sodium bicarbonate solution 5% 1000 ml
Sterilize!
Give. Indicate: 2 ml intravenously.

Rp. Potassium chloride solution 20% 1000 ml
Sterilize!
Give. Indicate: 15 ml intravenously.

Rp. Analgin solution 50% 1000 ml
Sterilize!
Give. Indicate: for intravenous drop infusion.

Rp. Diphenylhydramine solution 2% 100 ml
Sterilize!
Give. Indicate: 1 ml intramuscularly.

11. The topic of the next lesson. «Solutions for injections that require stabilization»

Tasks for UIRS and NIRS on this topic.
Soft drugs for topical use.

Topic of the lesson№23: «Solutions for injections that require stabilization»-4 h

1. Relevance Topics: In the process of sterilization of injectable solutions and their subsequent storage, the decomposition of drugs is possible, which necessitates their stabilization. The choice of stabilizers is determined by the mechanism of reactions that cause the decomposition of substances. Therefore, the study of the properties of solutions of medicinal substances, methods of their stabilization is relevant in the study of the technology of injectable dosage forms.

2. Objectives of the lesson:

2.1 General objectives

Learn how to prepare injectable solutions that need to be stabilized in pharmacies, evaluate their quality and prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• • 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;

2.4 Based on theoretical knowledge of the topic:

-able to:

• Use the State Pharmacopoeia of Ukraine, analytical and regulatory documentation to find the necessary information on the preparation of solutions for injection.
• Provide sanitary and hygienic conditions for aseptic preparation of solutions for injection.
• Evaluate the correctness of prescriptions and check the doses of toxic and potent substances in solutions for injection with stabilizers.
• Calculate the amount of drugs and excipients for the solution for injection.
• Choose the best technology based on the physicochemical properties of the ingredients and available equipment.
• Carry out the main technological operations for the preparation of injection solutions (weigh, dissolve, filter, control for the absence of mechanical impurities, hermetically sealed, draw up for sterilization, sterilize).
• Follow safety rules when working with devices for filtering, sterilizing and checking the purity of injectable solutions).
• Use small mechanization in the process of preparation of injection solutions (bactericidal lamps, filter unit, sterilizers, devices for sealing vials, etc.).

• Carry out quality control of prepared solutions, seal and dispense medicines before release.
• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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	Perform qualitative and quantitative analysis of

	of inorganic and organic substances	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 of liquid dosage forms for injection	Carry out calculations of medicinal, auxiliary substances and water for injections
Industrial Medicine Technology	Injectable solution technology	Technological stages of preparation of solutions for injection
Biopharmacy	Technological process of preparation of parenteral medicines	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. *Intra-subject integration* Isotonic and infusion solutions. Solutions for injection with thermolabile substances	Preparation of isotonic and infusion solutions in a pharmacy.	Calculate the amount of drugs and sterile water

4. Subject content:

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.

PROPERTY TECHNOLOGY OF INJECTION SOLUTIONS

Glucose solutions. The industry produces glucose solutions for injection at a concentration of 5, 10, 25 and 40%. However, injectable glucose solutions in large quantities are prepared in pharmacies. Glucose solutions are unstable compared to long-term storage. The main factor determining the stability of glucose in solution is the pH of the medium. In an alkaline environment, it is oxidized, caramelized and polymerized. At the same time there is yellowing and sometimes browning solution. In this case, under the influence of oxygen, hydroxy acids are formed: glycolic, acetic, formic and others, as well as acetaldehyde and hydroxymethylfurfural (destruction of the bond between carbon atoms). To prevent this process, glucose solutions are stabilized with a 0.1 M solution of hydrochloric acid to a pH of 3.0-4.0, because in this medium there is a minimum formation of 5-hydroxymethylfurfural, what nephroheptotoxic effect.

In a strongly acidic medium (at a pH of 1.0-3.0), D-gluconic (sugar) acid is formed in glucose solutions. With its further oxidation, especially in the sterilization process, it turns into 5-hydroxymethylfurfural, which causes the solution to turn yellow, which is associated with subsequent polymerization. At pH 4.0-5.0, the decomposition reaction slows down, and at pH above 5.0, the decomposition into hydroxymethylfurfural increases again. An increase in pH causes decomposition with a break in the glucose chain.

State Pharmacopoiea X prescribes stabilizing glucose solutions with a mixture of sodium chloride 0.26 g per 1 liter of solution and 0.1 M hydrochloric acid solution to pH 3.0-4.0.

Under pharmacy conditions, for convenience, this solution (known as Weibel's stabilizer) is prepared in advance according to the following recipe: sodium chloride — 5.2 g of dilute hydrochloric acid (8.3%) —4.4 ml of water for injection is up to 1 l. In the manufacture of glucose solutions (regardless of its concentration), Weibel's stabilizer is added 5% of the volume of the solution.

The mechanism of the stabilizing action of sodium chloride is not well understood. Some authors have suggested that when sodium chloride is added, a complex compound is formed at the site of the aldehyde glucose group. This complex is very fragile, sodium chloride is mixed from one molecule of glucose to another, replacing aldehyde groups, and thereby inhibits the course of the redox reaction.

However, at the modern level of studies on the structure of sugars, this theory does not reflect the entire complexity of the processes taking place. Another theory explains these processes as follows. As you know, in the solid state, glucose is in cyclic form. Partial ring opening occurs in the solution to form aldehyde groups, with moving equilibrium being established between the acyclic and cyclic forms. Acyclic (aldehyde) forms of glucose are most reactive to oxidation. Cyclic forms of glucose with oxygen bridges between the first and fifth carbon atoms are characterized by high stability. The addition of a stabilizer creates conditions in the solution that promote an equilibrium shift towards a cyclic form that is more resistant to oxidation. It is now believed that sodium chloride does not contribute to the cyclization of glucose, and in combination with hydrochloric acid creates a buffer system for glucose.

During thermal sterilization of glucose solutions without a stabilizer, dienes, carboxylic acids, polymers, and phenolic products are formed. Replacing thermal sterilization by sterilizing filtration, you can prepare a 5% glucose solution with a shelf life of 3 years without a stabilizer.

The quality of glucose itself, which may contain water of crystallization, is of great importance for the stability of the solutions produced. According to FS 42-2419-86, anhydrous glucose is produced, containing 0.5% of water (instead of 10%). It is distinguished by solubility, transparency and color of the solution. Its shelf life is 5 years. When using water glucose it takes more than indicated in the recipe.

The calculation is made according to the formula:

$$x = \frac{a \times 100}{100 - б},$$

where x - required amount of glucose

a - the amount of anhydrous glucose specified in the recipe;

b - the percentage of water in glucose according to the analysis.

Exemple:

Rp .: Solutionis Glucosi 40% 100 ml

Sterilisa!

Da. Signa. 10 ml intravenously.

Calculation:

For example, glucose contains 9.8% water. Then water glucose should be taken 44.3 g (instead of 40.0 g anhydrous).

$$x = \frac{40 \times 100}{100 - 9,8} = 44,3 \text{ r}$$

Technology:

Under aseptic conditions, in a volumetric flask with a capacity of 100 ml, water for injection dissolves glucose (44.3 g) "suitable for injection", add Weibel stabilizer (5 ml) and bring the solution to 100 ml. Conduct primary chemical analysis, filtered, sealed with a rubber stopper, check for the absence of mechanical impurities. In the case of positive control, the vials, sealed with stoppers, are rolled around with aluminum caps and labeled, and the tightness of the closure is checked.

WCP

Date	Recipe No.
Glucosi	44.3 (Ow. 9.8%)
Liguoris Wejbeli	5 ml
Aquae pro injectionibus	ad 100 ml
Sterilis $V_{zag.}$ =	100 ml

Prepared: (signature)
Checked: (signed)

Since glucose is a good medium for the development of microorganisms, the resulting solution is sterilized immediately after production at 100 ° C for 1:00 or at 120 ° C for 8 minutes. After sterilization, secondary control of the quality of the solution is carried out and arranged for release. The shelf life of the solution is 30 days.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. The pharmacist has prepared a solution for injection containing 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

2. The pharmacist has prepared an injectable solution with a substance that is easily oxidized and requires stabilization by an antioxidant. Specify this substance:

A * Ascorbic acid
B Diphenhydramine

C Sodium chloride
D Urotropin
E Calcium gluconate

3. Stabilization of novocaine solutions for injection is carried out in order to:
A * Prevention of hydrolysis of salts formed by strong acids and weak bases
B Prevention of redox processes
C Prevention of hydrolysis of salt formed by weak acid and strong base
D Prevention of hydrolysis of salt formed by weak base and weak acid
E To improve the dissolution of novocaine

4. For the preparation of 1000 ml of 5% glucose solution use Weibel stabilizer in the amount of:
A * 50 ml
B 100 ml
C 10 ml
D 20 ml
E 25 ml

5. What is the cause of instability of solutions of caffeine-sodium benzoate for injection:
A * Hydrolysis (salt of strong base and weak acid)
B Hydrolysis (salt of strong acid and weak base)
C Slight oxidation of the solution
D Caramelization of the solution
E Neutralization reaction

6. The pharmacist prepared a solution for injection containing 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

7. The pharmacist prepares a solution for injection with a substance that requires stabilization with a 0.1M solution of hydrochloric acid. Specify this substance:
A * Novocaine
B Calcium chloride
C Potassium chloride
D Hexamethylenetetramine
E Sodium benzoate

8. The pharmacist prepared an injectable 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

9. The pharmacist prepared an injectable solution using a stabilizer - 0.1M 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

10. Stabilization of novocaine solutions for injection is carried out in order to:

A * Prevention of hydrolysis of salts formed by strong acids and weak bases
B Prevention of redox processes
C Prevention of hydrolysis of salt formed by weak acid and strong base
D Prevention of hydrolysis of salt formed by weak base and weak acid
E To improve the dissolution of novocaine

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

11. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.

12. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.

13. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.

14. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.

15. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

3. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU “Golden Pages” - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristics of injectable with stabilizers	Define the concept of parenteral drugs, injectable drugs	1, 5
2	Requirements for injectable solutions	What are the main requirements for the preparation of medicines	1, 5
3	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 injectable solutions	1, 5
4	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, 5

7. Materials for self-quality training

A. Questions for self-control

1. Stability of injectable dosage forms and factors affecting it.
2. Stabilization of solutions for injection by physical, chemical and complex methods.
3. Stabilizers used for preparation of injectable solutions, their classification.
4. Characteristics of stabilizers used for the preparation of injectable solutions.
5. Stabilization of solutions of drugs subject to hydrolysis and saponification. Calculations of the amount of stabilizer.
6. Stabilization of solutions of easily oxidizable substances. Antioxidants, their classification and calculation of quantity.
7. Principles of stabilizer selection and calculation of its quantities in accordance with the requirements of NTD.
8. Assessment of the quality of solutions for injection, sealing, registration for release and storage of solutions for injection in accordance with the requirements of the State Pharmacopoeia of Ukraine and other regulations.

B. Tests with answers

1. 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

2. 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

3. 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

4. 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

5. 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

6. 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

7. 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

8. 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

C. Tasks for self-control

1. Rp: Solution Natrii salicylatis 3% -100 ml
Sterilize!
Da. Signa. For injections.

Situation. The student in the manufacture of this injectable solution decided because sodium salicylate is a salt formed by a strong base and a weak acid, so to stabilize this solution, he used a 0.1 N sodium hydroxide solution in the amount of 0.4 ml (at the rate of 4 ml per 1 liter of solution). Technology, sterilization mode and control in the manufacturing process is not violated.

What is your opinion about the quality of the manufactured dosage form? Theoretically substantiate the principle of stabilization.

2. Rp: Solution Novocaine of 10% - 50 ml
Sterilize!
Da. Signa. Mark. For injections.

Situation. The student in the manufacture of this dosage form for injection used as a stabilizer 0.1N. hydrochloric acid solution, because novocaine is a salt of strong hydrochloric acid and a weak organic base. Hydrochloric acid is needed to suppress hydrolysis during sterilization. Violations in the future in the technological process, sterilization and control, the student did not allow. What is your opinion about the correct stabilization of this dosage form?

8. Materials for classroom self-preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1. Take	Glucose solution 5% 200ml Sterilize! Give. Indicate: for intravenous drop infusion.	2. Take	Novocaine solution 50% 1 ml Sterilize! Give. Indicate: 1 ml intramuscularly
3. Take	Ascorbic acid solution 5% 100 ml Sterilize! Give. Indicate: 5 ml intravenously	4. Take	Nicotinic acid solution 1% 100 ml Sterilize! Give. Indicate: 10 ml intramuscularly

5. Take	Sodium caffeine benzoate solution 10% 50 ml Sterilize! Give. Indicate: 5 ml intramuscularly	6. Take	Dibasol solution 50%1 ml Sterilize! Give. Indicate: 2ml 4 times a day
7. Take	Atropine sulfate solution 50% 0.1 ml Sterilize! Give. Indicate: 1 ml subcutaneously	8. Take	Sodium thiosulfate solution 30% 100 ml Sterilize! Give. Indicate: 5 ml intravenously
9. Take	Novocaine solution 2% 100 ml Sterilize! Give. Indicate: 5 ml intramuscularly once in 2 days	10. Take	Sodium caffeine benzoate 50% 20 ml Sterilize! Give. Indicate: 1 ml subcutaneously
11. Take	Glucose solution 10% 200ml Sterilize! Give. Indicate: for intravenous drop infusion.	12. Take:	Dibasol solution 50% 0.5 ml Sterilize! Give. Indicate: 2 ml subcutaneously once a day
13. Take	Sulfanilamide (streptocid) soluble solution 0.5% 100 ml Sterilize! Give. Indicate: 10 ml intravenously	14. Take	Sodium salicylate solution 50% 10 ml Sterilize! Give. Indicate: 5 ml intravenously
15. Take	Novocainamide solution 10% 100 ml Sterilize! Give. Indicate: 5 ml intravenously.	16. Take	Aminophylline solution 2.4% 100 ml Sterilize! Give. Indicate: 5 ml intravenously once a day
17. Take	Sodium thiosulfate solution 30% 200 ml Sterilize! Give. Indicate: for intravenous drop infusion.	18. Take	Aminophylline solution 2.4% 100 ml Sterilize! Give. Indicate: 2 ml intravenously once a day
19. Take	Thiamine chloride solution 2% 100 ml Sterilize! Give. Indicate: 2 ml intramuscularly once a day	20. Take	Adrenaline tartrate solution 1% 200 ml Sterilize! Give. Indicate: 1 ml intramuscularly once a day
21 Take	Nicotinic acid solution 1% 200 ml Sterilize! Give. Indicate: 5 ml intravenously once a day	22 Take	Glucose solution 5% 200ml Sterilize! Give. Indicate: for intravenous drop infusion.
23 Take	Ascorbic acid solution 5% 250 ml Sterilize! Give. Indicate: 5 ml intravenously	24 Take	Novocaine solution 2% 200 ml Sterilize! Give. Indicate: 5 ml intramuscularly once in 2 days

9. Instructive materials for mastering professional skills, skills:
9.1. Methods of performing work, stages of implementation.
Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

9.2. Theoretical questions.
Answer (in writing) the questions of one of the following individual tasks.
- Antioxidants. Classification, characteristics of the mechanism of their action.
- The use of complex stabilizers to increase the stability of drug solutions.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.
10.1. Answer (in writing) the questions of one of the following individual tasks.
Task 1
The pharmacist prepared 150 ml of 10% glucose solution. Indicate how much Weibel's liquid he added to stabilize this solution:
A. 7,5.
B. 5.
C. 10,0.
D. 15,0.
E. 3,0.
Answer. A.
Task 2
The pharmacist must sterilize 250 ml of injectable glucose solution. Specify the mode of sterilization of the solution in the autoclave at a temperature of 120 ºC:
A. 8 min
B. 12 min
C. 25 min
D. 15 min
E. 30 min
Answer. B.
Task 3
Easily oxidized solutions stabilize _____.
Answer. *Antioxidants.*

11. The topic of the next lesson. «Isotonic and infusion solutions. Solutions for injections with thermoplastic substances. Suspensions for injection».

Topic of the lesson№24: «Isotonic and infusion solutions. Solutions for injections with thermoplastic substances. Suspensions for injection»-4 h

1. Relevance Topics: 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.

2. Objectives of the lesson:

2.1 General objectives

Learn how to prepare isotonic injectable solutions, evaluate their quality and prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• 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;

2.4 Based on theoretical knowledge of the topic:

-able to:

• Use the State Pharmacopoeia of Ukraine, analytical and regulatory documentation to search for the necessary information on the preparation of solutions for infusions;
• Calculate excipients for isotoning solutions by different methods;
• Make infusion solutions;
• Carry out quality control, packaging and design before the release of infusion solutions;
• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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***	General technology of	Carry out calculations of

discipline Organization and Economics of Pharmacy	liquid dosage forms for injection	medicinal, auxiliary substances and water for injections
Industrial Medicine Technology	Injectable solution technology	Technological stages of preparation of solutions for injection
Biopharmacy	Technological process of preparation of parenteral medicines	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. ***Intra-subject integration*** Eye medicine forms.	Preparation of isotonic drops in a pharmacy.	Calculate the amount of drugs and sterile water

4. Subject content:

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.

The isotonic concentration of the prescribed drug is not always indicated in the recipe. For example, a doctor may write a prescription as follows:

Rp.: Solutionis Glucosi isotonicae 200 ml
Sterilisa!
Da. Signa. For intravenous fluids.

In this case, the pharmacist must calculate the isotonic concentration.

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.

To obtain an osmotic pressure equal to the osmotic pressure of the serum of 7.4 atm., 1 gram molecule of the substance should be dissolved in less water: 22.4: 7.4 = 3.03 l.

But due to the fact that the pressure increases in proportion to the absolute temperature (273 ° K), it is necessary to correct for the temperature of the human body (37 ° C) (273 ° + 37 ° = 310 °). So, for storage in solution of osmotic pressure of 7.4 atm. 1 gram moles of a substance should not be dissolved in 3.03 liters of solvent, but in a slightly larger amount of water.

From 1 gram-mole of non- dissociating substance, a solution must be prepared:

3.03 - 273°
x l - 310°

$$x = \frac{3{,}03\ л \times 310°}{273°} = 3{,}44\ л.$$

However, in pharmacy conditions, it is advisable to conduct calculations for the manufacture of 1 l of solution:

1 g / mol - 3.44 l
x g / mol_v - 1 l

So, for the manufacture of 1 liter of isotonic solution of any medicinal

$$x = \frac{1{,}0}{3{,}44} = 0{,}29\ г/моля.$$

substance (non-electrolyte), it is necessary to take 0.29 g/mol of this substance, dissolve in water and bring the solution to 1 liter:

$$m = 0{,}29\ M \text{ чи } 0{,}29 = \frac{m}{M},$$

m - the amount of substance required for the manufacture of 1 liter of isotonic solution, g;
0,29 - isotony factor of a non-electrolyte substance;
M is the molecular weight of the drug.
the amount of substance required for the manufacture of 1 liter of isotonic solution, g
0,29 - isotony factor of a non-electrolyte substance;
M is the molecular weight of the drug.

For example, it is necessary to calculate the isotonic concentration of the glucose solution. Molecular glucose mass is 180.18. For 1 liter of isotonic solution you need glucose:

m = 0.29 x M; m = 0.29 x 180.18 = 52.22 g / l.

So, isotonic glucose concentration is 5.22%. Then, according to the recipe, for the manufacture of 200 ml of isotonic glucose solution, it is necessary to take it 10.4 g.

5.2 g - 100 ml
x g - 200 ml, x= 5,2*200/100=10,4 g of glucose

The relationship between osmotic pressure, temperature, volume and concentration in a diluted solution of a non-electrolyte can be expressed by the Mendeleev – Klapeyron equation:

$$p\ V = nRT,$$

where P is the osmotic pressure of blood plasma (7.4 atm.)
V is the volume of solution, l
R is the gas constant expressed for this case in atmospheric liters (0.082)
T is the absolute body temperature (310 °);
n is the number of gram molecules of the solute.

