**Pharmacy technology of medicines**

1. Pharmacy technology of medicines: purpose, tasks, history of development, current state and development prospects. Basic terms and concepts.
2. Main directions of state regulation of pharmaceutical production of medicines. Regulation of composition of prescriptions of medicines, standard and non-standard prescriptions.
3. Standardization of the quality of medicines, pharmaceutical substances, and auxiliary substances. Standardization of the conditions and process of manufacturing medicines in a pharmacy.
4. Characteristics of pharmaceutical substances and excipients used in the pharmaceutical production of medicines.
5. Classification of pharmaceutical dosage forms by state of aggregation, routes of administration into the body, methods of use, dispersion classification.
6. Dosing methods used in the manufacture of medicines in pharmacies. Measuring instruments. Metrological control.
7. Dosing by weight in a pharmacy. Factors affecting the accuracy of dosing by weight.
8. Scales used in pharmacies for dosing pharmaceutical substances. Metrological characteristics of scales.
9. Dosing by volume. Factors affecting the accuracy of dosing by volume. Rules for dosing liquids with high and low density. Characteristics of measuring pharmacy glassware and rules for working with it.
10. Drop dosing. Factors affecting the accuracy of drop dosing. Standard and non-standard drop meters. Calibration of a non-standard drop meter.
11. Packaging materials used in pharmaceutical production of medicines, their characteristics. Requirements for containers and closures.
12. Pharmaceutical glassware used in the pharmaceutical production of medicines, requirements for it.
13. Modes of sterilization of extemporaneous medicinal products. Characteristics of steam and dry-heat sterilization methods. Sterilization control.
14. Characteristics of powders as a dosage form and dispersion system, classification of powders. Dosing and packaging, quality control, packaging and registration for sale, storage of powders in pharmacies.
15. Technological scheme of manufacturing simple and complex powders in pharmacies. The importance of grinding and mixing stages.
16. Pharmaceutical technology for producing powders from ingredients prescribed in equal and sharply different quantities.
17. Technology of pharmaceutical production of powders with coloring substances.
18. Technology for pharmaceutical production of powders with lightweight, difficult to grind substances.
19. Technology of pharmaceutical production of powders from finished dosage forms. Improvement of powder production technology.
20. Characteristics of liquid pharmaceutical dosage forms, their classification. Methods of dosing solvents.
21. Characteristics of dispersion media used in pharmaceutical manufacturing technology of liquid dosage forms, their classification.
22. Requirements of regulatory legal acts for the quality of purified water. Conditions for obtaining, storing and using purified water in pharmacies.
23. Methods for indicating the concentration of solutions of pharmaceutical substances and excipients in doctor's prescriptions.
24. Characteristics of aqueous solutions. Technological scheme for the production of aqueous solutions in pharmacies.
25. Solubility of pharmaceutical substances. Designation of solubility of substances in accordance with the State Pharmacopoeia of the Republic of Belarus. Technological methods that accelerate and increase the solubility of substances in the pharmaceutical preparation of solutions.
26. Mass-volume manufacturing method. Determination of the total volume of a liquid dosage form, its change during dissolution of pharmaceutical substances. Volume increase coefficient, maximum concentration ( Cmax , %).
27. Technology of pharmaceutical preparation of solutions from slowly soluble pharmaceutical substances; using complex formation; from pharmaceutical substances with oxidizing properties.
28. Characteristics of concentrated solutions for burette units, conditions and technology of their pharmaceutical production. Strengthening and dilution of concentrated solutions.
29. Characteristics of mixtures. Pharmacy preparation of mixtures using concentrated solutions. Technology of preparation of mixtures using aromatic waters.
30. Characteristics of drops for internal and external (except eye) use, their classification. Checking doses of pharmaceutical substances of list "A", with established maximum single and maximum daily doses in drops. Technology of pharmaceutical production of drops.
31. Characteristics of standard pharmacopoeial solutions, their classification. Technology of pharmaceutical production of standard pharmacopoeial solutions of groups I and II .
32. Technology of pharmaceutical production of standard pharmacopoeial solutions, which have two names under which they can be prescribed in a doctor's prescription. Quality control, packaging and registration for sale, storage of standard pharmacopoeial solutions in pharmacies.
33. Classification and properties of high-molecular compounds (HMC) used in pharmacy, their characteristics. Technology of pharmacy production of HMC solutions, unlimitedly and limitedly swelling in water. Cases of incompatibility in HMC solutions and ways to overcome them.
34. Properties of colloidal solutions. Colloidal protection. Phenomenon of coagulation. Factors influencing coagulation. Cases of incompatibility in colloidal solutions of pharmaceutical manufacture.
35. Technology of colloidal solutions for pharmaceutical production. Quality control, packaging and registration for sale, storage of colloidal solutions in pharmacies.
36. Characteristics of suspensions, requirements for them. Characteristics of pharmaceutical substances and excipients used in the technology of pharmaceutical production of suspensions. The need to stabilize suspensions.
37. Methods for obtaining suspensions in pharmacy conditions. Stages of the dispersion method for preparing suspensions.
38. Technology of pharmaceutical production of suspensions from hydrophilic substances.
39. Technology of pharmaceutical production of suspensions from hydrophobic substances.
40. Condensation method for manufacturing suspensions. Quality control, packaging and registration for sale, storage of suspensions in pharmacies. Prospects for the development of suspensions as a dosage form.