Звідси $n = \frac{P \times V}{R \times T}$; $n = \frac{m}{M}$, тоді $\frac{m}{M} = \frac{P \times V}{R \times T}$, чи $m = \frac{M \times P \times V}{R \times T} = \frac{M \times 7{,}4}{0{,}082 \times 310}$

чи $m = 0{,}29 \times M$

When calculating the isotonic concentration of electrolytes as according to the law of van't Hoff. as in the Mendeleev – Clapeyron equation, it is worth making corrections, that is, the value (0.29 hm) must be divided by the isotonic coefficient “i”, which shows how many times the number of particles increases during dissociation (compared to a non-dissociating substance), and is numerically equal to:

$$i = 1 + a\ (n - 1),$$

where i - is the isotonic coefficient;
a - is the degree of electrolytic dissociation;

n - is the number of particles formed from one molecule of a substance during dissociation.

For example, in the dissociation of sodium chloride, two parts are formed (Na + ion and Cl-ion). then, substituting in the formula the value a = 0.86 (taken from the tables) and c = 2, receive:

$$i = 1 + 0.86 (2 - 1) = 1.86.$$

So, for NaCl and similar binary electrolytes with singly charged ions i= 1.86. Example for CaCl: n = 3, a = 0.75,

$$i = 1 + 0.75 (3 - 1) = 2.5.$$

So, for $CaCl_2$ and similar electrolytes

$$i = 2.5 (CaCl_2, Na_2SO_4, MgCl_2, Na_2HPO_3.).$$

For binary electrolytes with doubly charged ions $CuSO_4$, $MgSO_4$, $ZnSO_4$ (a = 0.5; n = 2).

$$i = 1 + 0.5 (2-1) = 1.5.$$

For weak electrolytes (boric, citric acid, etc.) (a = 0.1; n = 2).

$$i = \text{one} +0.1 (2-1) = 1.1.$$

The Mendeleev – Clapeyron equation with an isotonic coefficient is:

$$PV = i \cdot \frac{m}{M} \cdot RT \quad , \quad \rightarrow \quad m = \frac{PVM}{iRT} = = \frac{7,4 \cdot 1 \cdot M}{i \cdot 0,082 \cdot 810} = \frac{0,29 \cdot M}{i}.$$

For example, for sodium chloride :

$$m = \frac{0,29 \cdot 58,45}{1,86} = 9,06$$

So, for the manufacture of 1 liter of isotonic sodium chloride solution, you must take 9.06 g, or the physiological solution will be sodium chloride at a concentration of 0.9%.

To determine isotonic concentrations in the manufacture of solutions, which include several substances, it is necessary to conduct additional calculations. According to Dalton's law, the osmotic pressure of the mixture is equal to the sum of the partial pressures of its components:

$$P = P_1 + P_2 + P_3 + ... , \text{etc.}$$

This position can also be transferred to the diluted solutions, in which you must first calculate how much isotonic solution comes out of the substance or substances indicated in the recipe. Then set by the difference, the amount of isotonic solution should give the substance with which the solution is isotonets, after which find the amount of this substance.

Sodium chloride is used to isotonize solutions. If substances not compatible with it are prescribed, sodium sulfate, sodium nitrate or glucose can be used.

Rp .: Hexamethylentetramini	2.0
Natrii chloride	qs
Aquae pro injectionibus ad	200 ml

ut fiat solutio isotonica
Sterilisa!
Da. Signa. For injections.

Calculate the amount of isotonic solution obtained by 2.0 g of urotropin (Mm = 140). The isotonic concentration of urotropin will be 0.29 x 140 = 40.6 g or 4.06%.

4.06 - 100 ml
2,0 - x, x=50 ml,

Determine the amount of isotonic solution, which must be obtained by adding sodium chloride:

200 ml - 50 ml = 150 ml.

Calculate the amount of sodium chloride needed to obtain 150 ml of isotonic solution:

0.9 g - 100 ml
x g - 150 ml, x=0,9*150/100= 1,35 g

Thus, to obtain 200 ml of isotonic solution containing 2.0 g of hexamethylenetetramine, it is necessary to add 1.35 g of sodium chloride.

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.

Knowing the depression of a 1% solution of any substance, it is possible to determine its isotonic concentration.

Depression of 1% solutions are given in Appendix 4 of the textbook. Denoting the depression of a 1% solution of a substance At, determine the concentration of the solution, which is a depression equal to 0.52 ° C, according to the following formula:

$$x = \frac{0,52}{\Delta t}\%$$

1% - Δt °

x - 0,52 °C

1% glucose solution = 0.1 ° C:

So, the isotonic concentration of glucose solution will be 5.2%. When calculating the amount of substance required to obtain an isotonic solution, use the formula:

$$m_1 = \frac{0,52 \times V}{Dt \times 100},$$

where m_1 - is the amount of substance required for isotoning, g

V - volume of roses for recipes in the recipe, ml.

It is necessary to calculate the amount of glucose per 200 ml of isotonic solution.

$$m_1 = \frac{0,52 \times 200}{0,1 \times 100} = 10,4$$

of glucose need for 200 ml isotonic solution/

When two components in the recipe for the calculation of isotonic concentrations using the formula:

$$m_2 = \frac{(0,52 - \Delta t_2 \times C_2) \times V}{\Delta t_1 \times 100},$$

where

m- the amount of substance required for isotoning the solution, g

0,52 - depression of the freezing temperature of blood

Δt_2 - depression of the freezing temperature of a 1% solution of prescribed solution;

C_2 is the concentration of prescribed solution;

Δt_1 - depression of the freezing temperature of a 1% solution of the solution taken for isotonization of the solution prescribed in the recipe;

V is the volume of the solution prescribed in the recipe.

For example:

Rp .: Sol . Novocaini 2% 100 ml
Natrii sulfatis q.s.,
ut fiat sol. isotonica Sterilisa!
Da. Signa. For injections.

So, for the manufacture of isotonic solution of novocaine according to the above recipe, you must take 2.0 g of novocaine and 1.84 g of sodium sulfate.

With three or more components in the recipe for the calculation of isotonic concentrations use the formula:

$$m_1 = \frac{(0,52 - 0,122 \times 2) \times 100}{0,15 \times 100} = 1,84$$

Δt_1 - depression of the freezing temperature of a 1% solution of sodium sulfate (0.15°C);
C_2 is the concentration of atropine sulfate (1%);
Δt_2 - depression of the freezing temperature of a 1% solution of Novocain (0.122°C);
C_3 - the concentration of Novocain (2%);

For example:

Rp .: Atropini sulfatis 0.2
Morphini hydrochloride 0.4
Natrii chloridis
Aquae pro injectionibus ad 20 ml
ut fiat solutio isotonica Sterilisa!
Da . Signa . For injections.

Δt_1 - depression of the freezing temperature of a 1% solution of sodium chloride (0.576 ° C);
Δt_2 - depression of the freezing temperature of a 1% solution of atropine sulfate (0.073 ° C);
C_2 is the concentration of atropine sulfate (1%);
Δt_3 - depression of the freezing temperature of a 1% solution of morphine hydrochloride (0.086 ° C);
C_3 - the concentration of morphine hydrochloride (2%);
V is the volume of the solution prescribed in the recipe.

$$m_3 = \frac{0,52 - (0,073 \times 1 + 0,086 \times 2) \times 20}{\Delta t_1 \times 100} = 0,0955 \approx 0,1$$

When calculating the isotonic concentration by the cryoscopic method, the main source of errors is the absence of a strict proportional relationship between concentration and depression. It is important to note that deviations from proportional dependence are individual for each medicinal substance.

So, for a solution of potassium iodide, there is an almost linear (proportional) relationship between concentration and depression. Therefore, the isotonic concentration of some medicinal substances, determined by an experimental method, is close to the calculated one, for others there is a significant difference.

The second source of errors is the error of experience in the practical determination of depression in 1% solutions, as evidenced by the different values of depressions (Δt), published in some sources.

Calculate isotonic concentrations using sodium chloride equivalents. A more versatile and accurate method for calculating isotonic concentrations of pharmacopoeial solutions (adopted by SPh XI), based on the use of isotonic equivalents of medicinal substances for sodium chloride. In pharmacy practice, it is used most often.

The isotonic equivalent (E) of sodium chloride indicates the amount of sodium chloride that creates an osmotic pressure under the same conditions, equal to an osmotic pressure of 1.0 g of the drug substance.

For example, 1.0 g of novocaine is equivalent in its osmotic effect to 0.18 g of sodium chloride (see Appendix 4 of the textbook). This means that 0.18 g of sodium chloride and 1.0 g of novocaine create the same osmotic pressure and the same volumes of water are isotonic under equal conditions.

Knowing the sodium chloride equivalents, any solutions can be isotonuvaty, as well as determine the isotonic concentration. For example:

1.0 g of novocaine equivalent - 0.18 g of sodium chloride,

x g of novocaine - 0.9 g of sodium chloride

x=0,9*1/0,18=5,0

So, the isotonic concentration of Novocain is 5%.

Rp .: Solutionis Novocaini 2% 200 ml
Natrii chloridi qs,
ut fiat solutio isotonica Sterilisa!
Da . Signa . For intramuscular administration.

In this case, for the manufacture of 200 ml of isotonic sodium chloride solution, it was necessary to use 1.8 g:

0,9 – 100

x – 200

$$x = \frac{200 \times 0,9}{100} = 1.8 \text{ г.}$$

$1,0_{\text{новокаїну}} - 0,18_{\text{натрію хлориду}}$

$4,0_{\text{новокаїну}} - x_{\text{натрію хлориду}}$

$$x = \frac{4,0 \times 0.18}{1} = 0,72 \text{ г.}$$

So, sodium chloride is necessary to take 1.8 - 0.72 = 1.08 g .

Along with isotonicity, an important characteristic of the osmotic pressure of the solutions is osmolarity, **Osmolarity (osmolarity)** is the *value of the estimate of the total contribution of various solutes to the osmotic pressure of the solution.*

The unit of osmolarity is pitch per kilogram (pitch / kg), in practice the unit is usually used milliosmol per kilogram (mosmol / kg). The difference between osmolarity and osmolality is that they use various expressions for the concentration of solutions: molar and molar.

Osmolarity - the amount of resin per 1 liter of solution. Osmolality - the amount of resin per 1 kg of solvent. Unless otherwise indicated, osmolality (osmolarity) is determined using an osmometer instrument.

The determination of the osmolarity of the solutions is important when using parenteral nutrition of the body. The limiting factor for parenteral nutrition is the amount of fluid injected, which affects the circulatory system and water-electrolyte balance. Given certain limits of "endurance" of veins, it is impossible to use

solutions of arbitrary concentration. Osmolarity of about 1100 moz-mol / l (20% sugar solution) in an adult is the upper limit for administration through the peripheral vein.

The plasma osmolarity is about 300 mosmol / l, which corresponds to a pressure of about 780 kPa at 38 ° C. This is the starting point for the stability of the infusion solutions. The osmolarity value can vary from 200 to 700 mosmol / l.

TECHNOLOGY ISOTONIC SOLUTIONS. Isotonic solutions are prepared according to all the rules for preparing solutions for injections. The most widely used isotonic solution of sodium chloride.

Rp .: Solutionis Natrii chloridi 0.9% 100 ml Sterilisa !

Da . Signa . For intravenous administration.

To prepare the sodium chloride solution, it is preheated in the Dry-Air Sterilizer at 180 ° C for 2:00 in order to destroy possible pyrogenic substances. Under aseptic conditions, sterile sodium chloride is weighed out on sterile teresics, placed in a 100 ml sterile volumetric flask and dissolved in a portion of water for injection, after dissolving it is brought up to 100 ml with water for injection. The solution is filtered into a sterile vial, quality controlled, hermetically sealed with a sterile rubber stopper under running-in with a metal cap. Sterilized in an autoclave at 120 ° C for 8 minutes. After sterilization, secondary control of the quality of the solution is carried out and arranged for release. The shelf life of the solution prepared in pharmacies is 1 month.

PWC

Date Recipe No.

Natrii chloride 0.9

Aquae pro injectionibus ad 100 ml

Sterilis $V_{zag.}$ = 100 ml

Prepared: (signature)

Checked: (signed)

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.

Such a match is achieved, provided that the fluid is introduced into the body, will have:

- Compliance with the osmotic pressure of the solution introduced to the osmotic pressure of body fluids (isotonia)
- A certain concentration, composition and ratio of ions (isoionium)
- Determined the pH of the solution (isohydria)
- A certain viscosity.

Thus, plasma solutions, such solutions are called, by their osmotic pressure, ionic composition and pH value are close to blood plasma plasma, they are sometimes called balanced or stabilized solutions, and also under the name of the institution or the name of the author who proposed the solution.

Scientific studies have shown that, in order to ensure a more or less long-term vital activity of cells, readily assimilable nutrients should be added to the liquid,

which are necessary for replenishing the energy expenditure of organs. In order to provide nutrition to the cells and create the necessary redox potential, glucose is injected into physiological solutions. Blood contains glucose in the amount of 5-6 mol. With its help in the liver, heart muscle and other organs is carried out the oxidation of various harmful metabolic products and turning them into harmless to the body products. Therefore, glucose is necessary for equalization of the reduction potential in a physiological solution.

Isohydria. Isohydric called those solutions in which the pH corresponds to the pH of blood plasma or other body fluids into which this solution is administered.

The concentration of hydrogen ions in different body fluids is different, for example, blood serum has a slightly alkaline reaction, the pH ranges from 7.34 to 7.36, and cerebral spinal fluid varies from 7.71 to 7.85. With intense muscular work, the pH in the tissue fluid decreases to 6.6. As mentioned above, for the stability of isotonic solutions, the concentration of hydrogen ions plays an important role as a preservative and stabilizer of solutions. SPh XI recommends that for the manufacture of sterile solutions, especially in factory production, various stabilizers should be added.

In cases where the saline solution is used in large quantities, it becomes necessary to prepare them isohydric, otherwise the concentration of hydrogen ions of the blood will be disturbed. As you know, in the process of vital activity of cells and organs, acidic products of metabolism are formed, neutralized by buffer systems of the blood, such as carbonate, phosphate, and others. That is why similar pH regulators were introduced into infusion solutions. As a result, the solutions become balanced (ekvilibrovanimy).

To maintain a certain pH (equal to the pH value of blood plasma) is used:

1. carbonate system (NaHCO, + C02).
2. phosphate system (Na2HP03 + Na2P04).
3. Protein systems are ampholyte (ampholytes are substances that simultaneously possess the properties of acids and bases in an aqueous solution).

Plasma substituting solutions containing substances that increase the viscosity, are used as antishock and detoxification.

Solutions-regulators of water-salt and acid-base balance. Under the conditions of pharmacies, plasma-substituting solutions belonging to the first group are prepared mainly. These are Ringer's solutions, Ringer-Locke's solutions, acesol, disol, trisol, quartosol, chlo-salt, etc.

Ringer's solution - Locke.

Rp .: Natrii chloride	1.8
Kalii chloride	0.04
Calcii chloride	0.04
Natrii hydrocarbonis	0.04
Glucosi	0.2
Aquae pro injectionibus ad	200 ml
Sterilisa !	

Da . Signa . For intravenous administration.

Saline saline solution for intravenous administration. With the joint presence of sodium bicarbonate and calcium chloride, the formation of calcium carbonate precipitate is possible. Therefore, prepare two solutions. In the manufacture using a sterile 20% solution of calcium chloride.

In a sterile volumetric flask of 100 ml in a part of water for injection dissolve 1.8 sodium chloride, 0.22 glucose with a moisture content of 9%, 0.04 g of potassium chloride, add 4 drops (0.2 ml) of a 20% solution of calcium chloride and water for injection volume is adjusted to 100 ml. The solution is analyzed, filtered into a vial, sealed with a sterile rubber stopper, the control is carried out on mechanical impurities, rolled around with a metal cap, the sealing is checked and sterilized at 120 ° C for 8 minutes, the secondary control is carried out and arranged for tempering.

In another 100 ml volumetric flask, a solution of sodium bicarbonate is prepared. Sterilization conditions are similar to saline with glucose. Before use, the solutions are drained under aseptic conditions.

These solutions are used in the treatment of patients with acute gastrointestinal infections, accompanied by dehydration, intoxication, acidosis, and lack of blood electrolytes.

Antishock solutions . The introduction of plasma-substituting solutions, whose action is aimed at normalizing blood circulation, was not effective enough in combating shock. To obtain antishock solutions in plasma-substituting liquids, medicinal substances are added to increase blood pressure, normalize the functions of the central and autonomic nervous system, and restore the chemism of the blood and tissues. The antishock fluids include glucose- alcohol solutions, so-called stimulants, and solutions with hypnotics and narcotic substances.

Anti-shock fluids can be divided into three groups:

- Simple antishock solutions containing salts, glucose and ethyl alcohol;
- Complex antishock solutions containing glucose, ethyl alcohol, bromides and drugs;
- Complex antishock solutions containing glucose, ethyl alcohol, bromides, drugs, blood plasma.

Prepare anti-shock solutions in the same way as isotonic and plasma-substituting solutions.

Adding alcohol to injection solutions can be done in two ways:

1. The required amount of alcohol (under aseptic conditions) is added to the ready-made simple solution.

2. In the case of the manufacture of solutions in ampoules (or vials, hermetically sealed,) alcohol is introduced into the solution before sterilization.

In the manufacture of alcohol solutions, the bottles are filled to 3/4 volume, the contents of the bottle should not interfere with the stopper during sterilization. Traffic jams should not have punctures. Bottles corked under running-in with metal caps must be checked for tightness.

Alcohol solutions should be sealed with plugs of the brand IR-21 (beige), IR-119 (gray). When capping with 25P (red) brand stoppers, it is necessary to enclose specially treated parchment paper or non-lacquered cellophane under them.

Banaitis liquid.

Rp .: Solutionis Glucosi 25%	65 ml
Natrii chloride	0.5
Calcii chloride	0.12
Spiritus aethylici	60% 12 ml

Sterilisa!

Da . Signa . For intravenous administration.

Banaitis fluid is a plasma plasma-substituting agent used in mild cases of shock and in moderate blood loss.

Weigh 16.25 g of anhydrous glucose, 0.5 g of sodium chloride and 0.12 g of calcium chloride. It is brought to 65 ml with water for injection, filtered, 12 ml of 60% alcohol are added and the bottle is sealed. Sterilized with steam under pressure at 120 ° C for 8 minutes.

The use of plasma-substituting solutions is of great importance for medical practice, since their use reduces the amount of donated blood.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. An infusion of 5% glucose solution is prepared in the pharmacy. Specify the substance used to ensure the isotonicity of the solution:

A. * Sodium chloride
B. Sodium nitrate
C. Sodium sulfate
D. Sodium sulfite
E. Borate acid

2. The common technology in the production of injectable solutions of calcium chloride and magnesium sulfate is that they:

A. * Requires additional cleaning
B. Need stabilization
C. Prepared under aseptic conditions
D. Do not require sterilization
E. Do not require additional cleaning

3. When calculating the isotonic concentration of solutions for injections, the values of blood plasma depression are used. Specify its value:

A. * 0.52^{o}C
B. 0.34^{o}C
C. 0.10^{o}C
D. 0.45^{o}C
E. 0.90^{o}C

4. The pharmacy received a prescription for the solution for injection. Indicate which of the following medicinal substances CANNOT be sterilized:
A. * Hexamethylenetetramine
B. Novocaine
C. Glucose
D. Calcium chloride
E. Dibazole
5. The pharmacist prepared 100 ml of isotonic sodium chloride solution. Specify the method of sterilization of the final product in the pharmacy:
A. * Steam
B. Air
C. Gas
D. Mechanical
E. Physical
6. The pharmacist prepared an injectable solution of sodium bicarbonate. Specify the maximum volume of the vial:
A. * 80%
B. 100%
C. 0.5
D. 0.4
E. 0.3
7. Methods of sterilization used for the preparation of drugs under asepsis can be divided into physical, mechanical, chemical. Specify the method of sterilization that belongs to the chemical:
A. * Addition of preservatives
B. Dry heat sterilization
C. Radiation sterilization
D. Steam sterilization under pressure
E. UV sterilization
8. Inject a 10% sodium chloride solution for injection into the pharmacy. What is the best way to sterilize a pharmacist?
A. In an autoclave with saturated steam under pressure
B. Sterile filtration through a membrane filter
C. Gas sterilization
D. Dry heat sterilization
E. Radiation sterilization
9. Injectable solutions are prepared in the pharmacy, which should be pyrogen-free. Which substance solution can be depyrogenated by adsorption using activated carbon?
A. * Glucose
B. Atropine sulfate
C. Papaverine hydrochloride
D. Scopolamine hydrobromide
E. Platyphylline hydrotartrate

10. According to the doctor's prescription, 100 ml of 0.9% sodium chloride solution was prepared in the pharmacy. What is the mode of sterilization of this solution?

A. * 120°C - 8 min
B. 120°C -12 min
C. 120°C -15 min
D. 180°C - 30 min
E. 100°C - 15 min

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

16. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.
17. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
18. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
19. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
20. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

4. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU “Golden Pages” - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristics of	Define the concept of parenteral	1, 5

	injectable	drugs, injectable drugs	
2	Requirements for injectable solutions	What are the main requirements for the preparation of medicines	1, 5
3	Basic technological operations for the preparation of isotonic injectable solutions	What are the main technological stages of preparation of solutions for injection according to SPh. Rules for the introduction of drugs into injectable solutions	1, 5
4	Quality assessment, rules of packaging, design and storage of solutions for isotonic injections	What are the NTD and quality indicators of injectable solutions	1, 5

7. Materials for self-quality training

A. Questions for self-control

1. The value of isotonicity of solutions for injection.
2. Methods for calculating isotonic concentrations using sodium chloride equivalents, Raoul's laws (cryoscopic method), Vant-Goff, and the Mendeleev-Clapeyron equation.
3. Principles of selection of isotonic substances and general technological methods of preparation of isotonic solutions.
4. Infusion (physiological) solutions; requirements of the State Pharmacopoeia and other normative documents to them.
5. 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.
6. Features of technology of infusion solutions depending on structure of active substances.
7. Rules for preparation of solutions for injections with thermolabile substances and suspensions for injections.
8. 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).

B. Tests with answers

1. 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.

2. The pharmacist prepared 150 ml of 10% glucose solution. Indicate how much Weibel's liquid he added to stabilize this solution?

A. * 7.5ml.

B. 5ml.

C. 10ml.

D. 15ml.

E. 3ml.

3. 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%.

4. 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.

5. 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.

6. 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.

7. 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.

9. 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.

10. 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)

C. Tasks for self-control

1.Take: A solution of novocaine 2% - 100 ml
Sufficient sodium sulfate
to get an isotonic solution
Sterilize!
Mark. For intramuscular injection.

Situation. The student prepared a solution with the addition of 0.1 N sodium hydroxide solution at the rate of 0.4 ml per 100 ml. Assess the situation. What mistake did the student make?

2. Take: Analgin solution 2% - 10 ml
Sufficient sodium chloride
to get an isotonic solution
Sterilize!
Mix. Come on.
Mark. For intramuscular injection.

Situation. Under aseptic conditions, the student dissolved 0.2 grams of analgin and 0.05 grams of sodium chloride in purified water (10 ml). The resulting solution was filtered through a glass filter №3 and designed to release. What are your thoughts on the correctness of the method of preparation of the dosage forms.

8. Materials for classroom self-preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1. Take	Glucose isotonic solution 200 ml Sterilize! Give. Indicate: for intravenous drop	2. Take	Calcium chloride isotonic solution 200 ml Sterilize!

	infusion.		Give. Indicate: 10 ml intravenously
3. Take	Aminocaproic acid 5.0 Sodium chloride as needed to get the isotonic solution Water for injection - to 100 ml Sterilize! Give. Indicate: for intravenous drop infusion.	4. Take	Ephedrine hydrochloride isotonic solution 50% 1 ml Sterilize! Give. Indicate: 1 ml subcutaneously
5. Take	Dicaine solution 50%1 ml Sodium chloride as needed to get the isotonic solution Sterilize! Give. Indicate: for anesthesia	6. Take	Glutamic acid isotonic solution 1% 200 ml Sterilize! Give. Indicate: 10 ml intravenously 2 times a day
7. Take	Calcium chloride solution 0.25% 200 ml Glucose as needed to get the isotonic solution Sterilize! Give. Indicate: for intravenous injection	8. Take	Glucose isotonic solution 3% 400 ml Sterilize! Give. Indicate: for intravenous drop infusion.
9. Take	Papaverine hydrochloride solution 50% 2 ml Sodium chloride as needed to get epy isotonic solution Sterilize! Give. Indicate: 2 ml intramuscularly 2 times a day	10. Take	Papaverine hydrochloride solution 20% 10 ml Sodium chloride as needed to get epy isotonic solution Sterilize! Give. Indicate: 2 ml intramuscularly 2 times a day
11. Take	Novocaine isotonic solution 1% 100 ml Sterilize! Give. Indicate: 20 ml for anesthesia	12. Take:	Novocaine isotonic solution 3% 200 ml Sterilize! Give. Indicate: 20 ml for anesthesia
13. Take	Calcium chloride solution 0.5% 200 ml Sodium chloride as needed to get the isotonic solution Sterilize! Give. Indicate: for intravenous injection	14. Take	Calcium chloride solution 1% 250 ml Sodium chloride as needed to get the isotonic solution Sterilize! Give. Indicate: for intravenous injection
15. Take	Tetracaine solution 2% 200 ml Sodium chloride as needed to get the isotonic solution Sterilize!	16. Take	Tetracaine solution 1% 150 ml Sodium chloride as needed to get the isotonic solution Sterilize!

	Give. Indicate: 2 ml intramuscularly		Give. Indicate: 2 ml intramuscularly
17. Take	Aminocaproic acid 5.0 Sodium chloride as needed to get the isotonic solution Water for injection - to 100 ml Sterilize! Give. Indicate: for intravenous drop infusion.	18. Take	Calcium chloride 0.6 Potassium chloride 0.2 Sodium chloride as needed to get the isotonic solution Water for injection to 500 ml Mix. Sterilize! Give. Indicate: for intravenous injection
19. Take	Atropine sulfate 0,01 Morphine hydrochloride 0.1 Sodium bromide 2.0 Sodium chloride as needed to get the isotonic solution Water for injection 100 ml Mix. Sterilize! Give. Indicate: antishock liquid	20. Take	Glutamic acid isotonic solution 2% 150 ml Sterilize! Give. Indicate: 10 ml intravenously 2 times a day

9. Instructive materials for mastering professional skills, skills:

9.1. Methods of performing work, stages of implementation.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

9.2. Theoretical questions.

Answer (in writing) the questions of one of the following individual tasks.

- Nomenclature of the most frequently used solutions for infusions.
- Plasma (blood substitute) fluids, their classification by medical purpose and composition.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

10.1. Answer (in writing) the questions of one of the following individual tasks.

Task 1

Determine the isotonic concentration of glucose (depression of the freezing point of 1% glucose solution is 0.1 ° C:

A. 3%.

B. 7%.
B. 5.2%.
G. 1%.
D. 10%.
Answer. B.

Task 2
The osmotic pressure of blood plasma and tear fluid in the body is normally equal to _____.
Answer. 7,4

Task 3
Before preparing the solution for injection in the aseptic unit, the air is treated with _____.
Answer. *30 minute.*

11. The topic of the next lesson. «Eye medicine forms».

Topic of the lesson№25: «Eye medicine forms»-4 h

1. Relevance Topics: 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. Objectives of the lesson:

2.1 General objectives

Learn to prepare ophthalmic dosage forms (lotions, drops, rinses, ointments) taking into account the physicochemical properties of drugs and excipients, evaluate their quality and prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• 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.

2.4 Based on theoretical knowledge of the topic:
-able to:

• Assess the correctness of prescriptions and check the doses of toxic and potent substances, identify compliance with the prescribed amount of substances that are on the subject-quantitative account, the established rate of prescribing in one prescription, make adjustments if necessary.

• Use the State Pharmacopoeia, other normative and reference literature to search for the necessary information on the preparation of ophthalmic dosage forms.

• Provide sanitary and hygienic conditions for aseptic preparation of ophthalmic dosage forms.

• Identify types of incompatibilities in ophthalmic dosage forms.

• Calculate the amount of drugs and excipients for the preparation of ophthalmic dosage forms, including isotonic substances.

• Choose and justify the best option for the technology of ophthalmic dosage forms in accordance with the prescription, as well as the method of sterilization, if necessary.

• Prepare ophthalmic dosage forms with sequential performance of basic technological operations (weighing, measuring, dissolving, filtering, dispersing, mixing, fusion, sterilization, etc.).

• Use small mechanization in the preparation of ophthalmic dosage forms (filtering device, device for crimping metal caps, sterilization devices, drying cabinets, device UK-2).

• Select packaging and sealing material depending on the type of dosage form.

• Assess the quality of prepared ophthalmic dosage forms to issue them before the holiday.

• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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	Calculate molar and equivalent masses of chemical compounds. To

	that take place in aqueous solutions of electrolytes.	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 of liquid dosage forms for internal use and ointments for external use/	Carry out calculations of medicinal, auxiliary substances, water and ointments base.
Industrial Medicine Technology	Technology of ophthalmic dosage forms.	Technological stages of preparation of ophthalmic dosage forms
Biopharmacy	Technological process of preparation of ophthalmic dosage forms	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. ***Intra-subject integration***	Preparation of ointments and solutions in the	Calculate the amount of drugs and excipients.

Ointments and solutions	languages of pharmacies.	

4. Subject content:

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. For example:

Rp .: Solutionis Pylocarpini hydrochloridi 1% 10 ml
Natrii chloride qs,
ut fiat solutio isotonica
Da. Signa. 2 drops in both eyes.

Eye drops with a highly soluble medicinal substance of the list A. First, do the calculations necessary for isotoning the solution specified in the recipe.

The table determines the isotonic equivalent of pilocarpine hydrochloride in sodium chloride, equal to 0, 22. Next, find the amount of sodium chloride, equivalent to 0.1 g of pilocarpine hydrochloride:

1,0 pilokarpinu gidrokhlorida- 0,22 NaCl
0.1 pilokarpinu hydrochloride - 0,022 NaCl

10 ml of the solution must be sodium chloride:

$$x = \frac{0,9 \times 10}{100} = 0,09 \text{ г}$$

Determine the amount of sodium chloride needed to isotone a 1% solution of pilocarpine hydrochloride:

0.09-0.022 = 0.068 = 0.07 g

The manufacture is carried out in an aseptic room or box. Measure 10 ml of water for injection. In a sterile dry stand in half the amount (5 ml) of water for injection dissolve 0.1 g of pilocarpine hydrochloride (prepared on demand) and

0.07 g of sodium chloride. The solution is filtered into a vial for dispensing through a sterile, pre-washed folded filter and cotton wool. Wash the filter with the remaining water for injection (5 ml). Check the qualitative and quantitative content of pilocarpine hydrochloride, as well as the purity of the solution. If necessary, filtered again through the same filter and cotton. The solution is hermetically sealed and sterilized. After sterilization, the eye drops are monitored for the absence of mechanical impurities and are issued for tempering with an additional label “handle with care”, the signature is written out, the bottle is sealed.

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.

As for the accuracy of concentration, the first method will be more accurate concentration, since more water is used to flush out the adsorbed substance.

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.

Rp .: Riboflavini 0.001
Acidi ascorbinici 0.02
Kali and iodide 0.3
Sol. Acidiborici 2% 10 ml
Misce. Da. Signa. 2 drops 3 times a day in both eyes.

The solution is hypertonic due to the prescribed quantities of potassium iodide and boric acid. All ingredients are used in the form of sterile concentrated solutions.

3.3 ml of sterile water for injection, 5 ml of a 0.02% solution of riboflavin in combination with boric acid 4%, 0.2 ml of a 10% solution of ascorbic acid, 1.5 ml of a 20% solution of potassium iodide. The solution is controlled for the absence of mechanical impurities and clog under running.

If it is necessary to manufacture an intra-pharmaceutical preparation of eye drops with medicinal substances discharged in the amount of less than 0.05 g, they can be prepared from dry substances, but the solution in this case will be prepared in 10 or 20-fold amount. For example:

Rp .: Riboflavini 0.002
Acidi ascorbinici 0,2
Solutionis Kalii iodide 2% 10 ml
Glucosi qs ut fiat solutio isotonica
Misce. Da. Signa. 2 drops 3 times a day in both eyes.

The required amount of anhydrous glucose for isotoning the prescribed solution is 0.11 g.

The solution is prepared in a 20-fold amount. It should be borne in mind that the joint sterilization of ascorbic acid with potassium iodide causes a change in the color of the solution as a result of the redox reaction.

Therefore, this method of making drops is recommended: 0.04 g of riboflavin is dissolved by heating in 200 ml of water for injection, the solution is cooled and 0.4 g of ascorbic acid and 2.2 g of glucose are dissolved in it, filtered and sterilized by flowing steam at 100 ° C 30 minutes. After cooling the solution under aseptic conditions, 4.0 g of potassium iodide is added, the solution is filtered into 10 ml vials, sealed and rolled in metal caps.

Rp .: Solutionis Riboflavini 0.01% 10 ml
Acidi ascorbinici 0.05
Misce. Da. Signa. 2 drops in both eyes.

Prescribed quantities of medicinal substances have practically no effect on the osmotic pressure of the solution; therefore, it is advisable to prepare it with a 0.9% solution of sodium chloride.

3.6 ml of sterile water for injection, 0.5 ml (10 drops) of a 10% solution of ascorbic acid, 5 ml of a 0.02% solution of riboflavin and 0.9 ml of a 10% solution of sodium chloride (or 0, 09 g of sodium chloride). The bottle is closed with a sterile rubber stopper, looking at the solution for the absence of mechanical impurities and clog under run-in.

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.

Rp .: Hydrargyri oxydi fiavi	0.5
Olei Vaselini	0,5
Vaselini	20.0
Lanolini	4.0
Misce, fiat unguentum	

Da. Signa. Mercury ointment yellow.

Suspension-type eye ointment with a solids content up to 5%, which contains a highly colored substance - mercury oxide yellow.

Ointment is prepared under aseptic conditions. In a sterile mortar, carefully rub 0.5 g of mercury yellow oxide in a dry form, then with liquid paraffin (0.5 g is added dropwise with a calibrated pipette). Then, parts are sterilized with petrolatum and anhydrous lanolin, pre-weighed into a sterile parchment capsule. All thoroughly mixed until uniform. Check the quality of the prepared ointment according to NTD. Released in a jar of dark glass.

PWC

Date Recipe No.

Hydrargyri oxydi flavi	0,5
Olei Vaselini gtts XV	(0,1 = 3 krupl)
Vaselini pro oculi sterile	20.0
Lanolini anhydrici sterile	4.0
Addita aseptice m $_{zag.}$ =	25.0

Prepared: (signature)

Checked: (signed)

Sometimes the official ointment is discharged without specifying the base and constituent components, for example:

Rp.: Unguenti Hydrargyri oxydi flavi 10.0
Da. Signa. Mercury ointment yellow.

In this case, the ointment is prepared on the basis that specified in the documentation. The number of ingredients is determined in accordance with the pharmacopoeial prescription:

Mercury oxide yellow

Vaseline oil equally	2 parts
Vaseline (grade for eye ointments)	80 parts
Anhydrous lanolin	16 parts.

Calculations:

Mercury oxide yellow	0.2 g
Vaseline oil	0.2 g
Vaseline	8.0 g
Anhydrous lanolin	1.6 g

Rp.: Pilocarpini hydrochloride	0.2
Vaselini	3.0
Lanolini	3.0

Misce, fiat unguentum
Da. Signa. Eye ointment.

Ointment emulsion with a toxic water-soluble drug substance. In a sterile mortar, 0.2 g of pilocarpine hydrochloride is triturated with 0.9 ml (18 drops) of sterile water for injection (30% by weight of prescribed aqueous lanolin) and mixed with pre-sterilized anhydrous lanolin and petrolatum to obtain a homogeneous mass. Let go in a glass jar with a lid, sho is screwed, in a sealed form.

Rp.: Unguenti Zinci sulfatis 0.5% 10.0

Da. Signa. Lay for the eyelid of the right eye 2 times a day.

Ointment-emulsion with a substance in the general list, soluble in water. In aseptic conditions, in a sterile mortar, dissolve 0.05 g zinc sulfate in a few drops of sterile distilled water, add 10.0 g of sterile base for ophthalmic eyes, mix thoroughly. The ointment is transferred to a sterilized glass jar, which is sealed with a plastic screw cap, with a sterilized gasket and made to release.

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. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. The pharmacist prepared eye drops with trypsin. How is the sterility of the drops ensured?

A. * Preparing under aseptic conditions, without subsequent thermal sterilization.
B. Liquid steam sterilization.
C. Sterilization by UV radiation.
D. Radiation sterilization.
E. Sterilization by saturated steam under pressure.

2. The pharmacist prepared eye drops with dicaine. What substance should be used to bring the solution to isotonic concentration:

A. * Sodium chloride.
B. Sodium sulfate.
C. Sodium nitrate.
D. Boric acid.
E. Methylcellulose.

3. In the conditions of a drugstore prepare eye drops. Specify the solution of which substance is not isotonic:

A. * Colargol.
B. Pilocarpine hydrochloride.
C. Chloramphenicol.
D. Riboflavin.
E. Citral.

4. The pharmacist prepared eye drops with easily soluble drug substance. Specify the volume of purified water to dissolve it:

A. * Dissolve in half the purified water.
B. Dissolve in half the volume of purified water.
C. Dissolve in 1/3 of the volume of purified water.
D. Dissolve in 1/4 volume of purified water.
E. Dissolve in 3/4 volume of purified water.

5. The pharmacist prepared eye ointment with resorcinol. Specify the type of dispersed system that forms resorcinol when introduced into the pharmacopoeial base:

A. * Emulsion.
B. Suspension.
C. Solution.
D. Alloy.
E. Combined.

6. In the manufacture of eye ointments of great importance is the degree of dispersion of drugs. Indicate which drug substance, when introduced into the pharmacopoeial eye base, is first thoroughly rubbed with sterile Vaseline oil?

A. * Mercury oxide is yellow.
B. Resorcinol.
C. Pilocarpine hydrochloride.

D. Zinc sulfate.
E. Ethylmorphine hydrochloride.

7. Zinc ointment with sulfate is made in the pharmacy. Specify the type of dispersed system formed by zinc sulfate when administered to pharmacopoeial eye ointment.

A. * Emulsion.
B. Suspension.
C. Solution.
D. Alloy.
E. Combined.

8. The pharmacy received a prescription for an eye ointment containing zinc sulfate. Specify the correct method of administration of zinc sulfate:

A. * Dissolve in a small amount of water.
B. Rubbed with glycerin.
C. Grind with a liquid that is suitable for the base.
D. Grind with a particle of molten base.
E. Grind with a weighed base.

9. In the composition of eye drops as an excipient used…

A. * Prolongator.
B. Solvent.
C. For isotoning.
D. Preservative.
E. Corrigent.

10. The pharmacy received a prescription for eye drops, which include protargol. Which sterilization regimen should be chosen by the pharmacist?

A. * The solution is not subject to sterilization.
B. Liquid steam.
C. Autoclaving.
D. UV irradiation.
E. Dry heat.

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

21. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.

22. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.

23. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed.

OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
24. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
25. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

5. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU "Golden Pages" - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№№ Р	Main tasks	directions	answers (Literature)
1	2	3	4
1.	Characteristics of ophthalmic dosage forms	Define the concept of ophthalmic dosage forms	1, 5
2	Requirements for ophthalmic dosage forms	What are the main requirements for ophthalmic dosage forms (drops and ointments)	1, 5
3	Basic technological operations for the preparation of ophthalmic dosage forms.	What are the main technological stages of preparation of ophthalmic dosage forms	1, 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, 5

7. Materials for self-quality training

A. 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.

B. Tests with answers

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.