41. Characteristics of emulsions, their classification. Characteristics of emulsifiers used in the technology of pharmaceutical production of oil emulsions, their classification. Factors affecting the stability of emulsions.
42. Technology of pharmaceutical production of oil emulsions. Features of introduction of pharmaceutical substances into the composition of emulsions.
43. Characteristics of non-aqueous solutions, their classification. Quality control, packaging and registration for sale, storage of non-aqueous solutions in pharmacies.
44. Volatile solvents used in pharmaceutical technology, their characteristics, dosing methods.
45. Non-volatile solvents used in pharmaceutical technology, their characteristics, dosing methods.
46. Technology of pharmaceutical preparation of solutions on glycerin, oils, other non-volatile solvents. Factors accelerating obtaining of solution on non-volatile solvents.
47. Technology of pharmaceutical preparation of solutions on volatile solvents.
48. Characteristics of aqueous extracts from medicinal plant raw materials (MPR). Equipment used in the production of aqueous extracts. Quality control, packaging and registration for sale, storage of liquid dosage forms containing aqueous extracts from MPR in pharmacies.
49. Technology of pharmaceutical production of aqueous extracts from medicinal plant raw materials containing alkaloids, cardiac glycosides, and essential oils.
50. Technology of pharmaceutical production of aqueous extracts from medicinal plant raw materials containing saponins, tannins, anthraglycosides , phenolglycosides .
51. Technology of pharmaceutical production of aqueous extracts from medicinal plant raw materials containing mucus.
52. Features of introduction of pharmaceutical substances into aqueous extracts from medicinal plant raw materials. Pharmaceutical and preparation of infusions and decoctions from liquid and dry extracts (concentrates).
53. Characteristics of liniments, their classification. Technology of pharmaceutical production of homogeneous liniments.
54. Technology of pharmaceutical production of suspension, emulsion and combined liniments.
55. Characteristics of ointments as a medicinal form and as a dispersed system, their classification. Characteristics of ointment bases used in pharmacies.
56. Technological scheme of ointment production in pharmacies. Rules for introducing pharmaceutical substances into ointments.
57. Technology of pharmaceutical production of various types of ointments: ointment-alloy, ointment-solution.
58. Technology of pharmaceutical production of various types of ointments: ointment-emulsion, ointment-suspension.
59. Technology of pharmaceutical production of various types of ointments: combined ointment. Quality control, packaging and registration for sale, storage of ointments in pharmacies.
60. Characteristics of pastes, their classification, application, technology of pharmaceutical production.
61. Methods of obtaining suppositories in a pharmacy. Characteristics of suppository bases, their classification. Features of introducing pharmaceutical substances into suppository bases.
62. Pharmaceutical production of suppositories using the rolling method.
63. Pharmaceutical production of suppositories using the pouring method.
64. Creation of aseptic conditions in the pharmacy.
65. Justification of the need to manufacture, under aseptic conditions, medicinal forms for injections and infusions, for application to wounds and burn surfaces, for newborns and children of the first year of life, medicinal forms for the eyes, with antibiotics. Ensuring the sterility of injection and infusion medicinal forms in a pharmacy.
66. Equipment and conditions for obtaining, collecting and storing water for injections in a pharmacy. Characteristics of pharmaceutical substances and excipients for the manufacture of sterile solutions. Requirements imposed on them.
67. Stability of injection solutions, their physical, chemical and microbiological stabilization. Stabilization of glucose solutions and others in pharmacies.
68. Characteristics of isotonic solutions, technology of their pharmaceutical production. Calculation of isotonic concentrations.
69. Characteristics of infusion solutions, classification. Ensuring isohydricity, isoionicity, isoviscousity of solutions for infusion use in pharmacy conditions.
70. Technology of pharmaceutical production of infusion solutions – regulators of water-salt metabolism and acid-base balance.
71. Characteristics of eye drops and solutions of pharmaceutical manufacture. Calculation of isotonicity of eye drops. Chemical and microbiological stability of eye drops. Preservatives and prolongators for eye drops.
72. Technology of pharmaceutical production of eye drops from solid pharmaceutical substances and concentrated solutions. Quality control, packaging and registration for sale, storage of eye drops in the pharmacy.
73. Characteristics of eye ointments. Bases for eye ointments. Features of the technology of pharmaceutical production of eye ointments.
74. Characteristics of dosage forms for newborns and children of the first year of life, routes of their administration into the body. Requirements for dosage forms for newborns and children of the first year of life, their justification taking into account the anatomical and physiological characteristics of the child's body.
75. Features of the compositions and technology of pharmaceutical production of solid, soft and liquid dosage forms for newborns and children of the first year of life.
76. Characteristics of dosage forms with antibiotics. Selection of auxiliary substances and features of the technology of pharmaceutical production of dosage forms with antibiotics depending on the stability of antibiotics and the type of dosage form.
77. Characteristics of the in-pharmacy blank, its classification and nomenclature. Features of the technology of manufacturing the in-pharmacy blank.
78. Difficult cases and cases of incompatible combinations in complex powders, liniments, ointments, suppositories.
79. Characteristics of physical and physicochemical incompatibilities in pharmaceutical dosage forms.
80. Characteristics of incompatibilities caused by chemical phenomena in pharmaceutical dosage forms. Ways to prevent incompatibilities in pharmaceutical dosage forms.

**Industrial technology of medicines**

1. Objectives and tasks of industrial technology of medicines as an academic discipline. Basic terms used in industrial technology of medicines .

2. The system of requirements for the production and quality control of medicinal products – Good Manufacturing Practice (GMP). The main sections of GMP: introduction, terminology, personnel, buildings and premises, equipment, production process, functions of the quality control department (QCD), registration and reporting.

3. Legislative acts on requirements for the quality and conditions of production of medicines in the Republic of Belarus. Technological regulations, State Pharmacopoeia, Pharmacopoeial article of the manufacturer.

4. Differentiation and profiling of pharmaceutical enterprises. Structure of pharmaceutical enterprises. Workshop principle of organizing production of medicines.

5. Development of industrial production of medicines in the Republic of Belarus. Expansion of the range of industrially produced medicines. State program "Import substitution of medicines".

6. A set of measures to ensure quality, prepare production, workers, premises, equipment, materials, documentation, production rules and quality control of medicines.

7. Technological process, its components: stages and operations. Periodic, continuous and combined technological process. Types of technological processes.

8. Material and energy balance. Technical and economic balance. Technological output, expenditure, consumption coefficient and consumption rates.

9. General concepts of machines and apparatus. Machine as a unity of engine, transmission and actuator mechanisms.

10. General characteristics of thermal processes. Energy in production processes. Thermal processes in pharmaceutical production. Heat transfer mechanisms: thermal conductivity, convection, radiation, combined heat transfer.

11. Heating agents and heating methods. Water vapor as the main heat carrier. Wet, dry, saturated and superheated steam. Heat content of water vapor, communication and reduction of water vapor. Heating with sharp and blind steam.

12. Heat exchangers and their classification. Characteristics of heat exchangers: surface, mixing, regenerative and with internal heat release (coil, shell-and-tube, tube in tube, finned, steam jackets, scrubbers, refrigerators, boilers, air heaters, etc.).