C. Tasks for self-control

1. Rp: Solution dicaini 1% -10 ml
Da. Signa. 2 drops in the right eye.

Situation. Under aseptic conditions in a sterile stand, the student dissolved 0.1 grams of dicaine in 10 ml of purified water. The resulting solution was filtered through a glass filter into a sterile vial. Assess the situation. Is there a mistake in the preparation of eye drops at this technological stage?

2. Rp: Sulfacyl-sodium 18.0
Purified water 10 ml
Anhydrous lanolin 12.0
Vaseline 14.0
Vaseline oil 6.0
Mix. Come on. Mark. Eye ointment.

Situation. The student in aseptic conditions in a sterile mortar crushed sodium sulfacyl with 6.0 grams of sterile Vaseline oil, added in parts a sterile alloy of Vaseline with lanolin. Finally, add in portions 10 ml of sterile water, carefully emulsifying. Ointment transferred to a wide-necked glass for vacation, closed with a plastic lid. Labels: "Eye ointment", "Store in a cool place", "Cooked in aseptic conditions". Assess the correctness of the technology.

8. Materials for classroom self-preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1. Take	Solution of ethylmorphine hydrochloride 2% 10 ml Give it out. Mark. 2 drops in both	2. Take	Pilocarpine hydrochloride solution 1% 20 ml Give it out. Mark. 2 drops in the eye

	eyes		3-4 times a day
3. Take	Solution of silver nitrate 2% 10 ml Dispense in a dark glass bottle. Mark. Instill in the eyes of the child after birth	4. Take	Riboflavin 0.002 Ascorbic acid 0.025 Nicotinic acid 0.003 Water for injections 10 ml Give it out. Mark. 2 drops in both eyes
5. Take	Sulfacyl sodium 6.0 Vaseline oil 2.0 Lanolin 4.0 Vaseline grade "for eye ointments" 6.0 Purified water 2 ml Stir to form an ointment. Give it out. Mark. Lubricate the edges of the eyelids 2-3 times a day	6. Take	Riboflavin 0.001 Ascorbic acid 0.03 Glucose 0.5 Potassium iodide 0.02 Purified water 10.0 ml Mix. Give it out. Mark. 2 drops in both eyes 3 times a day.
7. Take	Ointments of boric acid 5% 25.0 Give it out. Mark. Lay for an eyelid at night	8. Take	Quinine hydrochloride 0.1 Methylene blue 0.01 Purified water 10 ml Mix. Give it out. Mark. 2 drops in both eyes 4-5 times a day for 30 days
9. Take	Mezaton solution 2% 10 ml Mix. Give it out. Mark. 2 drops in both eyes	10. Take	Ascorbic acid 0,2 Nicotinic acid 0.2 Glucose 0, 3 Purified water 10.0 ml Mix. Give it out. Mark. 2 drops in both eyes 3 times a day.
11. Take	Dicaine solution 1% 10 ml Give it out. Mark. 2 drops in both eyes	12. Take:	Ointments of yellow mercury acid 1% 10.0 Give it out. Mark. Lubricate the edges of the eyelids 2-3 times a day
13. Take	Riboflavin 0.002 Sodium chloride 0.09 The solution is 0.01% 10 ml Mix. Give it out. Mark. 2 drops in both eyes	14. Take	Proserine 0.025 Pilocarpine hydrochloride 0.1 Sodium chloride 0.068 Purified water 10 ml Mix. Give it out. Mark. 2 drops in both eyes
15. Take	Solution of atropine sulfate 1% 10 ml Give it out. Mark. 2 drops in both	16. Take	Tannin ointments 5% 30.0 Give it out. Mark. Apply for the eyelid 2 times a day

	eyes		
17. Take	Ointments of pilocarpine hydrochloride 2% 20.0 Give it out. Mark. Lay on the eyelid	18. Take	Scopolamine hydrobromide solution 0.25% 10 ml Give it out. Mark. 2 drops in both eyes
19. Take	Solution of adrenaline hydrotartrate 1% 10 ml Give it out. Mark. 1 drop 3 times a day	20. Take	Ointments of thiamine bromide 0.5% 10.0 Give it out. Mark. Apply to the lower eyelid 3 times a day for hermetic keratitis

9. Instructive materials for mastering professional skills, skills:
9.1. Methods of performing work, stages of implementation.
Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

9.2. Theoretical questions.
Answer (in writing) the questions of one of the following individual tasks.
- The problem of sterility and stability of eye drops in the process of their preparation, use and storage.
- Basics for eye ointments: composition, storage. Requirements for the bases used for the preparation of eye ointments.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

10.1. Answer (in writing) the questions of one of the following individual tasks.
Task 1
For the Patient it is necessary to prepare eye drops from sodium sulfacil of prolonged action. What substance can a doctor prescribe to prolong their action:
A. Sodium chloride.
B. Gelatin.
B. Glucose.
G. Polyethylene oxide-400.
D. Polyvinyl alcohol.
Answer. D.

Task 2

For preparation of eye ointment on a vaseline-lanolin basis use an ointment basis in a ratio: vaseline _____ parts, lanolin _____ parts.
Answer. 9, 1.

Task 3
Pick a pair

osage form . Eye ointments . Liquids for contact lens processing . Suspensions and emulsions . Eye sprays	eatures of technology . Moisturizing and disinfecting aqueous solutions . Solutions for injection, which are applied to the eye in a non-contact manner . Dilute with water to the required concentration . For application to the conjunctiva of the eye

Answer. 1–D; 2–A; 3–C; 4–B.

11. The topic of the next lesson. «Medicinal forms with antibiotics».

Topic of the lesson№26: «Medicinal forms with antibiotics»-4 h

1. Relevance Topics: Antibiotics are the low-molecular chemotherapeutic substances produced by microorganisms or obtained from natural sources, as well as their synthetic analogues or derivatives possessing the ability to suppress pathogens of a disease in the patient's organism or to inhibit development of malignant carcinomas. Medicines with antibiotics in their composition are represented, as a rule, in such medicinal forms as for injections, for internal use, for external use, for use rectally and vaginally. The invariance of the chemical structure, physical state and pharmacological action of antibiotics should be kept both while preparing medicines and during their storage and application by patients.

2. Objectives of the lesson:

2.1 General objectives

Learn to prepare dosage forms with antibiotics, taking into account the physicochemical properties and quantity of drugs and excipients, assess their quality, prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• 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.

• Features of working with antibiotics.

• 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 with antibiotics, their packaging and labeling.

2.4 Based on theoretical knowledge of the topic:

-able to:

• Use the State Pharmacopoeia, other normative and reference literature to find the necessary information on the preparation of drugs with antibiotics.
• Provide sanitary and hygienic conditions for aseptic preparation of dosage forms with antibiotics.
• Evaluate the correctness of prescriptions.
• Identify types of incompatibilities in dosage forms with antibiotics.
• Calculate the amount of drugs and excipients for the preparation of dosage forms with antibiotics.
• Be able to calculate the mass of the antibiotic (in grams), which corresponds to a certain activity and is expressed in units of action.
• Select and justify the optimal technology of dosage forms with antibiotics in accordance with the prescription, as well as the method of sterilization, if necessary.
• Prepare dosage forms with antibiotics with sequential performance of basic technological operations (weighing, measuring, dissolving, filtering, dispersing, mixing, fusing, sterilization, etc.).
• Use small mechanization in the preparation of dosage forms with antibiotics (filtering device, device for crimping metal caps, sterilization devices, drying cabinets).
• Select packaging and sealing material depending on the type of dosage form.
• Assess the quality of prepared dosage forms with antibiotics and issue them before release.
• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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 of liquid dosage forms for internal use and ointments for external use with antibiotics	Carry out calculations of medicinal, auxiliary substances, water and ointments base.
Industrial Medicine Technology	Technology of dosage forms with antibiotics.	Technological stages of preparation of dosage forms with antibiotics
Biopharmacy	Technological process of preparation of dosage forms with antibiotics.	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. *Intra-subject integration* Ointments and solutions	Preparation of ointments and solutions in the languages of pharmacies.	Calculate the amount of drugs and excipients.

4. Subject content:

MEDICINAL FORMS WITH ANTIBIOTICS

Drugs containing antibiotics are usually presented by injectable dosage forms, oral, rectal and vaginal. In the extrusion formulations of pharmacies with antibiotics, dosage forms are prepared mainly for external use: eye drops, lotions, drops for the ears, nose, ointment, suppositories, powders (powders).

The constancy of the chemical composition, physical condition and pharmacological action of antibiotics should be stored both in the manufacture of medicines, and during their use by patients.

Requirements for antibiotic dosage forms:

- Manufacturing must be carried out under aseptic conditions. This is due to the fact that the antibacterial activity of antibiotics is reduced under the influence of microorganisms or their enzymes.
- The form of the dosage form must ensure the stability of the antibiotic during the process of technology and during storage;
- The dosage form should provide the necessary concentration of the antibiotic in the macroorganism at its minimum dosage.

Calculations of antibiotic activity of antibiotics.

Antibacterial activity of antibiotics is expressed in units of action (AU), which correspond to specific weight parts of a chemically pure preparation, established by the method of biological standardization.

In some antibiotics (streptomycin, erythromycin, etc.), the unit of action corresponds to 1 μg of a chemically pure drug in the form of a base, acid, or salt.

If there is no such correspondence, then when recalculating the ED of antibiotics into weight ratios, you should use the data given in the corresponding private articles of the Global Fund, which indicate the relationship between the mass and units of action of some antibiotics.

Thus, 1 U of chemically pure crystalline benzylpenicillin corresponds to 0.0005988 mg of pure crystalline sodium benzylpenicillin salt.

In 1 mg of chemically pure sodium salt, theoretically 1670 ED. If 200,000 ED of benzylpenicillin is written out in the recipe, by the mass this amount will be:

200,000: 1670 = 120 mg = 0.12 g .

Or:

1 млн. ОД – 0,6 г бензилпенициліну

200000 ОД – х

$$x = \frac{200000 \times 0,6}{1000000} = 0,12 \text{ г}$$

Powder technology with antibiotics. Sophisticated antibiotic powders are used in surgical, dermatological and dental practice. they are prepared according to the general rules for the manufacture of complex powders, taking into account the properties of the incoming ingredients.

Antibiotics are added to sterilized and cooled powders under aseptic conditions.

Rp: Streptocidi
Sulfadimezini aa 2.0

Misce fiat pulvis subtilissimus
Da. Signa. For injection into the nasal cavity every 2 hours.

In a sterile mortar, rub down 2.0 g of streptocide with 20 drops of alcohol, then add 2.0 g of sulfadimesin. The mixture is poured onto the capsule, leaving approximately 0.2 g in a mortar. Then 0.2 g of ephedrine hydrochloride is introduced into the mortar, mixed thoroughly in several stages, and thoroughly rubbed, mixed with the mixture previously poured onto the capsule. The resulting mixture is sterilized at 150 ° C for 1:00, after which 0.12 g of sodium benzylpenicillin is added under aseptic conditions, following the rules of mixing.

Technology of liquid dosage forms. Liquid drugs with antibiotics are prescribed for internal (solutions, suspensions, less often - emulsions) and external use (nasal drops, lotions, eye drops). Of the drugs for external use 1/3 accounted for eye drops.

As solvents use purified water, alcohol, glycerin, vegetable oils. Solutions are prepared according to the general rules of manufacture. Feature - compliance with aseptic conditions. Filtration of solutions through normal filter paper should be avoided.

In most cases, pharmacies prepare only a sterile solvent, and dissolves are performed immediately before use.

Aqueous solutions. Sodium benzylpenicillin solutions. For their manufacture as solvents use isotonic sodium chloride solution: glucose solution; Novocain solution (0.25 and 0.5%). It should be borne in mind that solutions of novocaine with stabilizers have a pH of 3.8-4.5, glucose solutions 3.0-4.0. At the indicated pH values, the benzylpenicillin solutions are inactivated at normal temperature.

Therefore, benzylpenicillin must be dissolved immediately before administration. The solution is not consumed; it is not subject to further use, since benzylpenicillin is inactivated when it is withdrawn.

Rp .: Benzylpenicillini-natrii 200000 ED
Solutionis Natrii chloridi isotonicae 150 ml
Misce. Da. Signa. For industrial injuries.

First, prepare a sterile isotonic solution of sodium chloride, in which 0.12 g of benzylpenicillin sodium salt is dissolved.

Solutions of polymyxin sulfate. For production as an solvent, an isotonic solution of sodium chloride is used (immediately before use at the rate of 10,000-20000 IU per 1 ml of isotonic sodium chloride solution) or a 0.5-1% solution of novocaine.

Rp .: Polymixini M sulfatis 200000 ED
Solutionis Natrii chloridi isotonicae 200 ml
Misce. Da. Signa. Lotion for wetting tampons

By chemical structure, polymyxin is a complex compound comprising polypeptide residues. Different polymyxins have an additional letter. Polymyxinsulfate is applied topically (with weakly healing wounds, necrotic ulcers, bedsores, purulent otitis, inflammatory diseases of the eyes and ears) and inside. Parenteral administration is not allowed (renders nefro-and from effect).

Polymyxin Sulfate is stable in an acidic environment and decomposes into an alkaline one. The antibiotic activity is 8000 IU in 1 mg. According to this recipe, 0.25 g of antibiotic (2000000 IU) is dissolved in aseptic conditions in sterile isotonic solution of sodium chloride.

Eye drops. Eye drops with chloramphenicol. Solutions are prepared in fresh water for injection or isotonic sodium chloride solution under aseptic conditions. The dissolution of the antibiotic can be carried out by heating.

Levomycetin is used to treat typhoid and paratyphoid fever, pneumonia, dysentery, brucellosis, gonorrhea, trachoma, and other diseases caused by microorganisms that are susceptible to it. It is effective against rickettsia, spirochetes, pathogens of trachoma, lymphogranuloma venereum, etc. It affects bacteria strains resistant to penicillin, streptomycin, sulfonamides. An antibiotic is used in tablets and capsules, rectally in suppositories and locally in the form of aqueous solutions.

Levomycetin - a broad-spectrum antibiotic. However, it may not always be used simultaneously with other antibiotics. For example, it should not be used simultaneously with benzylpenicillin - the combination leads to a weakening of the therapeutic effect, and the treatment of pneumonia is antagonistic effect.

It should not be combined with drugs that inhibit blood formation (sulfonamides, pyrazoline derivatives, cytostatics). With simultaneous use of chloramphenicol and butamide, cases of hypoglycemic shock have been reported. The use of chloramphenicol in psoriasis, eczema, fungal and other skin diseases, pregnancy is contraindicated.

Rp.: Novocaini 0.1
Solutionis Acidi borici 2% 10 ml
Misce. Da. Signa. 2-3 to ap and 3 times a day in both eyes.

Recipe is compatible due to the presence of boric acid, which improves the solubility of chloramphenicol and increases the stability of novocaine. Boric acid and chloramphenicol (thermostable substance) is dissolved in warm water for injection, the solution is cooled and novocaine is dissolved in it. Sterilized by fluid steam at 100 ° C - 30 minutes. To increase the stability of the solution, you can add as a stabilizer 1 drop of a 0.1 M hydrochloric acid solution.

In ophthalmology, chloramphenicol is often combined with riboflavin, ascorbic acid and glucose. To improve the solubility of chloramphenicol and isotoning drops with chloramphenicol, you can use a sterile borobufer solution of the following composition: sodium tetraborate 0.02 g, sodium chloride 0.02 g,

boric acid 0.11 g, water for injection to 10 ml. In the prepared borobufer solution dissolve chloramphenicol.

An aqueous solution of chloramphenicol for a long time retains stability (about 2 years), if stored at a temperature of + 5 ° C.

Eye drops with streptomycin are prepared under aseptic conditions on sterile isotonic solution of sodium chloride at a concentration of 10,000-100,000 IU of streptomycin per 1 ml of solution.

Streptomycin is often combined with penicillin and biomycin. Streptomycin stable at pH 7-8; when heated to 100 ° C, it is inactivated, so its solutions cannot be sterilized. Streptomycin can not be combined with acids, salts of alkaloids.
Drops with streptomycin do not lose activity for one month at room temperature.

Eye drops with biomycin (chlortetracycline hydrochloride) are prepared from a water-soluble preparation under aseptic conditions on a sterile buffer solution with this prescription:

Rp.: Biomycini 50000 ED
Natrii chloridi Natrii tetraboratis aa 0.05
Aquae pro injectionibus 10.0
Misce. Da. Signa. Eye drops.
Such drops persist for 2-3 days.

Ear and intranasal drops are prepared at a concentration of 10,000-100,000 U / ml. The solvent is water for injection, isotonic sodium chloride solution, as well as solutions of the respective medicinal substances.

Often, ephedrine hydrochloride is prescribed in nasal drops along with benzylpenicillin, and 0.1% solution of epinephrine hydrochloride. Such recipes can not be considered rational, since these substances in 4:00 inactivate the antibiotic by 40%. Inactivation can be slowed down by storing the solutions in the refrigerator.

Rp .: Benzylpenicillini-natrii 100000 ED
Streptomycini sulfatis 200000 ED
Solutionis Natrii chloride 0,9% 20 ml
Misce . Da. Signa . Nasal drops.

In a glass containing 200,000 U of streptomycin sulfate, make 20 ml of sterile isotonic sodium chloride solution. The resulting solution is poured into a glass containing 100,000 IU of penicillin.

To increase the stability of some antibiotics (penicillin, chloramphenicol, bitsilina, etc.). Different buffer solutions are used as solvents.

Nose drops with neomycin sulfate. This is a fairly active antibiotic, but it has limited use, as it has high nephro and ototoxicity.

Although the ingestion of the antibiotic does not have a toxic effect, it should be taken in violation of renal excretory function, preservation of the intestinal

mucosa, with cirrhosis of the liver, uremia due to increased absorption of the drug. Through these skin the drug is not absorbed. Neomycin sulfate is a chemically resistant substance, the drug solutions withstand sterilization. The drug is a white or yellowish-white powder, easily soluble in water, very little in alcohol, hygroscopic.

Rp .: Neomycini sulfatis 200000 ED
Solutionis Adrenalini hydrochloridi 0.1% qtts X
Sol. Natrii chloridi isotonicae 20 ml
Misce. Da. Signa. Nose drops.

Antibiotic solutions (0.5%) are prepared on water for injection or isotonic sodium chloride solution (at the rate of 5000 IU in 1 ml).

According to this recipe, 0.3 g of neomycin sulfate (100,000 U = 0.15) is dissolved in 20 ml of sterile isotonic sodium chloride solution, the liquid is filtered and 10 drops of adrenaline hydrochloride solution are added (standard cap meter).

Neomycin sulfate can be combined with gramicidin and erythromycin in the manufacture of topical medications. It should not be used with antibiotics such as streptomycin, monomitsin, kanamycin, gentamicin.

Injection solutions with antibiotics are prepared on pyrogen-free water for injection or isotonic sodium chloride solution.

Despite the instability of aqueous solutions of antibiotics, the search for water-soluble antibiotics continues intensively, because such antibiotics do not inactivate bilcabiomas of the blood, tissues, organs and do not form antigenic complexes with them.

Along with the search for water-soluble antibiotics, work is underway to create microcrystalline antibiotic suspensions using a variety of solvents. As non-aqueous solvents, propylene glycol, polyoxyethylene glycol, lactic acid carboxamide and other solvents used to prepare tetracycline, chlortetra cyclin, oxytetracycline, chloramphenicol, etc. are used to make injection solutions of antibiotics.

Alcohol solutions. Levomycetin is also used in the form of alcoholic solutions, often in combination with sulfa drugs.

Rp .: Laevomycetini
Norsulfasoli-natrii aa 2.0
Spiritus aethylici 100 ml
Misce. Da. Signa. To rub skin.

In a sterile vial for dispensing are placed 2, 0 g of sterilized norsule sodium phasol and chloramphenicol and measure 100 ml of 90% ethyl alcohol, shaken until complete dissolution.