13. Cooling agents, methods of cooling, condensation and their mechanisms. Characteristics of condensers: surface and mixing (direct-flow and counter-flow). Application of cooling and freezing, cryoprocesses, condensation in industrial technology.

14. The degree of grinding, its dependence on the strength, hardness, elasticity and brittleness of the material.

15. Theoretical foundations of grinding. Surface and volume theory of grinding. Rebinder's unified theory of grinding. Methods of grinding: crushing, splitting, impact, abrasion, etc.

16. Grinding machines, operating principle and mode. Dismembrators, disintegrators, excelsior mills, hammer mills, ball mills, vibratory mills, jet mills.

17. Basic rule of grinding. Features of grinding plant materials. Purpose and use of grinding in industrial technology.

18. Classification of solid materials. Fundamentals of air and hydraulic classification of crushed material. Mechanical classification (sifting). Sieves and sieve analysis. Materials and types of meshes (woven, stamped, grate). Standards and numbering of sieves.

19. The structure and operating principle of mechanized sieves: swinging, rotating, vibrating. Safety precautions when sifting.

20. Mixing in industrial production of medicines. Production of powder mixtures. Factors affecting the homogeneity of mixtures during the production, transportation and storage of powders *.* Mixers for solid, liquid and pasty materials

21. Characteristics of powders for external and oral use: effervescent powders, nasal powders, for the preparation of oral solutions, suspensions, syrups.

22. Technological and equipment schemes for the production of powders in pharmaceutical production conditions. Dosing, packaging and packing of powders in industrial production conditions.

23. Shelf life and storage conditions of powders. Tests for powders: homogeneity of content, homogeneity of dosed units, homogeneity of mass, homogeneity of mass of dose in multi-dose containers, etc.

24. Characteristics of industrial production fees. Technological scheme of production of fees in industrial conditions *.*

25. Characteristics, types and nomenclature of tablets for oral, external, sublingual, implantation and parenteral use. Uncoated and coated tablets, effervescent tablets, soluble, dispersible, enteric-coated and modified-release tablets, lyophilisate tablets.

26. Theoretical foundations of tableting: mechanical, capillary theories, fusion under pressure. Manifestation of cohesive and adhesion forces during pressing.

27. Characteristics and operating principle of crank and rotary tableting machines. Main elements of tableting machines: matrices and punches. Tableting machine feeders: frame, mixing, vacuum, vibration. Double-pressing tableting machines.

28. Characteristics of technological and physicochemical properties of pharmaceutical substances and excipients: flowability, compressibility, granulometric composition, bulk density and density after shrinkage, relative density, etc.

29. Excipients used in the production of tablets (fillers, disintegrating, sliding, adhesive, antifriction, colorants, flavoring agents, prolongators), their characteristics and nomenclature.

30. Characteristics of the stages and operations of the technological process of tablet production.

31. Technological schemes for tablet production: direct pressing and the use of granulation in tablet production.

32. Production of trituration tablets by molding. Production of lyophilized tablets.

33. Methods of granulation in the production of tablet masses: wet and granulation by pressing or rolling. Classification and characteristics of wet granulation: pressing and structural.

34. Structural granulation by pelleting, in a fluidized bed, spray drying, moisture-activated granulation.

35. Drying of granulate. Fluidized bed dryers SP-30, SP-60, SP-100, etc.

36. Tablet coating, purposes and methods of coating. Range and characteristics of auxiliary substances for applying coatings to tablets: sugar, sugar syrup, basic magnesium carbonate, dyes, glossing agents, film formers, plasticizers.

37. Technology of shell extension (panning): rolling, testing, grinding, glossing.

38. Characteristics and classification of film coatings of tablets, nomenclature of film-forming agents for film coatings.

39. Methods of applying film coatings to tablets.

40. Technology of tablet coatings by pressing. Production of granulate for pressed coatings.

41. Characteristics of multilayer tablets and extended-release, retard tablets.

42. Tests for tablets: uniformity of dosage units, uniformity of content, uniformity of mass, dissolution, disintegration, talc and aerosil.

43. Dissolution test for solid dosage forms. Devices and methods for conducting the Dissolution test: device with a basket, with a paddle stirrer, with a piston cylinder and with a flow cell.

44. Characteristics of the “Tablet disintegration” test, devices and methods for conducting the test, interpretation of results for different types of tablets.

45. Characteristics and classification of granules: effervescent, film-coated, modified-release and enteric-coated.

46. Technological scheme of granule production. Nomenclature of industrial granules. Packaging, marking, storage of granules.

47. Characteristics of dragees. Production of dragees by the method of building up in dragee kettles (obductors).

48. Medicines for parenteral use, their characteristics and classification.

49. Characteristics of injectable medicinal products. Infusion medicinal products, characteristics and classification. Concentrates for the preparation of injectable medicinal products and infusion medicinal products .

50. Testing of medicinal products for parenteral use: homogeneity of dosage units, homogeneity of content, homogeneity of mass, bacterial endotoxins – pyrogenicity.

51. Glass and polymer containers for sterile medicinal products, requirements and classes of glass. Quality control of glass containers. Testing for hydrolytic and thermal stability, fixation of closures and their tightness.

52. Air preparation system of pharmaceutical enterprises organized according to GMP . Particle contamination levels for different zones in the “equipped” and “operating” states.

53. Concept of installations for obtaining water for injection. Water treatment system in pharmaceutical enterprises.

54. Ampoule production : glass rod preparation , calibration, washing. Ampoule production on semiautomatic machines, annealing.

55. Preparing ampoules for filling. Opening ampoules , external and internal washing of ampoules . Vacuum , syringe and steam condensation internal washing of ampoules. Drying and sterilization of ampoules .

56. Methods of filling ampoules with solutions: vacuum, syringe and steam condensation.

57. Sealing of ampoules. Semi-automatic machines for sealing ampoules. Sealing of ampoules with gas protection.

58. Sterilization of injection solutions. Pharmacopoeial methods of sterilization: thermal, chemical, radiation, sterilization by filtration.

59. Air sterilizers. Thermal sterilization modes depending on the properties of objects and their quantity. Control of sterilization reliability. Safety precautions for various sterilization methods.

60. Marking of ampoule solutions. Quality assessment of injection solutions in ampoules: transparency, color, volume, sterility, toxicity, bacterial endotoxins-pyrogens, testing for mechanical inclusions.

61. Ways of stabilizing injection solutions. Range of stabilizers: acids, alkalis, antioxidants, anticatalysts, etc. Use of gas protection in the production of injection solutions. Characteristics and nomenclature of preservatives.

62. Features of industrial production of injection solutions of glucose, novocaine, caffeine-sodium benzoate, calcium chloride, magnesium sulfate, calcium gluconate, ascorbic acid, etc.

63. Features of production of infusion solutions in industrial conditions. Types of infusion solutions: plasma-substituting, water-salt balance regulators, for parenteral nutrition, oxygen carriers and multifunctional. Requirements for isotonicity, isohydry, isoiony and isoviscousity for infusion solutions.

64. Industrial production of saline, plasma-substituting and detoxifying solutions. Nomenclature of industrially produced infusion solutions.

65. Features of industrial technology of injection solutions of thermolabile drugs.

66. Sterile suspensions and emulsions of industrial production. Suspensions of insulin, corticosteroids, etc., their production.

67. Obtaining emulsions for parenteral nutrition, using ultrasonic equipment in their production.

68. Industrial production of powders for sterile solutions: features of technology and lyophilization of powders. Packaging of powders into vials and ampoules.

69. Physical, chemical, biological processes occurring in injectable drugs. Stability of drugs. Factors influencing the stability of drugs.

70. Methods of stabilization of medicinal products : physical and chemical. Basic principle of stabilization of medicinal products . Shelf life of the finished medicinal product.

71. Characteristics of eye medicines: eye drops, inserts, lotions. Requirements for stability, absence of foreign mechanical impurities, pH value, comfort, etc. for eye drops and lotions .

72. Industrial production of eye drops. Stages and operations of the technological process of eye drops production.

73. Stabilization and preservation of eye drops, characteristics of preservatives. Use of buffer solvents in the production of eye drops. Prolongation of the action of eye drops with methylcellulose, polyvinyl alcohol, polyacrylamide, etc.

74. Eye soft medicinal products. Requirements for eye ointments and eye ointment bases. Sterility, stability of eye ointments.

75. Technological scheme for the production of eye ointments under aseptic conditions. Standardization of eye ointments: particle size, homogeneity, structural and rheological properties, viscosity, pH, etc.