Rp .: Laevomycetini 3.0
Solutionis Acidi borici 2% 40.0
Spiritus aethylici 70% 50.0

Misce. Da. Signa. Protirats skin.

Levomycetin is dissolved in alcohol, then a solution of boric acid is added.

Suspensions. More stable than aqueous solutions of antibiotics is oil-based suspensions for injection. In the manufacture of suspensions, the degree of dispersion of the solid phase is important.

Rp .: Benzylpenicillini-natrii 1,000,000 ED
Olei Persicorum 100.0
Sterilisa!
Misce. Da. Signa. 1-2 ml intramuscularly 2 times a day.

100.0 g of peach oil is weighed into the vial for tempering, closed with a cotton swab and sterilized at 180 ° C for 30-40 minutes. Then, under aseptic conditions, the sodium salt of benzylpenicillin is triturated in a sterile mortar with a small amount of sterile oil, gradually adding all the oil. The prepared suspension is placed in a sterile vial for dispensing.

Rp .: Streptomycini sulfatis 100000 ED
Olei Jecoris Aselli seu
Olei Ricini 20.0
Misce. Da. Signa. For lubrication of wounds.

Suspension of the antibiotic streptomycin sulfate, is a yellow amorphous powder. Streptomycin forms a number of salts with acids, well soluble in organic solvents.

Due to the wide spread of resistant strains of gram-positive and gram-negative microorganisms and high toxicity, the role of streptomycin in the treatment of purulent infections has sharply decreased. The antibiotic is mainly used as an anti-tuberculosis drug in combination with penicillin, polyxene, sulfanilamide preparations. Streptomycin contains an easily oxidized aldehyde group, turns into a carboxyl group, and with this conversion, the drug loses its antibacterial properties.

Therefore, streptomycin is incompatible with acids and alkalis, causing the decomposition of the drug and its inactivation. Thus, in 1 M solution of hydrochloric acid at 25 ° C, streptomycin loses 35% within 6:00, and 80% of its activity per day. In 0.1 M sodium hydroxide solution, streptomycin is inactivated within 3:00 by 50%.

Streptomycin is incompatible with neomycin, tetracycline, gentamic and kanamycinous, exhibiting ato and nephrotoxic effect. Streptomycin, both in dry form and in solution, is more resistant than the salts of benzylpenicillin.

Under aseptic conditions, 0.12 g of streptomycin sulfate is triturated with a small amount of pre-sterilized castor oil (a few drops to ensure a wedging effect), after

which the remaining oils are added in several stages. The contents are transferred to the vial and drawn up to leave.

Technology of soft dosage forms. Ointment. In the manufacture of antibiotic ointments, special attention should be paid to the composition of the base and the method of administration of antibiotics.

Most are ointments made on anhydrous bases. It is believed that the most suitable basis for eye ointments - a mixture consisting of vaseline - 9.0 g ("for eye ointments") and anhydrous lanolin - 1.0 g.

The Institute of Antibiotics also offers other combinations: a mixture of 4 parts of anhydrous lanolin and 6 parts of vaseline (“for eye ointments”); the basis of the composition: paraffin 30.0 g, sunflower oil 70.0 g

Also proposed polyorganosiloxanes bases (silicones). Penicillin on such bases is maintained for a long time (up to 3 months or more). All bases for ointments with antibiotics are used only after their sterilization. Stored in jars of 10.0 g.

For the manufacture of ointments with antibiotics, it is recommended to use anhydrous hydrophobic or hydrophilic base or emulsion bases of the type M/B or B/O. For example, streptomycin ointment with sulfonamides can be prepared on an emulsion basis of this composition: self-emulsifying glycerol monostearate 12.0 g. Wax white 3.0 g, glycerin 5.0 g, liquid paraffin 10.0 g, propyl parahydroxybenzoate 0.035 g, water to 100 ml.

Ointments with antibiotics are prepared under aseptic conditions in compliance with the general rules of ointment manufacturing.

Ointments with salts of benzylpenicillin are prepared according to the type of trituration ointments, since the antibiotic is quickly inactivated in an aqueous solution.

Rp .: Unguenti Benzylpeniciliini-natrii 20.0
Da. Signa. Lay for ever 3–4 hours

The ointment must be prepared according to the approved recipe (FS 42-84-72): 0.65 g of sodium benzyl-penicillin, 20.0 g of anhydrous lanolin, vaseline to 100.0 g.

A bottle of penicillin, pre-rubbed with 10% alcohol, is opened with sterile forceps and 0.13 g of benzylpenicillin sodium salt is transferred to a sterile, slightly heated mortar. The drug is ground into a fine powder, then ground with a small amount of sterile base (4.0 g anhydrous lanolin and 16.0 g petrolatum), melted and cooled to 40 ° C, which is then added to penicillin in small portions with constant stirring until a homogeneous mass is formed. Place in a sterile jar with a screw cap and sterile gasket. Make out to leave. Shelf life ointment 10 days.

Penicillin ointment on petrolatum itself is not recommended, as they are ineffective for poor absorption of penicillin by the skin.

Rp .: Benzylpenicillini-natrii 500000 ED
Olei Persicorum 90.0

Cetacei 0,5
Lanolini 10.0
Misce, fiat unguentum
Da. Signa. To lubricate Bani affected areas

To the molten spermaceti add lanolin water, peach oil and mix. Penicillin is ground in a mortar, then the base is added in parts with stirring. Anhydrous ointments withstand longer storage (up to 4 months) than ointments prepared on the basis contain water (up to 1 month) at a temperature not higher than 10 ° C. It is not recommended to rub the antibiotic with oil due to the deterioration of its release from the ointment .

The introduction of fats in ointments with antibiotics is undesirable, since the peroxide compounds contained in them can cause the destruction of antibiotics. Irrational and prescription in their composition of tar and ichthyol. Ointment tetracycline ophthalmic (tetracycline 1%, Ditetracycline 10%, etc.) Prepare under aseptic conditions on a sterile basis. They are used in the treatment of trachoma, keratitis, corneal ulcers, acute conjunctivitis and other inflammatory eye diseases.

Rp .: Unguenti Tetracyclini hydrochloridi 1% 10.0
Da. Signa. Lubricate eyelids 2-3 times a day

0.1 g (100,000 U) of tetracycline hydrochloride are added to the pre-sterilized mortar, carefully ground, and then the parts are added to the molten base (to a temperature of 40 ° C). Ointment stored in a cool, dark place.

In the treatment of skin diseases, for example, acne, streptostaphilus, dermatitis, furunculosis, folliculitis, eczema, trophic ulcers, the use of 3% tetracycline ointment is recommended.

Tetracyclines are often prescribed to outpatients, but do not limit their use to pregnant women and children under 8 years of age. This is due to the possibility of tetracycline deposition in the tooth enamel, the development of early caries, as well as its negative effect on the formation of the bone skeleton. In these cases, it is recommended to use semisynthetic tetracyclines with a prolonged action: metacycline and dioxycyline.

Rp .: Erytromycini 1.111
Lanolini anhydrici 40.0
Natrii metabisulfitis 0.01
Vaselini pro oculi ad 100.0
Misce, fiat unguentum
Da. Signa. Ointment for lubrication of damaged skin areas

Ointment with erythromycin, which is a white powder, odorless, bitter taste, slightly soluble in water, easily - in alcohol, hygroscopic. The spectrum of

antimicrobial action is close to penicillin, but compared to it, erythromycin is better tolerated and can be used for penicillin allergy.

Erythromycin is thoroughly ground with 10-12 drops of sterile vaseline oil. Sodium metabisulphite is dissolved in a few drops of sterile water, emulsified with cooled lanolin-petroleum jelly and the resulting emulsion is added to the suspension of erythromycin in several steps by careful rubbing. The ointment contains erythromycin 10,000 IU in 1.0 g ointment.

Amphotericin B ointment (VFS 42-545-76)

Rp .: Amphotericini	4.3
Olei Vaselini	20.0
Tweeni-80	1.0
Vaselini pro oculi ad	100.0
Misce, fiat unguentum	
Da. Signa. Lubricate eyelid skin.	

Ointment with amphotericinam, which is a yellow or orange powder, is practically insoluble in water and alcohol, is hygroscopic. Sensitive to light and heat. The antibiotic is effective against many pathogenic fungi. It is used intravenously, inhalation and topically (as an ointment). With the introduction of the gastrointestinal tract is practically not absorbed. When administered intravenously, it is very effective, but due to toxicity it should be used only as directed by a physician with precise dosage compliance. When amphotericin is dissolved in water or in a 5% glucose solution, a colloidal solution is formed.

Amphotericin is triturated with 2-2.5 g of petroleum jelly, after which the cooled alloy of petrolatum, twin-80 and petroleum jelly remaining oil is added in several stages with careful grinding, until a homogeneous mass is obtained. The ointment contains amphotericin B 30000 IU in 1.0 g. Levorinov ointment (FS 42-1144-78)

Rp .: Levorini	2.15
Lanolini anhydrici	10.0
Olei Vaselini	5.0
Vaselini pro oculi ad	100.0
Misce, fiat unguentum	
Da. Signa. Causes on lesions of the skin	

Ointment containing levorin, which is an odorless and tasteless dark yellow powder, is hygroscopic. Easily destroyed in acidic and alkaline environments. Virtually insoluble in water and alcohol. Levorin is used as an ointment for interdigital erosions and skin lesions caused by yeast-like fungi; they lubricate the affected areas 1–2 times a day for 10–15 days. The ointment contains levorin 500000 ED in 1.0 g.

According to this recipe, levorin is thoroughly ground with 20 drops of vaseline oil, and a cooled alloy of anhydrous lanolin with vaseline and vaseline oil is added to the mixture in several steps.

Suppositories. In practical medicine, the appointment of antibiotics in the form of suppositories is of great importance.

The absorption rate of antibiotics depends on the nature of the base for which cocoa butter, wax and various surfactants are used. Recently, it has been proposed to use hydrogenated oils as suppository bases. Suppositories are prepared by downloading or pressing, as the heat cannot be lured.

Suppositories with penicillin. Penicillin is ground with a small amount of milk sugar and in the form of a fine powder is injected into a suppository base. The content of penicillin in one rectal suppository is from 100,000 to 500,000 ED. When stored in a cool place, the activity of ready-made suppositories can be stored for 2 months. Sometimes, to accelerate the action of penicillin, it is dissolved in sodium citrate solution (1: 1000) and mixed with a suppository base. The stability of such suppositories is not more than 10 days.

Tetracycline Suppositories. Tetracycline hydrochloride is most often used for this purpose, which is caused by the less pronounced local irritant effect of this antibiotic. Suppositories containing 0.3 g (300,000 U) of tetracycline are usually prescribed.

Rp .: Tetracyclini hydrochloride
0.3
Olei Cacao qs
Misce, fiat suppositorium
Da tales doses № 6
Signa. 1 candle 3 times a day.

1.8 g of tetracycline hydrochloride are placed in a sterile mortar, triturated (without dissolving in water) and 16.2 g of crushed cocoa butter are added in portions with stirring. It is crushed to obtain a homogeneous plastic mass, from which six suppositories are pumped out, and drawn up for tempering.

QUALITY ASSESSMENT, STORAGE AND VACATION OF MEDICINAL FORMS WITH ANTIBIOTICS

Dosage forms with antibiotics are assessed as well as other dosage forms - they check the correctness of documentation, packaging (capping), conduct organoleptic control (color, smell, sediment), check for the absence of mechanical impurities (liquid medicines), deviations in volume or mass. , homogeneity of mixing (powders, ointments), melting point, time of complete deformation (suppositories).

Storage of dosage forms with antibiotics is based primarily on the physicochemical properties of each individual antibiotic. For example, aqueous

solutions of polymyxin M sulfate are stored for 7 days at a temperature of 4-10 ° C. Gramicidin is stored in an aqueous solution for not more than 3 days, while in alcoholic and fatty solutions it is not inactivated for a long time.

The general requirement for the storage of dosage forms with antibiotics is the temperature in a refrigerator, a place protected from light, the pH of the medium. In a buffer solution with a pH of 6.5, the stability of the salts of benzylpenicillin increases to 15–20 days at temperatures up to + 5 ° C.

Medicines with antibiotics are released in a sterile container, as much as possible eliminates microflora, make out the labels: "Cooked aseptically"

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. Preparation of medicinal facilities is in aseptic terms (Solutions for injections, eye medical forms). Estimation of qualityassessment. The pharmacist prepares several solutions with antibiotics in aseptic conditions. What kind of substance can he sterilize?

A. * Levomycetin
B. Benzylpenicillin sodium
C. Neomycin sulfate
D. Benzylpenicillin-potassium
E. Polymyxine sulfate

2. "The pharmacist prepared the powder by prescription:
Rp .: Velzylpenicyllini-natrii 100,000 ED
Streptocidi 2,0
M.f.rulv.
D.S.: For blowing.
Indicate the amount of antibiotics if 1000000 units corresponds to 0.6 g: "

A. * 0,06
B. 1,2
C. 0,18
D. 0,6
E. 2.0

3. Preparation of medicinal facilities is in aseptic terms (Solutions for injections, eye medical forms). Estimation of qualityassessment. Specify the substance necessary for isotoning of eye drops with levomycetin:

A. * Sodium chloride
B. Analgin
C. Potassium iodide
D. Ascorbic acid
E. Glucose

4. To prepare eye drops with antibiotic a dispensing chemist has been using flowing steam sterilization under 100 ºC for 30minutes.What antibiotic allows for such sterilization?

A. Levomycetin (Chloramphenicol)
B. Sodium benzylpenicillin
C. Streptomycin sulfate
D. Biomycin
E. Erythromycin

5. A pharmacist made eye drops of pilocarpine hydrochloride and adrenaline hydrochloride solution. A peculiarity of the incorporation of the adrenaline hydrochloride solution is that it is added:

A. After sterilization, aseptic
B. After dissolving of solids
C. To the half dose of solvent
D. In the first place
E. After isotoning

6. A pharmacist has dissolved a medicinal substance in sterile purified water to make an eye ointment. Specify this medicinal substance:

A. Pilocarpine hydrochloride
B. Xeroform
C. Menthol
D. Basic bismuth nitrate
E. Purified sulfur

7. A pharmacist needs to prepare 10.0 g of eye ointment vehicle. What amounts of lanolin and vaseline should be taken?

A. .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

8. Specify the base for the preparation of antibiotic ointments:

A. 6 parts of vaseline + 4 part of lanolin
B. 8 parts of vaseline + 2 part of lanolin
C. 5 parts of vaseline + 5 part of lanolin
D. 7 parts of vaseline + 3 part of lanolin
E. 5 parts of vaseline + 1 part of lanolin

9. A pharmaceutist prepares several different solutions with antibiotics under aseptic conditions. He can sterilize the solution of the following substance:

A. Chloramphenicol
B. Benzylpenicillin-sodium

C. Neomycin sulphate
D. Benzylpenicillin-potassium
E. Polymyxin sulphate

10. To prepare eye drops with antibiotic a pharmacist has using flowing steam sterilization under 100 ºC for 30 minutes. What antibiotic allows for such sterilization?

A. Levomycetin (Chloramphenicol)
B. Sodium benzylpenicillin
C. Streptomycin sulfate
D. Biomycin
E. Erythromycin

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

26. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.

27. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.

28. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.

29. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.

30. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

6. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU “Golden Pages” - 2001 - 281 p.

6.3. Orienting map regarding independent work with literature on the topic of employment.

№	Main tasks	directions	answers

№ P			(Literature)
1	2	3	4
1.	Characteristics of dosage forms with antibiotics	Define the concept of dosage forms with antibiotics	1, 2, 3, 4, 5
2	Requirements for dosage forms with antibiotics	What are the main requirements for dosage forms with antibiotics	1, 2, 3, 4, 5
3	Basic technological operations for the preparation of dosage forms with antibiotics	What are the main technological stages of preparation of dosage forms with antibiotics	1, 2, 3, 4, 5
4	Quality assessment, rules of packaging, design and storage of dosage forms with antibiotics	What are the NTD and quality indicators of dosage forms with antibiotics	1, 2, 3, 4, 5

7. Materials for self-quality training

A. Questions for self-control

1. Requirements for dosage forms with antibiotics.
2. Factors affecting the stability of medications with antibiotic.
3. Antibiotics which are most frequently used in medications preparing in a pharmacy.
4. Particularities of introducing antibiotics into powders and liquid dosage forms.
5. Justify the need for aseptic conditions in preparing dosage forms with antibiotics.
6. What methods do allow achieving the stability of antibiotics?
7. Antibiotic ointments, applied basis and rules for administration.
8. General rules for preparing liquid and solid medications with antibiotics.
9. Assessment of the quality of dosage forms with antibiotics. Normative documentation. Ways to improve.

B. Tests with answers

1. A pharmaceutist is preparing an ointment under aseptic conditions on the sterile ointment base - composition of vaseline and lanoline with the ratio 6:4. The drug substance is incorporated by suspension type. Such technology of ointment preparation is typical for the following substance:

A. Benzylpenicillin sodium
B. Sodium chloride
C. Thiamine chloride
D. Pilocarpine hydrochloride
E. Sodium sulfate

2. A pharmacy received a prescription for preparation of dermatological ointment with benzylpenicillin. Specify the type of ointment that necessary to prepare:

A. Suspension ointment
B. Liquid ointment
C. Hydrophilic ointment
D. Alloy ointment
E. Combined

3. A pharmacy received a formulation for eye drops containing 1% solution of pilocarpine hydrochloride. What substance should be used to ensure that the resultant solution is isotonic?

A. Sodium chloride
B. Boric acid
C. Glucose
D. Sodium nitrate
E. Sodium sulfate

4. 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.

5. 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.

6. The pharmacist should prepare 10.0 g of eye ointment base for medicinal forms with antibiotics. What amounts of lanolin and vaseline were used for this purpose?

A. * 4.0 g of anhydrous lanolin and 6.0 g of vaseline.
B. 1.0 g of anhydrous lanolin and 9.0 g of vaseline.
C. 2.0 g of anhydrous lanolin and 8.0 g of vaseline.
D. 7.0 g of anhydrous lanolin and 3.0 g of vaseline.
E. 3.0 g of anhydrous lanolin and 7.0 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 pharmacist 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.

C. Tasks for self-control

1. Rp.: Tetracyclini hydrochloridi 0.3
Olei Cacao q.s.
Misce, fiat suppositorium
Da tales doses № 6
Signa. Use 1 suppository 3 times a day.

Situation. Place 1.8 g of tetracycline hydrochloride in a sterile mortar, triturate thoroughly (without dilution in water) and while stirring add 16.2 g of the powdered cacao butter in portions. Mix to obtain the homogeneous plastic mass, from which roll out six suppositories and registrate them to dispensing.

2. Rp.: Laevomycetini
Norsulfasoli-natrii aa 2.0
Spiritus aethylici 100 ml
Misce. Da. Signa. For rubbing of the skin.

Situation.

Place 2.0 g of sterile sodium norsulphasol and 2.0 g of sterile levomycetin into sterile bottle for dispensing, add 100 ml of 90 % ethyl alcohol, close and shake to the complete dissolution.