76. Characteristics of eye inserts, film-forming agents in the production of eye inserts.

77. Definition, characteristics, classification of medical and skin patches . Testing of patches for sterility, dissolution. Range of auxiliary substances for production of patches .

78. Equipment for obtaining patch masses, spreading and drying patches (reactors , USPL-1 unit, chamber-loop dryer, etc.).

79. Nomenclature of plasters: adhesive plaster, bactericidal, pepper , corn . Liquid plasters: kleol, collodion, etc. Aerosol plasters.

80. Production of mustard plasters. Packaging , labeling, storage of patches .

81. Characteristics of hydrogel sheets. Production of hydrogel sheets. Testing of hydrogel sheets for sterility, dissolution. Packaging, labeling, storage of hydrogel sheets.

82. Characteristics of the inhalation route of administration of drugs. Drugs for inhalation, their characteristics and classification.

83. Liquid medicinal products for inhalation: medicinal products which are converted into a vapour state; liquid medicinal products for nebulisation; metered-dose medicinal products for inhalation under pressure. Tests for medicinal products for inhalation: uniformity of the dose released, particle size, number of doses in the inhaler.

84. Powders for inhalation, their testing: particle size, number of doses in a multi-dose inhaler.

85. Characteristics of medicinal products under pressure.

86. Characteristics and classification of aerosols. Requirements for medicinal products under pressure: particle size, dose obtained with one press of the dosing valve, etc.

87. Auxiliary substances used in the production of aerosols: propellants, solvents, solubilizers, surfactants, film formers, etc.

88. Technological scheme of aerosol production. Characteristics of aerosol cans, valve-spray systems. Methods of filling aerosol cans. Assessment of the quality of aerosol packaging.

89. Solutions, emulsions, suspensions, drops for internal use, their characteristics. Powders and granules for the preparation of solutions, emulsions, suspensions for internal use.

90. Tests for liquid medicinal products for internal use: uniformity of dosage units, uniformity of content, uniformity of mass, dose and uniformity of dosing of drops for internal use, uniformity of mass of doses in multi-dose containers.

91. Medical solutions, characteristics, classification of solutions depending on the nature of the solvent, concentration and method of production (chemical interaction or dissolution): aqueous, alcoholic, oily, glycerin liquid solutions. Requirements for medical solutions.

92. Production of solutions for internal and external use by various methods in pharmaceutical enterprises.

93. Dissolution as a diffusion-kinetic process. Intensification of the dissolution process. Temperature and hydrodynamic conditions in the production of medical solutions.

94. General characteristics of hydrodynamic processes. Fundamentals of hydraulics. Concept of real and ideal liquids. Hydrostatics and hydrodynamics of liquids.

95. Technological schemes for the production of solutions for internal and external use. General and specific rules for the production of aqueous and non-aqueous solutions *.*

96. Use of mechanical mixing in the production of medical solutions. Mixer designs, their characteristics.

97. Pneumatic mixing with compressed gas, air, live steam, bubbling, circulation mixing.

98. Gravitational and pulsation mixing. Use of rotary-pulsation devices to intensify the dissolution process.

99. Theoretical foundations and use of ultrasound for dispersion and mixing of medical solutions. Electrostrictive and magnetostrictive ultrasound generators, their characteristics and design.

100. Separation of heterogeneous systems. Separation of liquid and solid phases by settling. Siphon devices for separating solid and liquid phases .

101. Separation by gravity. Sedimentation and sedimentation. Sedimentation rate. Factors influencing the sedimentation rate. Construction of periodic and semi-continuous settling tanks.

102. Separation of solid and liquid phases under the action of pressure difference. Filtration, filtration methods, filtration equation. Filter types: Nutsche and Druck filters, filter presses, cartridge, drum, disk. Filters for cleaning gases from mechanical impurities. Characteristics of filter materials.

103. Separation of solid and liquid phases in a centrifugal force field. Centrifugation, separation factor, filtering and settling centrifuges, periodic and continuous action, supercentrifuges. Characteristics of separators.

104. Production of medical solutions: basic acetic-aluminum salt, basic lead acetate, alcohol and aqueous solutions of iodine, iodinol, iodonate, alcohol solution of methylene blue , brilliant green , etc.

1 05. Production of medical solutions: alcohol solution of methylene blue , brilliant green , etc. Quality assessment of solutions for external and internal use. Packaging, labeling, storage of medical solutions.

106. Methods for obtaining suspensions and emulsions in pharmaceutical plants: mechanical mixing, breaking in a liquid medium, dispersion using ultrasound.

107. Characteristics of equipment for industrial production of suspensions and emulsions: rotary pulsation apparatus, colloid mills, dispersers, homogenizers.

108. Soft medicinal products, characteristics, classification. Ointments, creams, gels, pastes, poultices, liniments, their characteristics. Tests for soft medicinal products: homogeneity of dosage units, sterility.

109. Classification of ointments. Hydrophobic, hydrophilic and water-emulsion ointments.

110. Characteristics and classification of ointment bases. Quality control of ointments: structural and mechanical properties of ointments (rheology).

111. Lipophilic and hydrophilic creams. Characteristics of lipophilic and hydrophilic gels. Nomenclature of gelling agents. Characteristics of pastes and poultices.

112. Features of production of ointments and pastes at pharmaceutical enterprises. Technological schemes of ointment production.

113. Medicinal products for rectal use, characteristics, classification. Suppositories, rectal capsules, foams, tampons. Rectal solutions, suspensions, emulsions. Powders and tablets for the preparation of rectal solutions and suspensions. Soft medicinal products for rectal use.

114. Medicinal products for vaginal use, characteristics, classification. Pessaries, vaginal tablets and capsules, foams, tampons, solutions, emulsions and suspensions. Tablets for the preparation of vaginal solutions and suspensions. Soft medicinal products for vaginal use.

115. Characteristics of industrially produced suppositories. Characteristics of suppository bases.

116. Technological equipment for the production and packaging of suppositories.

1 17 . Syrups, characteristics, classification: flavor and medicinal. The importance of syrups in drug therapy. The use of new auxiliary substances sorbitol, fructose, synthetic sweeteners for the production of syrups with high bioavailability.

118. Technological schemes for the production of syrups at pharmaceutical enterprises. Assessment of the quality of syrups. Nomenclature: sugar syrup, aloe with iron, marshmallow, rosehip, etc.

119. Powders and granules for the preparation of syrups, tests for them: homogeneity of dosage units, homogeneity of content, homogeneity of mass. Packaging, labeling, storage of syrups.

120. Aromatic waters, characteristics, classification. Technological scheme of production of aromatic water solutions and distilled aromatic waters.

121. Capsules, characteristics, classification. Hard and soft capsules, enteric-coated and with modified release of active substances, wafers.

122. Technological scheme for the production of gelatin capsules. Preparation of gelatin mass, capsule formation by immersion, pressing and drop methods.

123. Filling capsules with contents. Equipment for the production and filling of capsules.

124. Tests for capsules: uniformity of dosage units, uniformity of content, uniformity of mass, dissolution, disintegration for hard and soft capsules. Packaging, labeling, storage of capsules.

125. Microencapsulation methods: physical, physicochemical, chemical. Characteristics of auxiliary substances for microencapsulation.

126. Extraction of plant, animal, microbiological raw materials and tissue culture in the “solid – liquid” system as one of the types of mass exchange processes.

127. Technological characteristics of phases: content of active, extractive substances and moisture in raw materials; quality of raw materials, rate and magnitude of swelling of raw materials, absorption of extractant by raw materials, density, bulk density and bulk density of raw materials, porosity and porosity of raw materials, grinding of raw materials, surface of raw material particles, coefficient of leaching, internal diffusion, swelling and absorption.

128. Characteristics of extractants. Requirements for extractants: dissolving capacity, selectivity, polarity, viscosity, surface tension, reaction of the medium.

129. Classification and modern range of extractants: water, ethyl alcohol, chloroform, ether, acetone, etc. Use of liquefied gases in the production of extraction drugs.

130. Regularities of extraction of capillary-porous raw materials with a cellular structure, stages of extraction: penetration of the extractant into the raw material, dissolution and desorption, internal molecular diffusion, external molecular and convective diffusion.

131. Diffusion equations (first and second Fick equations and convective diffusion). Coefficients of internal, molecular and convective diffusion.