8. Materials for classroom self-preparation:

8.1 List of educational individual practical tasks that must be performed during the practical lesson:

A set of individual tasks

1. Take	Penicillin sodium salt 100,000 units Sodium chloride solution 0.9% 10 ml Mix. Give. Indicate: 2 drops 4 times a day in both eyes	2. Take	Penicillin sodium salt 250,000 units Ephedrine hydrochloride 0.05 Sulfanilamide (streptocid) 1.5 Norsulfazole 1.5 Mix to form a fine powder Give. Indicate: inhale when the flu
3. Take	Polymyxin M sulfate 1,000,000 units Sodium chloride isotonic solution 100 ml Mix. Give. Indicate: lotion	4. Take	Laevomycetin 0.2 Water for injection 100 ml Mix. Give. Indicate: for rectal infusion (microclyster)
5. Take	Laevomycetin 1.0 Salicylic acid 0.5 Resorcinol 0.5 Ethanol 70% 50 ml Mix. Give. Indicate: rub into the injured skin	6. Take	Laevomycetin 2.0 Salicylic acid 1.0 Resorcinol 0.5 Ethanol 70% 70 ml Mix. Give. Indicate: rub into the injured skin
7. Take	Neomycin sulfate 0.1 Epinephrine hydrochloride solution 0.1% 10 drops Sodium chloride isotonic solution 20 ml Mix. Give. Indicate: nasal drops	8. Take	Belladonna extract 0.015 Erythromycin 100,000 units Novocaine 0.2 Anaestesine 0.2 Cocoa butter 2.0 Mix to prepare a suppository Give the following doses: № 20 Indicate: 1 suppository 2 times a day
9. Take	Monomycin 250,000 units Laevomycetin 2.5 Sulfanilamide (streptocid) 2.5 Mix to form a fine powder Give. Indicate: for blowing in the ear	10. Take	Tetracycline hydrochloride 500,000 units Sulfanilamide (streptocid) 2.0 Mix. Give. Indicate: powder
11. Take	Penicillin sodium salt 250,000 units Norsulfazole 2.0 Mix to form a fine powder Give. Indicate: inhale when the flu	12. Take:	Oletetrin 250,000 units Novocaine solution 1% 10 ml Mix. Give. Indicate: 6-8 drops into the ear canal 4-5 times a day
13. Take	Laevomycetin 1.0 Resorcinol 0.5 Ethanol 70% 50 ml	14. Take	Monomycin 200,000 units Laevomycetin 2.0 Sulfanilamide (streptocid) 3.0

	Mix. Give. Indicate: rub into the injured skin		Mix to form a fine powder Give. Indicate: for blowing in the ear

9. Instructive materials for mastering professional skills, skills:
9.1. Methods of performing work, stages of implementation.
Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

9.2. Theoretical questions.
Answer (in writing) the questions of one of the following individual tasks.
- The problem of sterility and stability of medicines with antibiotics in the process of their preparation, use and storage.
- Assessment of the quality of dosage forms with antibiotics.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

10.1. Answer (in writing) the questions of one of the following individual tasks.
Task 1
For the Patient it is necessary to prepare eye drops from sodium sulfacil of prolonged action. What substance can a doctor prescribe to prolong their action:
A. Sodium chloride.
B. Gelatin.
B. Glucose.
G. Polyethylene oxide-400.
D. Polyvinyl alcohol.
Answer. D.

Task 2
For preparation of medicines with antibiotics on a vaseline-lanolin basis use an ointment basis in a ratio: vaseline _____ parts, lanolin _____ parts.
Answer. 6, 4.

Task 3
Pick a pair

Dosage form	Features of technology
1. Eye ointments	A. Moisturizing and disinfecting

2. Liquids for contact lens processing 3. Suspensions and emulsions 4. Eye sprays	aqueous solutions B. Solutions for injection, which are applied to the eye in a non-contact manner C. Dilute with water to the required concentration D. For application to the conjunctiva of the eye

Answer. 1–D; 2–A; 3–C; 4–B.

11. The topic of the next lesson. «Children's and geriatric medical forms».

Topic of the lesson№27: « Children's and geriatric dosage forms »-6 h

1. Relevance Topics: Nowadays, 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. Objectives of the lesson:

2.1 General objectives

Learn to prepare children's and geriatric dosage forms, taking into account the physicochemical properties and quantity of drugs and excipients, assess their quality, prepare for dispensing.

2.2 Educational goals:

Formation of professionally important properties and personality traits of the future pharmacist. Educating students of professional responsibility in the manufacture of medicines.

2.3 Specific objectives:

-know:

• 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 with antibiotics, their packaging and labeling.

2.4 Based on theoretical knowledge of the topic*:*

-able to:

• Use the State Pharmacopoeia, other normative and reference literature to find the necessary information on the preparation of children's and geriatric dosage forms.

• Provide sanitary and hygienic conditions for aseptic preparation of children's and geriatric dosage forms.
• Evaluate the correctness of prescriptions.
• Identify types of incompatibilities in children's and geriatric dosage forms.
• 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.
• Prepare children's and geriatric dosage forms with sequential performance of basic technological operations (weighing, measuring, dissolving, filtering, dispersing, mixing, fusing, sterilization, etc.).
• Use small mechanization in the preparation of children's and geriatric dosage forms (filtering device, device for crimping metal caps, sterilization devices, drying cabinets).
• Select packaging and sealing material depending on the type of dosage form.
• Assess the quality of children's and geriatric dosage forms and issue them before release.
• Fill in the passport of written control.

3. Materials for classroom self-preparation (interdisciplinary integration).

Disciplines	Know	Be able to
1. Preliminary Latin	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 of liquid dosage forms for internal use and ointments for external use with antibiotics	Carry out calculations of medicinal, auxiliary substances, water and ointments base.
Industrial Medicine Technology	Technology of children's and geriatric dosage forms.	Technological stages of preparation of children's and geriatric dosage forms
Biopharmacy	Technological process of preparation of children's and geriatric dosage forms.	In the process of preparation to take into account pharmaceutical factors, taking into account their comprehensive impact on the biological activity of active substances.
3. *Intra-subject integration* Ointments and solutions	Preparation of ointments and solutions in the languages of pharmacies.	Calculate the amount of drugs and excipients.

4. Subject content:

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.

The following liquid dosage forms are most often extemporaneously produced in pharmacies: drops, solutions for internal and external use, solutions for injections (in hospital pharmacies), eye drops (if an aseptic block is available), emulsions, suspensions, infusions and decoctions.

Example 1. Rp: Mentholum 0,15
Olei vaselini 15,0
Misce. Da. Signa. For skin lubrication.

The medicinal form is an oily solution for external use with the hydrophobic, odorous and volatile substance menthol. The prescription is written out on the prescription form F№1 (According to the order №360 dated 07.19.2005). The recipe is designed correctly. Doses are not checked. The dosage form can be manufactured.

Passport of written control (reverse side)	**Passport of written control (front side)**
m (Mentholum) = 0,15 m (Olei vaselini) = 15,0 m = 15,15 ml	Date ____ № prescription____ Mentholum 0,15 Olei vaselini 15,0 $m_{(gen)}$ = 15,15 Prepared Checked Dispensed

Technology. Weigh 15 g of vaseline oil into a dry beaker, slightly heat it in a water bath at 40–50°C and dissolve 0.15 g of menthol in it.

Quality control. Ready medicines are checked for cleanliness, and the dishes in which they are kept are checked for tightness. If the bottle with the finished medicinal product is turned upside down, the liquid should not seep

through the stopper when lightly tapped on the palm of the hand. A corked bottle with a liquid drug (solution) is slightly shaken, turned over and viewed in direct and reflected light. There should be no visible foreign particles in the liquid. A designed and filled in label "Inner" or "External" is pasted on the bottle.

Solutions containing poisonous substances are sealed, issued with a signature and an additional label "Handle with caution". If the medicinal product requires special storage conditions, then additional labels are pasted, for example. "Store in a cool place", "Shake before use", etc.

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.

Example 2 Rp. Dimedroli
Papaverini hydrochloride aa 0,05
Olei cacao quantum satis
Misce fiat suppositorium
Da tales doses № 10
Signa. 1 suppository at night when the temperature rises

This dosage form is rectal suppositories of the W/O emulsion type, which include potent medicinal substances that are soluble in water.

Verification of single and daily doses of potent substances (diphenhydramine, papaverine hydrochloride, novocaine) is carried out by

Checking the doses of dimedroli: HSD = 0,1 HDD = 0,25 SD = 0,05 The dose is not overrated DD = 0,05 The dose is not overrated	Checking the doses of novocaini: HSD = 0,25 HDD = 0,75 SD = 0,15 The dose is not overrated DD = 0,15 The dose is not overrated	Checking the doses of papaverini: HSD = 0,2 HDD = 0,6 SD = 0,05 The dose is not overrated DD = 0,05 The dose is not overrated The dosage form can be prepared

comparing them with higher single and daily doses for internal administration.

Passport of written control (reverse side)	**Passport of written control (front side)**
m (dimedroli) = 0,5 г m (papaverini) = 0,5 г m (novocaini) = 1,5 г. m (олії какао) = 30,0 – (0,5 + 0,5 + 1,5) = 27,5 г.	Date ____ № prescription ____ Dimedroli 0,5 Papaverini hydrochloridi 0,5 Novocaini 1,5 Aquae purificatae gtts XX (1 ml = 20 drops.) Olei Cacao 27,5 Lanolini anhydrici 0,5 m = 3,1 № 10 Prepared Checked Dispensed

Technology. Medicinal substances are placed in a mortar (according to the rule of preparation of powders), they are ground first in dry form, and then approximately 1 ml (20 drops) of purified water is added (based on the solubility of the medicinal substances) and ground until dissolved. The resulting solution is mixed with part of the ground cocoa oil, gradually adding another amount of it. If necessary, add anhydrous lanolin (approximately 0.5 g). Mix until a homogeneous mass is obtained, which lags behind the walls of the mortar, which is weighed. The mass is noted on the back of the prescription and in the passport of written control. Form a rod from the mass, divide it into 10 portions and roll out a candle from each portion.

Quality control. For control, several doses are weighed, deviations in mass should not exceed ±5%. Suppositories should be of the same shape, length and thickness.

Soft dosage forms occupy a significant place in the arsenal of dosage forms for children and play an important role in pediatric practice. When making ointments for children, 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".

Solid dosage forms. In pharmacies, powders for internal use and powders are made from solid dosage forms for children. The powders for internal use are prepared in aseptic conditions in accordance with the requirements of the Federal Drug Administration. Powders are prepared by grinding powders followed by their sterilization.

Example 3 Rp. Streptocidi 1,2
Talci 65,0
Misce, fiat pulvis
Da. Signa. Children's powder

This dosage form is undosed powder - powder with streptocide (list B) and talc. The prescription is written out on the prescription form F№1 (According to the order №360 dated 07.19.2005). The recipe is designed correctly. Medicinal substances are compatible.

Doses are not checked because LF is for external use. The dosage form can be manufactured.

Passport control (reverse side)	**Passport control (front side)**
m (Streptocide) = 1,2 г m (Talk) = 65,0 г m = 65,0 + 1,2 = 66,2 г	Data ____ № prescription ____ Talci 65,0 Streptocidi 1,2 m = 66,2 Prepared Checked Dispensed

Technology. The talc is ground in a mortar, a portion is poured onto the capsule, leaving approximately 1.2 g, 1.2 g of streptocide is added, and mixed thoroughly. The remaining talc is added in parts, mixed until homogeneous.

Sterilize. Packed in a wax capsule, placed in a paper bag. They are decorated with a signature, additional labels: "Store in a dry place", "Store in a place protected from light."

Quality control. Powders should be homogeneous when viewed with the naked eye and have a particle size of no more than 0.160 mm.

Preservation. In a package that protects against external influences and ensures the stability of the drug during the specified shelf life, in a dry and, if necessary, cool, protected from light place for no more than 15 days.

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.

Example 4 Rp. Mentholi 0,4
Unuguentum camphoratum 20,0
Misce. Da. Signa. for rubbing into the joints

This dosage form is an ointment-solution, since camphor, which is part of the camphor ointment, and menthol are soluble in the base. The prescription is written on the prescription form F No. 1 (According to Order No. 360 of July 19, 2005). The recipe is designed correctly. Doses are not checked. The dosage form can be manufactured.

Passport control (reverse side)	**Passport control (fronr side)**
Composition of camphor ointment: Camphorae : 10 parts.─ 2,0 Vaselin: 60 parts─ 12,0 Lanolimi anhydrici: 30 parts.─ 6,0 m = 100 parts - 20,0	Дата ____ № prescription ____ Vaselini 12,0 Lanolini anhydrici 6,0 Mentholi 0,4 Camphorae 2,0 m = 20,4 Prepared Checked Dispensed

Technology: a portion of (12.0) petroleum jelly and (6.0) anhydrous lanolin are placed in a porcelain cup and melted in a water bath, since taking into account the solubility of menthol in petroleum jelly (1:5) and camphor in petroleum jelly (1:7) and in lanolin (1:8), substances can be dissolved in the whole base, but not in its part. In a semi-hardened base, since menthol and camphor are volatile substances, dissolve 0.4 menthol and 2.0 camphor at a temperature of no more than 40 °C. Stir until cooled and transfer to a jar pre-weighed on tare scales. Close with a lid with a lined circle of parchment.

6. Materials methodological support classes

6.1. Tasks for self-examination of the initial level of knowledge-skills

Tests with answers

1. The pharmacy received a prescription for the preparation of a dermatological ointment for an adult with benzylpenicillin. Specify the type of prepared ointment:
A. * Ointment-suspension.
B. Ointment-solution.
C. Ointment-emulsion.
D. Ointment-alloy.
E Combined.

3. The pharmacist prepared eye drops with chloramphenicol. Specify the method of sterilization:
A. * Liquid steam.
B. Tyndalization.
C. Pasteurization.
D. Dry heat.
E. Pressure ferry.

4. The pharmacist prepared a suspension of sulfur. Specify which stabilizer should be used:
A. * Medical soap.
B. Lanolin.
C. Gelatose.
D. Starch solution.
E. Methylcellulose solution.

5. The pharmacist prepared an emulsion for an adult:
Rp.: Olei Ricini 10
Phenylii salicylatis
Bismuth subnitrates ana 1.0
Aquae purificatae ad 100.0
Misce. Da. Signa. 1 table each. l. 3 times a day
Indicate how the pharmacist introduced phenylsalicylate to the composition of the emulsion?
A. * Grinding with stabilizer and ready-made emulsion.
B. Grinding with ready-made emulsion.
C. Dissolved in oil to prepare primary emulsion.
D. Grinding with stabilizer and water designed to dilute the primary emulsion.
E. Dissolved in part of the water intended for dilution of the primary emulsion.

6. The pharmacy received a prescription for the preparation of infusion for an adult. From which medicinal plant material can this medicinal form be prepared?
A. * Rhizomes with valerian roots.
B. Rhubarb roots.
C. Oak bark.
D. Viburnum bark.

E. Shingles bark.

7. You need to prepare zinc ointment for the child. How much zinc oxide should the pharmacist weigh out to prepare 25 g of ointment?
A. * 2.5 g.
B. 12.5 g.
C. 20.0 g.
D. 5.0 g.
E. 1.25 g.

8. A pharmacist needs to prepare vaginal suppositories based on gelatin and glycerin for an adult. In what ratio should gelatin be taken; water and glycerin?
A. * 1:2:5.
B. 7:7:93.
C. 1:10:90.
D. 30:60:10.
E. 2.6:5:60.

9. The doctor prescribed suppositories without specifying the basis. Specify the base used by the pharmacist to prepare suppositories by the rolling method:
A. * Cocoa butter.
B. Lazupol.
C. Gelatin-glycerine.
D. Butyrol.
E. Polyethylene oxide.

10. The pharmacist prepared eye drops containing riboflavin, potassium iodide and ascorbic acid. Specify the method of introduction of potassium iodide:
A. * Add aseptically after sterilization.
B. Dissolve riboflavin in the solution.
C. They are added last in the stand.
D. Dissolve in purified water, sterilize.
E. Place first in the bottle.

6.2 Information necessary for the formation of knowledge-skills can be found in the textbooks:

A) Basic

31. Aseptic dosage forms: thermal recipe: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 184 p.

32. Solid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F.

Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 176 p.
33. Soft dosage forms: thermal preparation: Methodical recommendations / O.I.Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2003. - 128 p.
34. Liquid dosage forms: thermal preparation: Methodical recommendations / O.I. Tikhonov, L.V. Bondareva, T.G.Yarnih, N.F. Orlovetska and others; Ed. OI Tikhonov and T. G. Yarnikh. - M.: Publishing house NUPh; Original, 2005. - 160 p.
35. Workshop on pharmaceutical technology of drugs; for stud. Pharmac. higher studies. institutions / A.I. Tikhonov, T.G. Yarnikh, V.A. Sobolev, and others; Ed. A.I. Tikhonov. - M.: Publishing house NFAU Golden Pages, 2002. - 256 p.

B) additional literature:

7. Dictionary of reference for pharmacy specialists in management and economics / ed. prof. Chernykh V.P. // Kharkov: Publishing house NFUU “Golden Pages” - 2001 - 281 p.

8. **6.3. Orienting map regarding independent work with literature on the topic of employment.**

№№ Р	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, 2, 3, 4, 5
2	Requirements for children’s dosage forms	What are the main requirements for children’s dosage forms	1, 2, 3, 4, 5
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, 2, 3, 4, 5
4	Technology of preparation of liquid, soft and solid medicinal forms for children	What are the main technological stages of preparation of dosage forms	1, 2, 3, 4, 5
5	Problems of improving medicinal forms for children	Describe the problems of improvement that arise in the process of preparing medicines for children.	1, 2, 3, 4, 5
6	Characteristics of geriatric	Give a description of medicines	1, 2, 3, 4, 5

	dosage forms	for old people, describe the features of the old man’s body, which determine the ways of intriduction of medicines	
7	Technology of preparation of liquid, soft and solid medicinal forms	What are the main technological stages of preparation of dosage forms	1, 2, 3, 4, 5
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).	1, 2, 3, 4, 5

7. Materials for self-quality training

A. 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.

B. Tests for self-control with standards of answers.

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.

C. Tasks for self-control

1. Rp. Erythromycin 100,000 IU
Cocoa butter 1.0
Let the suppository form
Da tales doses No. 10
Signa.1 suppository 3 times a day. (The child is 3 years old)

Situation. The student prepared suppositories in aseptic conditions, as they contain the antibiotic erythromycin. Weighed 0.11 grams of erythromycin, mixed with 10.0 grams of ground cocoa butter. Weighed the suppository mass and indicated its weight on the back of the prescription and in the passport. Prepared a rod, divided it into 10 equal parts, gave each part a cone-like shape. Packed. Released with the label "External", "Store in a cool place", "Prepared in aseptic conditions".

How would you rate the quality of the dosage form?

2. Rp. Benzylpenicillin sodium 100,000 units
Solution sodium chloride 10ml
Misce. Da. Signa 2 drops 3 times a day in both eyes. (The child is 8 months old)

Situation. The student dissolved 0.09 grams of sodium chloride in 10 ml of water for injections and filtered. Weighed 0.06 grams of benzylpenicillin sodium salt and dissolved it in isotonic sodium chloride solution. I prepared everything in aseptic conditions. Stopped Released with labels "External", "Store in a cool place", "Prepared in aseptic conditions".

Assess the situation.

8. Materials for classroom self-preparation:
8.1 List of educational individual practical tasks that must be performed during the practical lesson:
A set of individual tasks

1. Take	Dimedroli Papaverini hydrochloridi aa 0,01 Novocaini 0,05 Olei cacao quantum satis Mix to prepare a suppository Give the following doses: № Indacate 1 suppository 3 times a day for 12 years child	2. Take	Prednisolon 0,05 Tetraceclin 0,5 Sulphadimezyn Streptocyd Laevomycetin aa 5,0 Penicillin sodium salt 125,000 units Mix. Give. Indicate powder
3. Take	Codeini 0,05 Infusi radix Altheae 50 ml Sugar suryp 10 ml Mix. Give. Indacate for 1 tablespoon 3 times a day, 9 years old child	4. Take	Menthol 0,15 Vaselyn oil 15,0 Mix. Give. Indicate: powder
5. Take	Streptocyd 1,2 Talk 65,0 Mix to prepare powder Give. Indicate.	6. Take	Laevomycetin 2.0 Salicylic acid 1.0 Resorcinol 0.5 Ethanol 70% 70 ml Mix. Give. Indicate: rub into the

			injured skin
7. Take	Neomycin sulfate 0.1 Epinephrine hydrochloride solution 0.1% 10 drops Sodium chloride isotonic solution 20 ml Mix. Give. Indicate: nasal drops	8. Take	Infusi radix Altheae Natrii benzoatis Natrii hydrocarbonatis aa 1,0 Sirupus simplex 5 ml Mix.Give. Indicate 1 tablespoon 3 times a day
9. Take	Salicylic acid 0.5 Resorcinol 0.3 Precipitated sulfur 1.0 Levomycitin Streptocide at 0.5 25 ml of 3% boric acid solution Mix . Give. Indicate: Apply to the injured area once a day	10. Take	Dill water 100 ml Indicate: 1 teaspoon 3-4 times a day
11. Take	Hydrogen peroxide solution 3% 100 ml Give. Indicate:for lotions 12. Take:	12. Take:	Analgin 0,1 Cocoa butter as needed Mix to form suppositories Give 6 doses. Indicate: 1 suppository in the rectum for paine, for child 12 years old
13. Take	Precipitated sulfur 1,0 Camphor alcohol Boric acid 2% Ethanol 96% per 10 ml Mix. Give. Indicate. Vidal's milk. Apply to the injured area 2 times a day	14. Take	Menthol 0,2 Salicylic acid 0,6 Talk Zink oxide per 0,6 Glycerin 9,0 Ethanol 70% 20ml Mix. Give. Indicate: apply to the injured area 1 time a day

9. Instructive materials for mastering professional skills:

9.1. Methods of performing work, stages of implementation.

Each student performs one task from the proposed set of individual tasks.