132. Maceration, remaceration, percolation, repercolation, rapid repercolation, continuous extraction, circulation.

133. Extractors, classification, design and operating principle of spray, rotary-disc, pulsation, centrifugal and mixing-sedimentation extractors.

134. Stages of development of production of medicinal products from plant raw materials and their classification. Characteristics of total (native) or galenic and total purified (new galenic) medicinal products.

135. Medicines from individual substances isolated from plants and complex ones. Technical and economic features of production of medicines from plant raw materials. State Pharmacopoeia of the Republic of Belarus, Good Manufacturing Practice ( GMP ) in production of medicines from plant raw materials.

136. Tinctures, characteristics, classification. Obtaining tinctures by dissolving thick and dry extracts.

137. Methods of obtaining extract during production of tinctures: maceration and its modifications, 4-fold maceration, turbo extraction, percolation. Purification of tinctures from ballast substances.

138. Tests for tinctures: relative density, ethanol content, methanol and 2-propanol, dry residue, heavy metals, quantitative determination. Determination of alcohol concentration in tinctures.

139. Extracts, classification by consistency and extractant used. Liquid extracts, characteristics . Technological scheme for the production of liquid extracts.

140. Methods for obtaining extracts during the production of liquid extracts: percolation, repercolation with a completed and unfinished cycle.

141. Purification of extracts from ballast substances. Tests for liquid extracts: relative density, ethanol content, methanol and 2-propanol, dry residue, heavy metals, quantitative determination.

142. Evaporation, methods of evaporation: under vacuum, atmospheric pressure and increased pressure. The structure of evaporation units: evaporation apparatuses, receivers, vacuum pumps, refrigerators, receivers.

143. Drying in industrial production of medicines. Forms of moisture bonding with material. Statics and kinetics of drying. Drying methods: contact and convective drying. Sublimation (lyophilic) drying.

144. Thick and dry extracts, characteristics, classification. Technological scheme for the production of thick and dry extracts.

145. Methods for obtaining extracts during the production of thick and dry extracts: bismaceration, percolation, repercolation, countercurrent extraction, circulation extraction. Purification of aqueous and alcohol extracts from ballast substances. Evaporation and drying of extracts.

146. Tests for thick and dry extracts: dry residue; solvents; heavy metals; water, loss on drying; quantitative determination.

147. Liquid (1:2) and dry extracts-concentrates for the preparation of aqueous extracts. Nomenclature of liquid extracts-concentrates 1:2 (valerian) and dry extracts-concentrates (addons, marshmallow root, thermopsis).

148. Technological schemes for the production of liquid and dry extract concentrates. Tests for liquid and dry extract concentrates. Packaging, labeling, storage of liquid and dry extract concentrates.

149. Brief historical background of the creation of highly purified drugs from medicinal plant raw materials. Technological scheme for the production of highly purified drugs from medicinal plant raw materials.

150. Methods for obtaining primary extracts in the production of highly purified medicinal products, characteristics of the extractants used. Purification of extracts from ballast and accompanying substances: fractional precipitation, solvent change, liquid extraction, chromatography, etc.

151. Private technology of maximally purified medicinal products from medicinal plant raw materials. Production of adonizide.

152. Testing of maximally purified medicinal products from medicinal plant raw materials: quantitative determination of biologically active substances. Packaging, labeling, storage of maximally purified medicinal products from medicinal plant raw materials.

153. Medicines from animal raw materials, characteristics and brief historical background of creation. Classification of medicines from animal raw materials by medical use, nature of active substances and methods of production.

154. Features of the use of animal raw materials in the production of medicines. Technological scheme for the production of medicines from dried and defatted animal organs for internal and injection use.

155. Classification of drugs by duration of action and nature of distribution of active substances in the human body. Methods of prolonging the action of drugs: decreasing the rate of excretion from the body, slowing down biotransformation, inhibition and duration of absorption.

156. Therapeutic systems: matrix (biodegradable and non-biodegradable), membrane, osmotic, systems for targeted delivery of active substances.

157. Transdermal therapeutic systems (TTS). Classification of TTS based on technological and pharmacokinetic principles.

158. Drugs with targeted action. Ringsdorf model and its components: polymer carrier, solubilizer, drug, vector (targeting device). Modern nomenclature of delivery systems: monoclonal antibodies, glycoproteins, erythrocytes, liposomes.