Write out and issue a prescription in accordance with the requirements of the order of the Ministry of Health of Ukraine No. 360 dated July 19, 2005. Give a description of the drug. Describe the optimal variant of the technology of suppositories by rolling out with theoretical justification and necessary calculations, taking into account the dosing of toxic and potent drugs and the physicochemical properties of drugs. Give an assessment of quality. Specify clearance of the drug before the distribution. Write a passport control written.

9.2. Theoretical questions.

Answer (in writing) the questions of one of the following individual tasks.

- Corrigents which are used for the manufacture o medicines for children and the eldery;
-Peculiarities of old age, age gradations and their characteristics from the point of viev of polypragmatism and polymorbidity.

10. Materials for self-control of mastering the knowledge, skills, and skills provided by this work.

10.1. Answer (in writing) the questions of one of the following individual tasks.

Task 1

Anatomical and physiological features of the child's body require the creation of liquor forms, which have a high _____, _____ and minimal _____.

Answer: bioavailability, pharmacotherapeutic effectiveness, side effects.

Task 2

Internal solutions for children are prepared _____ without adding of stabilizers or conservants.

Answer. mass method

Task 3

All dosage forms manufactured for children, especially for infants, are subject to full _____ control.

Answer: Chemical

Task 4

Geriatric drugs are divided into two large groups: drugs that are used for an , _____and drugs that are prescribed for the _____.

Answer: pharmacological test, prevention of premature aging

Task 5

A feature of geriatric practice is the _____ selection of the dose of individual drugs for an individual person with a clear _____, method of application, interaction with food, and other factors.

Answer: Individual, separation of time

11. The topic of the next lesson. «Final control 2».

Topic of the lesson№28: «Final control №2» - 2 hours

1. Actuality of the topic: Final modular control will assess students' knowledge of the main areas of regulation of drug production in Ukraine, methods of dosing drugs and excipients, technology of soft dosage forms of any composition, types of solvents, general rules and special cases of preparation of liquid dosage forms for injections, quality control and register before dispensing.

2. Specific objectives:
As a result of studying the discipline, students should **know** the following:
• Characteristics of liniments as a dosage form and dispersed systems;
• Production of liniments, their technology;
• Characteristics of diphilic (hydrophilic-lipophilic) ointment bases and emulsifiers for their production. Characteristics of suspension ointments and their technology. Official prescriptions of suspension ointments;
• Characteristics of combined ointments and general rules of their manufacture. Stages of the technological process of manufacturing multiphase ointments taking into account the physicochemical properties of drugs. Biopharmaceutical aspects of ointments.,
• Characterization of suppositories as a dosage form and as dispersed systems. Classification of suppositories. Requirements of the State Pharmacopoeia to them. Methods of prescribing suppositories; checking the doses of toxic and potent drugs in them. Pharmacopoeial prescriptions and difficult cases. Bases for suppositories; requirements for them and a brief description. Features of prescribing sticks and calculating the basis for them;
• Composition and properties of official suppository bases used in the casting method. Calculations of the number of suppository bases for the manufacture of candles, balls and sticks by pouring;
• Aseptic conditions of drug production. The procedure for monitoring compliance with the sanitary and anti-epidemic regime in pharmacies;
• Characteristics of injectable dosage forms; requirements set for them by the State Pharmacopoeia and their implementation;
• Characteristics of stabilizers used for the manufacture of injectable solutions; their classification. Principles of selection of stabilizers and calculation of their quantity;
• Isotonicity values for injection solutions.
• Characteristics of dosage forms used for the treatment of eye diseases.
• Characteristics of dosage forms with antibiotics; requirements for them and factors affecting their stability.
• Dosage forms for infants and children under 1 year. Characteristics of children's dosage forms. Dosage forms that have advantages in geriatrics.

Students should also **be able to**:

• use normative, background, educational, and scientific literature to accomplish professional tasks;
• read and write recipes in Latin;
• prepare dosage forms based on extemporal recipes with the implementation of successive technological operations, accomplish tasks of preparation and release of pharmaceutical dosage forms, taking into account the compatibility of the components of the prescription;
• choose the optimal option of technology of medications for stages of preparation with a quality assessment at each stage;
• check the doses of narcotic and potent medications and the norms for the release of narcotic and intoxicating substances by prescription;
• calculate components of a recipe;
• evaluate the quality of the finished pharmaceutical dosage form;
• identify frequently repeated medications recipes in a pharmacy and make their intra-pharmaceutical procurement;
• conduct a set of measures ensuring pharmacies compliance with the sanitary regime and control of the aseptic preparation of dosage forms;
• use means of small mechanization in the preparation and packaging of dosage forms and medications;
• ensure the safety of goods and materials;
• observe the rules for the occupational safety and health;
• comply with the deontological principles of relationship with employees of pharmacies, patients and their relatives, physicians of medical and preventive institutions;
• issue a passport of written control for the manufactured medicinal product;
• conduct sanitary education training among patients.

3. TASKS FOR INDEPENDENT EXTRACURRICULAR WORK:
3.1. Repeat the theoretical material of the topics:

1. Soft dosage forms.
2. Liniments.
3. Ointments are homogeneous.
4. Ointments are heterogeneous, combined.
5. Preparation of suppositories by pumping and pouring method.
6. Requirements for the manufacture of sterile and aseptic drugs in pharmacies. Solutions for injection.
7. Isotonic, physiological solutions.
8. Suspension for injection.
9. Ocular dosage forms.
10. Dosage forms with antibiotics.
11. Pediatric and geriatric dosage forms.

3.2. To repeat the basic normative documentation regulating the prescription, conditions of preparation, technology, storage and release of solid dosage forms and medicinal products with liquid dispersion medium.

LIST OF QUESTIONS FOR ORAL DISUSION:

1. Characteristics of liniments as a dosage form and their classification depending on the nature of bases applied, medical supplies, and the physicochemical properties of ingredients. Quality assessment of liniments and registration of their release.

2. Technology and homogeneous of suspension liniments (provide examples).

3. Preparation of emulsions and combined liniments.

4. Characteristics of ointments as a dosage form and a dispersion system. Features of dermatological ointments with resorcinol, zinc sulfate, salicylic acid. Influence of bases on the bioavailability of pharmaceutical substances from ointments.

5. Classification of ointments depending on the purpose, place of application, consistency, physicochemical properties of included pharmaceutical substances. Pastes, their classification; particularities of the dermatological pastes preparation.

6. Characteristics of ointments bases and requirements for them. Characteristics of hydrophobic ointment bases (hydrocarbons, fats, silicone).

7. Characteristics of hydrophilic bases (jels of proteins, polysaccharides, polyethylene oxides, etc.). Characteristics of protective pastes and their technology.

8. Characteristics of diphilic (emulsion) bases which contain lanolin and its derivatives, pentol, sorbitan oleate, polyols, etc.

9. Homogeneous ointments and their characteristics. Main technological stages of their preparation and rules for homogeneous ointment administration.

10. Suspension (trituration) ointments; their classification and technology depending on the percentage of pharmaceutical substances. Standard recipes of suspension ointments.

11. Emulsion ointment; their characteristics and technology. The preparation of ointments with protargol, colloid silver, tannin, dry and thick extracts.

12. Ointments of combined type and their technology. Provide examples. The preparation of ointments with the usage of pharmaceutical compounding (concentrates and half-finished products). Assessment of the ointments quality and registration of their release according to the SPU.

13. Characteristics of suppositories as a dosage form and a disperse systems; their classification depending on the purposes. Suppository bases, their classification. Characteristics of hydrophilic bases.

14. The SPU requirements for suppositories, the meaning of their geometrical shape. Prescription of suppositories and checking the doses of poisonous and potent pharmaceutical substances. The composition and preparation of gelatin-glycerol suppository bases. Introducing soluble and insoluble pharmaceutical substances into water-soluble bases.

15. Characteristics of hydrophobic suppository bases. Preparation of suppositories with pharmaceutical substances, soluble and insoluble in fat suppository bases.
16. Technological stages of suppositories preparing by hand rolling. The introduction into suppositories of pharmaceutical substances soluble in water and other indifferent liquids depending on prescribed amount.
17. Preparation of suppositories with protargol, collargol, tannin, ichthiol, extracts of different consistencies. Packaging, registration to the release, and storage conditions.
18. Technological stages of preparing suppositories by pouring. What are the forward and backward ratios of medications substitution and in which cases are they used?
19. Determination of dosage forms for injection and the SPU requirements for them. Ways of administration of injectable solutions. List of technological stages of solutions for injection preparation and provide their brief description.
20. Asepsis, its importance to ensure sterility and apyrogenicity of injectable solutions. Creation of aseptic conditions in a pharmacy in accordance with the order of the MoH of Ukraine №275 dated 15.05.2006. The concept of pyrogenic substances and verifying of apyrogenicity of injectable solutions preparations in accordance with the requirements of the SPU.
21. Characteristics of solvents used for the preparation of injectable solutions and requirements for them. Conditions for obtaining and storing water for injection, according to the order of the MoH of Ukraine.
22. Classification and characteristics of methods of solutions for injection and auxiliary materials sterilization. Physical methods of sterilization, the applied equipment.
23. The concept of the stabilization of injectable solutions. Mechanism of injectable solutions stabilization with salts of weak bases and strong acids, and salts of strong bases and weak acids (provide specific examples).
24. Antioxidants; the principle of their action in stabilizing solutions of easily oxidized substances (provide examples).
25. Materials and equipment used for filtrating injectable solutions. Particularities of technology of thermolabile substances solutions and suspensions for injection (provide examples).
26. Particularities of the technology of glucose solutions for injection. How to conduct the control of sterility of injectable solutions according to the requirements of the SPU?
27. Particularities of the technology of sodium bicarbonate solutions for injection. Assessment of the injectable solutions quality.
28. Particularities of the technology of ascorbic acid solutions for injection. Stepwise quality control of medications for injection according to the order of the MoH of Ukraine № 626 dated 15.12.2004.
29. Meaning of the injectable solutions isotonicity. Methods of calculating the isotonic concentrations of medications. Examples of calculations according to

Raoult's law (cryoscopic method) and with the usage of isotonic sodium chloride equivalents.

30. The concept of infusion solutions (physiological solutions); their classification and purposes. Requirements for isotonicity, isoionity, and isohydricity for these solutions.

31. Particularities of the technology of plasma-substituted solutions, for example Ringer, Ringer-Locke solutions, etc. Calculations of isotonicity of injectable solutions with the usage of the Van't Hoff equation and Mendeleev-Clapeyron equation.

32. Characteristics of drug forms used in ophthalmology (drops, lotions, washings, emulsions, suspensions, ointments, powders). Requirements for ophthalmic dosage forms.

33. Providing stability of lotions and eye drops during the preparation, use, and storage. Classification of stabilizers.

34. Justification of necessity of eye drops prolonged action and methods of achieving according to the SPU requirements.

35. Maintenance of sterility of eye drops and lotions before and after packaging disclosure. The nomenclature of preserving agents, their classification.

36. Particularities of the eye drops technology depending on the solubility of included ingredients and calculations required for the drops isotonicity achievement.

37. Requirements for eye ointments. The eye ointments technology; particularities of introducing zinc sulfate and resorcinol into them.

38. Characteristics of the bases used for the preparation of eye ointments, and the requirements for them. Assessment of the ophthalmic dosage forms quality, registration of their release, storage conditions in accordance with the requirements.

39. SPU requirements for dosage forms with antibiotics. Conditions of their preparation. Particularities of introducing antibiotics into solid dosage forms.

40. Particularities of introducing antibiotics into liquid dosage forms (lotions, washings, rinses, eye and ear drops). What methods are used to achieve their stability?

41. Characteristics of the bases for the preparation of ointments with antibiotics, the conditions for their sterilization. Particularities of antibiotics in ointments and suppositories introduction.

42. Difficult cases in prescriptions, their classification and ways to overcome them (changing the order of dissolving, addition of excipients, disintegrating, heating, etc.).

43. Determination of pharmaceutical incompatibility and their classification. Rights and duties of the pharmacist-technician in relation to such recipes according to the order of the Ministry of Health of Ukraine №360 dated 19.07.2006. Concept of pharmacological incompatibility.

44. Physical (physicochemical) incompatibility; their causes and ways to overcome (provide examples).

45. Chemical incompatibility; their causes and ways to overcome (provide examples).
46. Classification and examples of chemical incompatibility, which proceeds with the formation of precipitate. Neutralization and saponification reactions in different dosage forms (provide examples).
47. Incompatible medications which contain alkaloids, cardiac glycosides, antibiotics, vitamins. Possible ways to overcome the incompatibility in liquid and soft dosage forms.
48. Causes of chemical incompatibility, which proceeds with the discoloration and gases release. Reactions which proceed without visible features.
49. Physical and chemical incompatibilities of powders; possible ways to overcome them.

4. INDEPENDENT AUDITOR'S WORK IN THE CLASS:

TASKS 1. Perform written work according to the proposed option.
TASKS 2. To answer questions from the list of questions for oral questioning.
TASK 3. Repeat the tests.

Tests with answers

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. 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

12 A pharmacist prepares a liniment-solution. Specify cookware for the liniment preparation:

A. Stand
B. Cylinder
C. * Vacuum bottle
D. Mortar
E. Measured bulb

13 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

14 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

15 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

16 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

17. 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

18. 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

19. 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

20. 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

21. 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

22. 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

23. 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

24. 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

25. 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

26. 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

27. 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

28. 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

29. 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

30. 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

31. The pharmacy got different bases for ointments. What kind of ointment bases are PEO?
A. * Hydrophilic
B. Fatty
C. Silicones
D. Differential
E. Hydrocarbon
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

32 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

33. 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

34. 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

35. 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

36. 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%

37. 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

38. 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

39. 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

40. 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

41. 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

42. 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.

43. 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

44. 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

45. 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

46. 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

47. 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

48. 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

49. 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

50. 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

51. 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

52. 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

53. 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

54. 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

55. 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.

56. 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

57. 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

58. 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

59. The mass of one vaginal suppository should be within:
A. From 1.0 g to 3.0 g
B. From 1.0 g to 4.0 g
C. From 1.0 g to 5.0 g
D. 1.5 g to 3.0 g
E. * From 1.5 g to 6.0 g

60. A pharmacist prepares vaginal suppositories. Specify what should be the mass of the vaginal suppository, if it is not listed in the recipe:
A. 3.0 g
B. 2.5 g
C. * 4.0 g
D. 2.0 g
E. 1.5 g

61. Which of the following vaginal dosage forms are made in pharmacy practice?
A. * pessaries
B. Vaginal tablets
C. Vaginal capsules
D. Vaginal foams
E. Tablets for the preparation of vaginal solutions and suspensions

62. The doctor prescribed pessaries and did not indicate their mass. Specify the mass with which the pessaries should be prepared:
A. 3.0
B. * 4.0
C. 1.5
D. 0.5
E. 6.0

63. The doctor prescribed rectal suppositories and did not indicate their mass. Specify the mass with which it is necessary to prepare suppositories:
A. 4.0
B. 1.0
C. * 3.0
D. 5.0
E. 2.0

64. The recipe does not indicate the form of rectal suppositories. What is the best form to prepare suppositories?

A. Cylindrical
B. pessary
C. spherical
D. * torpedo
E. Ovoid

65. In the manufacture of rectal suppositories, the pharmacist adhered to the specified mass and shape. Specify the maximum diameter of the candles can be made:
A. * 1.5 cm
B. 2.0 cm
C. 0.5 cm
D. Up to 4 cm
E. Arbitrary

66. Specify the hydrophilic base, which is used to prepare suppositories:
A. * Polyethylene oxide
B. Cacao butter
C. hydrogenated fats
D. Witepsol
E. Lanoleva

67. The pharmacist needs to prepare 10 rectal suppositories based on cocoa butter, each of which contains 0.2 g of anestezin. Specify the amount of base to use:
A. 10.0 g
B. * 28.0 g
C. 30.0 g
D. 40.0 g
E. 37.5 g

68. 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 purified water, glycerin or triturated with the indicated liquids, emulsified and mixed with the base.
B. Protargol is dissolved in part of the molten base, and then mixed with the rest of the base.
C. Protargol dissolved in its melted base
D. Protargol is introduced into the composition of the hydrophobic mass in the form of fine powder.
E. Protargol is ground with a few drops of fatty oil, and then mixed with ground base.

69. In the manufacture of suppositories by rolling out after the introduction of chloral hydrate into cocoa butter, the suppository mass became viscous and began

to spread. Does the substance need to be added to the suppository mass to restore the density and plasticity?

A. * Wax
B. Glycerol
C. Purified water
D. Dimexide
E. Starch

70. The pharmacy received a prescription for making cocoa butter based balls. Manufacturing method you need to choose with this?

A. Casting
B. * Download
C. Pressing
D. Granulation
E. Draining

71. The pharmacist prepares the balls on a fat basis by downloading. Specify the basis to be used:

A. * Cacao butter
B. Butyrol
C. Vaseline
D. Sebuvinol
E. Witepsol

72. For the preparation of suppositories by the method of manual formation (download) use the basis:

A. Witepsol
B. Confectionery fat
C. Lanolev basis
D. * Cacao butter
E. Solid fat on palm kernel

73. After the introduction of medicinal substances into the cocoa butter, the suppository mass disintegrated. Does the substance need to be added to the suppository mass to provide plasticity?

A. Vaseline
B. Paraffin
C. Glycerol
D. Wax
E. * Anhydrous lanolin

74.The pharmacy prepares rectal suppositories with 0.1 g of euphyllin by download method. Specify the number of bases for 10 suppositories:

A. 19.5 g

B. 28.0 g
C. * 29.0 g
D. 30.0 g
E. 30.5 g

75. What role does anhydrous lanolin in the suppository mass in the manufacture of suppositories by rolling out?
A. * Plasticizer
B. Solvent
C. Preservative
D. solubilizers
E. emollients

76. The pharmacist needs to prepare suppositories using the rolling-out method, which include quinine hydrochloride in an amount of less than 5%. Specify a rational way of introducing the substance into the base:
A. Grind dry and mix with cocoa butter
B. Dissolve in melted cocoa butter
C. * Dissolve in the minimum amount of purified water and add cocoa butter
D. Mix with glycerin and add to cocoa butter
E. disperse with vaseline oil and then mix with base

77. The pharmacist prepares suppositories by rolling out with novocaine in an amount up to 5%. Specify a rational way of introducing the substance into the base:
A. Dissolve in the minimum amount of castor oil
B. Dissolve in the minimum amount of alcohol-water-glycerin mixture
C. Dissolve in melted base
D. * Dissolve in the minimum amount of purified water
E. Dissolve in ethyl alcohol

78. A pharmacist prepares suppositories with streptocid on a polyethylene oxide basis. Specify a rational way of introducing the substance into the base:
A. Dissolve in melted base
B. Vegeted and mixed with base
C. Grind with a small amount of purified water
D. * Type in suspension
E. Mix with Vaseline Oil

79. For the patient you need to prepare glycerin suppositories. Specify the components that are included:
A. Glycerin, sodium carbonate
B. Glycerin, sodium bicarbonate
C. Glycerin, stearic acid

D. * Glycerin, sodium carbonate, stearic acid
E. Sodium bicarbonate, stearic acid, glycerin

80. Specify the composition of gelatin-glycerin base according to the requirements of the DF:
A. * Gelatin 1 hour, Glycerol 5 hours, Waters purified 2 hours
B. Gelatin 1 h., Glycerol 2 h., Purified Water 5 h.
C. Gelatin 2 hours, Glycerol 2 hours, Purified Water 5 hours
D. Gelatin 5 h., Glycerol 1 h., Purified Water 2 h.
E. Gelatin 5 h., Glycerol 2 h., Purified Water 1 h.

81. The disintegration time for hydrophilic suppositories should be no more than:
A. 20 minutes.
B. 30 min.
C. 45 min.
D. 2 hours.
E. * 1 hour

82. Full deformation time for suppositories in a lipophilic base should be no more than:
A. 5 minutes.
B. 10 min.
C. * 15 minutes.
D. 20 min.
E. 25 min.

83. Specify the parameter determined to establish the quality of suppositories on a hydrophobic basis in accordance with the requirements of the DF of Ukraine:
A. * Melting temperature
B. Boiling temperature
C. Freezing point
D. Temperature of cure
E. Temperature limits of distillation

84. Specify the parameter defined to establish the quality of suppositories on a hydrophilic basis in accordance with the requirements of the DF of Ukraine:
A. * Time of dissolution
B. Full freezing time
C. Boiling time
D. Distillation time
E. Melting time

85. The pharmacist needs to prepare suppositories on a gelatin-glycerin basis. Specify the technology base for such suppositories:

A. * Purified water is added to the gelatin and left to swell for 30-40 minutes. After that, glycerin is added and, with stirring, heated in a water bath until a transparent homogeneous mass is formed.

B. Gelatin is dissolved in hot water, glycerol is added and mixed.

C. Gelatin is dissolved in glycerin, add purified water, mix

D. Water is mixed with glycerin and gelatin is dissolved in the resulting mixture.

E. Gelatin is dissolved in a minimum amount of ethyl alcohol, add purified water and glycerin

86. The amount of the base should be used to prepare suppositories according to the recipe:
Rp.: Anaesthesini 0.1
Xeroformii 0.5
Olei Cacao qs ut fiant suppositorium
Da tales doses number 10.
Signa. 1 candle per day rectally

A. * 24.0

B. 25.0

C. 30.0

D. 36.0

E. 40.0

87. A pharmacist prepares suppositories with chloral hydrate. What is the peculiarity of preparing suppositories with this medicinal substance?

A. * For large quantities, you must additionally enter the seal.

B. It is always necessary to add anhydrous lanolin.

C. Always in the form of an aqueous solution

D. soluble in alcohol-water-glycerin mixture

E. Always in suspension.

88. For the preparation of suppository dosage forms that do not require special preparation conditions, it is advisable to use as a basis:

A. * Polyethylene oxide base

B. Cacao butter

C. Lazopol

D. gelatin-glycerin base

E. Soap-glycerin base

89. A pharmacist prepares casting vaginal suppositories. Specify a hydrophilic base that he can use:

A. Cacao butter

B. Witepsol

C. * Polyethylene oxide

D. Solid fat
E. Butyrol

90. The pharmacist prepares suppositories on the basis of fat by the method of pouring. Specify the basis to be used:
A. * Butyrol
B. Vaseline
C. Cacao butter
D. Wax
E. Spermaceti

91. The pharmacist needs to prepare 10 rectal suppositories based on cocoa butter, each of which contains 0.2 g of anestezin. Specify the amount of base to use:
A. 10.0 g
B. * 28.0 g
C. 30.0 g
D. 40.0 g
E. 37.5 g

92. The pharmacist needs to prepare suppositories with novocaine based on cocoa butter. Specify the optimal method of introducing novocaine:
A. Introduce Novocain in the form of fine powder
B. * Enter Novocain in the form of an aqueous solution
C. Grind Novocain parts of the molten base
D. Grind novocaine in the presence of a volatile liquid
E. Grind novocaine with a related liquid

93. A pharmacist needs to prepare suppositories using the butyrolu-based pouring method. Specify a rational way to prepare the mold for casting:
A. * Smeared with soapy alcohol.
B. Oiled with castor oil
C. Smear alcohol-water-glycerin mixture
D. Oiled Vaseline Oil

E. Lubricated with salicylic alcohol
94. The pharmacist prepares the suppositories by casting. What factor should be used to calculate the amount of gelatin-glycerin base?
A. Increase in volume
B. * Conversion factor
C. Water absorption coefficient
D. Isotonic coefficient
E. Substitution rate

95. The pharmacist prepares the suppositories by casting. What is the ratio of the transition from fatty bases to gelatin-glycerin?

A. * 1.21
B. 1.20
C. 1.31
D. 1.11
E. 1.25

96. A pharmacist prepares rectal suppositories with cocoa butter which contain dimedrol in an amount of less than 5%. Specify a rational way of introducing the substance into the base:

A. * dissolved in purified water
B. dissolved in olive oil
C. dissolved in melted cocoa butter
D. dissolve in vaseline oil
E. dissolved in alcohol

97. Pharmacist prepared suppositories by casting. What coefficient did he use when calculating the gelatin-glycerin basis?

A. * Transition rate
B. Increase volume
C. Water absorption coefficient
D. Isotonic coefficient
E. Substitution rate

98. For the patient prepare urethral sticks. Specify what parameters the doctor must specify in the prescription for the pharmacist to calculate the amount of the basis.

A. Diameter, length and number of sticks.
B. Diameter and number of sticks.
C. The number and length of sticks.
D. The diameter of the sticks and the appearance of the base.
E. Type of base and number of sticks.

99. 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.

100. 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.

101. 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

102. 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

103. 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

104. 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

105. 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

106. What is a shelf-live for sterile solutions for injections prepared and closed by aluminum cup in pharmacy?
A). 10 days
B). 1 month
C). 2 month
D). 5 days
E). 3 month

107. A pharmacist prepared a solution for injections. What the method of sterilization of tableware is used for preparation of aseptical medicines?
A). Dry air
B). Tindalization
C). Fluid vapour
D). Chemical substances
E). UV-rays

108. What the method used for the control of parameters while sterilizing by autoclave?
A). Thermo-tests
B). Stabilizers
C). Buffer solutions
D). Isotonic agents
E). Antioxidants

109. A chemist"s shop prepares solution for injections. When should it be checked for the absence of mechanical inclusions?
A). Before and after sterilization
B). Before filtration
C). Before chemical analysis
D). After registration for dispensing
E). Before and after packing

110. A pharmacist prepares a solution for injections. What amount of the bottle should be checked for the absence of mechanical inclusions?
A). 50% of all bottles
B). All bottles (100%)
C). 75 % of all bottles
D). 25 % of all bottles

E). 10 % of all bottles

111. The pharmacist has prepared a solution for injection containing 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

112. The pharmacist has prepared an injectable solution with a substance that is easily oxidized and requires stabilization by an antioxidant. Specify this substance:

A * Ascorbic acid
B Diphenhydramine
C Sodium chloride
D Urotropin
E Calcium gluconate

113. Stabilization of novocaine solutions for injection is carried out in order to:

A * Prevention of hydrolysis of salts formed by strong acids and weak bases
B Prevention of redox processes
C Prevention of hydrolysis of salt formed by weak acid and strong base
D Prevention of hydrolysis of salt formed by weak base and weak acid
E To improve the dissolution of novocaine

114. For the preparation of 1000 ml of 5% glucose solution use Weibel stabilizer in the amount of:

A * 50 ml
B 100 ml
C 10 ml
D 20 ml
E 25 ml

115. What is the cause of instability of solutions of caffeine-sodium benzoate for injection:

A * Hydrolysis (salt of strong base and weak acid)
B Hydrolysis (salt of strong acid and weak base)
C Slight oxidation of the solution
D Caramelization of the solution
E Neutralization reaction

116. The pharmacist prepared a solution for injection containing 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

117. The pharmacist prepares a solution for injection with a substance that requires stabilization with a 0.1M solution of hydrochloric acid. Specify this substance:
A * Novocaine
B Calcium chloride
C Potassium chloride
D Hexamethylenetetramine
E Sodium benzoate

118. The pharmacist prepared an injectable 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

119. The pharmacist prepared an injectable solution using a stabilizer - 0.1M 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

120. Stabilization of novocaine solutions for injection is carried out in order to:
A * Prevention of hydrolysis of salts formed by strong acids and weak bases
B Prevention of redox processes
C Prevention of hydrolysis of salt formed by weak acid and strong base
D Prevention of hydrolysis of salt formed by weak base and weak acid
E To improve the dissolution of novocaine

121. 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

122. 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

123. 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

124. 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

125. 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

126. 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

127. 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

128. 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

129. An infusion of 5% glucose solution is prepared in the pharmacy. Specify the substance used to ensure the isotonicity of the solution:

A. * Sodium chloride
B. Sodium nitrate
C. Sodium sulfate
D. Sodium sulfite
E. Borate acid

130. The common technology in the production of injectable solutions of calcium chloride and magnesium sulfate is that they:

A. * Requires additional cleaning
B. Need stabilization
C. Prepared under aseptic conditions
D. Do not require sterilization
E. Do not require additional cleaning

131. When calculating the isotonic concentration of solutions for injections, the values of blood plasma depression are used. Specify its value:

A. * 0.52^{o}C
B. 0.34^{o}C
C. 0.10^{o}C
D. 0.45^{o}C
E. 0.90^{o}C

132. The pharmacy received a prescription for the solution for injection. Indicate which of the following medicinal substances CANNOT be sterilized:

A. * Hexamethylenetetramine

B. Novocaine
C. Glucose
D. Calcium chloride
E. Dibazole

133. The pharmacist prepared 100 ml of isotonic sodium chloride solution. Specify the method of sterilization of the final product in the pharmacy:

A. * Steam
B. Air
C. Gas
D. Mechanical
E. Physical

134. The pharmacist prepared an injectable solution of sodium bicarbonate. Specify the maximum volume of the vial:

A. * 80%
B. 100%
C. 0.5
D. 0.4
E. 0.3

135. Methods of sterilization used for the preparation of drugs under asepsis can be divided into physical, mechanical, chemical. Specify the method of sterilization that belongs to the chemical:

A. * Addition of preservatives
B. Dry heat sterilization
C. Radiation sterilization
D. Steam sterilization under pressure
E. UV sterilization

136. Inject a 10% sodium chloride solution for injection into the pharmacy. What is the best way to sterilize a pharmacist?

A. In an autoclave with saturated steam under pressure
B. Sterile filtration through a membrane filter
C. Gas sterilization
D. Dry heat sterilization
E. Radiation sterilization

137. Injectable solutions are prepared in the pharmacy, which should be pyrogen-free. Which substance solution can be depyrogenated by adsorption using activated carbon?

A. * Glucose
B. Atropine sulfate
C. Papaverine hydrochloride

D. Scopolamine hydrobromide
E. Platyphylline hydrotartrate

138. According to the doctor's prescription, 100 ml of 0.9% sodium chloride solution was prepared in the pharmacy. What is the mode of sterilization of this solution?

A. * 120°C - 8 min
B. 120°C -12 min
C. 120°C -15 min
D. 180°C - 30 min
E. 100°C - 15 min

139. 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.

140. The pharmacist prepared 150 ml of 10% glucose solution. Indicate how much Weibel's liquid he added to stabilize this solution?

A. * 7.5ml.
B. 5ml.
C. 10ml.
D. 15ml.
E. 3ml.

141. 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%.

142. 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.

143. 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.

144. 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.

145. 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.

146. 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.

147. 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)

148. The pharmacist prepared eye drops with trypsin. How is the sterility of the drops ensured?

A. * Preparing under aseptic conditions, without subsequent thermal sterilization.
B. Liquid steam sterilization.
C. Sterilization by UV radiation.
D. Radiation sterilization.
E. Sterilization by saturated steam under pressure.

149. The pharmacist prepared eye drops with dicaine. What substance should be used to bring the solution to isotonic concentration:
A. * Sodium chloride.
B. Sodium sulfate.
C. Sodium nitrate.
D. Boric acid.
E. Methylcellulose.

150. In the conditions of a drugstore prepare eye drops. Specify the solution of which substance is not isotonic:
A. * Colargol.
B. Pilocarpine hydrochloride.
C. Chloramphenicol.
D. Riboflavin.
E. Citral.

151. The pharmacist prepared eye drops with easily soluble drug substance. Specify the volume of purified water to dissolve it:
A. * Dissolve in half the purified water.
B. Dissolve in half the volume of purified water.
C. Dissolve in 1/3 of the volume of purified water.
D. Dissolve in 1/4 volume of purified water.
E. Dissolve in 3/4 volume of purified water.

152. The pharmacist prepared eye ointment with resorcinol. Specify the type of dispersed system that forms resorcinol when introduced into the pharmacopoeial base:
A. * Emulsion.
B. Suspension.
C. Solution.
D. Alloy.
E. Combined.

153. In the manufacture of eye ointments of great importance is the degree of dispersion of drugs. Indicate which drug substance, when introduced into the pharmacopoeial eye base, is first thoroughly rubbed with sterile Vaseline oil?
A. * Mercury oxide is yellow.

B. Resorcinol.
C. Pilocarpine hydrochloride.
D. Zinc sulfate.
E. Ethylmorphine hydrochloride.

154. Zinc ointment with sulfate is made in the pharmacy. Specify the type of dispersed system formed by zinc sulfate when administered to pharmacopoeial eye ointment.

A. * Emulsion.
B. Suspension.
C. Solution.
D. Alloy.
E. Combined.

155. The pharmacy received a prescription for an eye ointment containing zinc sulfate. Specify the correct method of administration of zinc sulfate:

A. * Dissolve in a small amount of water.
B. Rubbed with glycerin.
C. Grind with a liquid that is suitable for the base.
D. Grind with a particle of molten base.
E. Grind with a weighed base.

156. In the composition of eye drops as an excipient used…

A. * Prolongator.
B. Solvent.
C. For isotoning.
D. Preservative.
E. Corrigent.

157. The pharmacy received a prescription for eye drops, which include protargol. Which sterilization regimen should be chosen by the pharmacist?

A. * The solution is not subject to sterilization.
B. Liquid steam.
C. Autoclaving.
D. UV irradiation.
E. Dry heat.

158. 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.

159. 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.

160. 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.

161. 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.

162. 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.

163. 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.

164. 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).

165. Specify the substance necessary for isotoning of eye drops with chloramphenicol:

A. * Sodium chloride.
B. Analgin.
C. Potassium iodide.
D. Ascorbic acid.
E. Glucose.

166. 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.

167. 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.

168. Preparation of medicinal facilities is in aseptic terms (Solutions for injections, eye medical forms). Estimation of qualityassessment. The pharmacist prepares several solutions with antibiotics in aseptic conditions. What kind of substance can he sterilize?

A. * Levomycetin
B. Benzylpenicillin sodium
C. Neomycin sulfate
D. Benzylpenicillin-potassium
E. Polymyxine sulfate

169. "The pharmacist prepared the powder by prescription:
Rp .: Velzylpenicyllini-natrii 100,000 ED
Streptocidi 2,0
M.f.rulv.
D.S.: For blowing.
Indicate the amount of antibiotics if 1000000 units corresponds to 0.6 g: "
A. * 0,06
B. 1,2
C. 0,18
D. 0,6
E. 2.0

170. Preparation of medicinal facilities is in aseptic terms (Solutions for injections, eye medical forms). Estimation of qualityassessment. Specify the substance necessary for isotoning of eye drops with levomycetin:
A. * Sodium chloride
B. Analgin
C. Potassium iodide
D. Ascorbic acid
E. Glucose
171. To prepare eye drops with antibiotic a dispensing chemist has been using flowing steam sterilization under 100 ºC for 30minutes.What antibiotic allows for such sterilization?
A. Levomycetin (Chloramphenicol)
B. Sodium benzylpenicillin
C. Streptomycin sulfate
D. Biomycin
E. Erythromycin
172. A pharmacist made eye drops of pilocarpine hydrochloride and adrenaline hydrochloride solution. A peculiarity of the incorporation of the adrenaline hydrochloride solution is that it is added:
A. After sterilization, aseptic
B. After dissolving of solids
C. To the half dose of solvent
D. In the first place
E. After isotoning

173. A pharmacist has dissolved a medicinal substance in sterile purified water to make an eye ointment. Specify this medicinal substance:

A. Pilocarpine hydrochloride
B. Xeroform
C. Menthol
D. Basic bismuth nitrate
E. Purified sulfur

174. A pharmacist needs to prepare 10.0 g of eye ointment vehicle. What amounts of lanolin and vaseline should be taken?

A. .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

175. Specify the base for the preparation of antibiotic ointments:

A. 6 parts of vaseline + 4 part of lanolin
B. 8 parts of vaseline + 2 part of lanolin
C. 5 parts of vaseline + 5 part of lanolin
D. 7 parts of vaseline + 3 part of lanolin
E. 5 parts of vaseline + 1 part of lanolin

176. A pharmaceutist prepares several different solutions with antibiotics under aseptic conditions. He can sterilize the solution of the following substance:

A. Chloramphenicol
B. Benzylpenicillin-sodium
C. Neomycin sulphate
D. Benzylpenicillin-potassium
E. Polymyxin sulphate

177. To prepare eye drops with antibiotic a pharmacist has using flowing steam sterilization under 100 ºC for 30 minutes. What antibiotic allows for such sterilization?

A. Levomycetin (Chloramphenicol)
B. Sodium benzylpenicillin
C. Streptomycin sulfate
D. Biomycin
E. Erythromycin

178. A pharmaceutist is preparing an ointment under aseptic conditions on the sterile ointment base - composition of vaseline and lanoline with the ratio 6:4. The drug substance is incorporated by suspension type. Such technology of ointment preparation is typical for the following substance:

A. Benzylpenicillin sodium
B. Sodium chloride
C. Thiamine chloride
D. Pilocarpine hydrochloride
E. Sodium sulfate

179. A pharmacy received a prescription for preparation of dermatological ointment with benzylpenicillin. Specify the type of ointment that necessary to prepare:

A. Suspension ointment
B. Liquid ointment
C. Hydrophilic ointment
D. Alloy ointment
E. Combined

180. A pharmacy received a formulation for eye drops containing 1% solution of pilocarpine hydrochloride. What substance should be used to ensure that the resultant solution is isotonic?

A. Sodium chloride
B. Boric acid
C. Glucose
D. Sodium nitrate
E. Sodium sulfate

181. 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.

182. 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.

183. The pharmacist should prepare 10.0 g of eye ointment base for medicinal forms with antibiotics. What amounts of lanolin and vaseline were used for this purpose?

A. * 4.0 g of anhydrous lanolin and 6.0 g of vaseline.
B. 1.0 g of anhydrous lanolin and 9.0 g of vaseline.
C. 2.0 g of anhydrous lanolin and 8.0 g of vaseline.
D. 7.0 g of anhydrous lanolin and 3.0 g of vaseline.
E. 3.0 g of anhydrous lanolin and 7.0 g of vaseline.

184. 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).

185. Specify the substance necessary for isotoning of eye drops with chloramphenicol:

A. * Sodium chloride.
B. Analgin.
C. Potassium iodide.
D. Ascorbic acid.
E. Glucose.

186. The pharmacist 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.

187. 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.

6. Information needed for knowledge-skills development can be found in the textbooks:

A) 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. Practicum on pharmacy technology of medicines; for studio Pharmacist higher tutor institutions / O. I. Tikhonov, T. G. Yarnykh, V. O. Sobolev, and others; Ed. OI Tikhonova. - X .: View of the NFPA: Golden Pages, 2002. - 256 p.

B) additional literature:

1. Dictionary-Directory for Pharmacy Specialists in Management and Economics, ed. prof. Chernykh V.P. // Kharkiv: Publishing House of the National Academy of Sciences of Ukraine "Golden Stays" - 2001 - 281 p.