



«ԵՐԵՎԱՆԻ ՄԽԻԹԱՐ ՀԵՐԱՑՈՒ ԱՆՎԱՆ ՊԵՏԱԿԱՆ
ԲԺՇԿԱԿԱՆ ՀԱՄԱԼՍԱՐԱՆ» ՀԻՄՆԱԴՐԱՄ



“YEREVAN STATE MEDICAL UNIVERSITY
AFTER MKHITAR HERATSI” FOUNDATION

Ֆարմացիայի ամբիոն
Department of Pharmacy

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Questionnaire on IV year “Pharmaceutical chemistry” state exam for bachelor's degree students 2024-2025 academic year

1. Drug analysis methods: physical, chemical, physicochemical, biological. Methods of pharmacopea, Purity detection methods.
2. Drugs identity detection. Drugs identity detection chemical methods, general (group) and specific (particular) reactions, their differences. Inorganic substances functional analysis. Anions and kations general identification methods.
3. Element-organic analysis. Mineralization methods for sulfur, nitrogen, halogens, metals containing organic substances. Belstein test, description and significance.
4. Organic drugs functional analysis: nitration reactions, nitroization reactions, diazotation and azoconjugation reactions, halogenation reactions, condensation reactions for amine and carbonyl groups, lignin test reaction.
5. Organic drugs functional analysis: salt and complex formation reactions. esteration, acylation, hydrolysis reactions. Oxidation-reduction and decomposition reactions.
6. Organic bases and their salts detection reactions: general and specific alkaloid reagents, their description. Heterocycles detection: pyridine detection reaction: Zinke method. Xanthine derivatives detection reactions: murexide sample reaction.
7. Drugs quantitative analysis chemical methods. Advantages and disadvantages. Drugs quantitative analysis titrimetric methods. Acid-base titration in aqueous medium. Direct and indirect neutralization methods. Titration in non-aqueous solvents medium: titration of weak and very weak bases.
8. Precipitating titration methods. Argentometry: Mohr, Volhard, Fajans methods. Thiocyanometry, mercurimetry, mercurometry.
9. Oxidation-reduction titration methods. Iodometry, iodine-chlorometry, iodometry, bromatometry, bromometry, permanganatometry, cerimetry. Complexometry, complexometry: conditions, titrant, indicators. Nitritometry (methods of equivalence point detection). Gravimetric and gasometric methods of quantitative analysis. Element quantitative analysis. Keldahl method. Method of burning with oxygen in a flask.
10. Physical and physicochemical methods usage in drug analysis. Classification of physicochemical methods.
11. Optical methods: refractometry. Refractive index, factors influencing on the refractive index. Specificities of refractometry. Structure and work principle of the devices applied in refractometry.

12. Optical methods: polarimetry. Rotation angle, factors influencing on the rotation angle. Specificities of polarimetry. Structure and work principle of the devices applied in polarimetry.
13. Medicinal products acting on cholinergic system. Cholinomimetic agents. M-cholinomimetics, pilocarpine hydrochloride. Chemical structure, physical properties, identification and quantitative analysis.
14. Medicinal products of anti-cholinesterase group, carbamates. Meta-aminophenol derivatives, Physostigmine salicylate. Physical properties, basic hydrolysis, quantitative analysis. Neostigmine methyl sulfate. Physical properties, identity, quantitative analysis.
15. Cholinolytic medicinal products, their dosage forms. Products having natural origin: atropine sulfate, scopolamine hydrobromide. Cholinolytic agents having synthetic origin: homatropine hydrobromide, Trophaphen, Tropacen. Natural source of Atropine sulfate, chemical synthesis, physical properties. Identification and quantity detection methods.
16. Medicinal products acting on adrenergic system. Adrenomimetics (phenyl-alkylamines) Adrenaline hydrotartrate, hydrochloride (Epinephrine). Sources of Adrenaline, biosynthesis in the organism, industrial synthesis. Noradrenaline hydrotartrate, ephedrine hydrochloride, mesatone hydrochloride, phenoterole, izadrine. Physicochemical properties, identification and quantity detection methods.
17. Adrenoblockers (aryloxy propanolamines), anaprilin, propranolol, atenolol, timolol maleate, chemical structure, physical properties. Identity, quantitative analysis of timolol maleate and anaprilin.
18. Medicinal products acting on CNS. Psycho-stimulants. Methylxanthine derivatives: caffeine, theophylline, theobromine. Natural sources of purine alkaloids and synthesis methods. Physicochemical properties, general reaction (Murexide sample), identification and quantitative analysis. Double salts of purine alkaloids: Euphylline, Diprophylline, Caffeine-sodium benzoate.
19. Antipsychotics: phenothiazine derivatives promethazine, ethmozine, ethacyzin, chemical structures, physical properties, identification reactions, quantity detection methods.
20. Somnolents. Barbituric acid derivatives: barbital, phenobarbital, hexobarbital sodium, thiopental sodium, hexenal, benzobarbital (benzonal). Tautomer forms of barbuturic acid derivatives. Synthesis, physical properties, identification and quantity detection methods.
21. Benzodiazepine derivatives. diazepam, fhenazepam, nitrazepam, oxazepam, synthesis, physicochemical properties, identification and quantity detection methods.
22. Antidepressants, classification. Tricyclic antidepressants: Amitriptyline, Nialamide, Imipramin, physical properties, identification, quantitative analysis. Fluoxetine, identification, quantitative analysis.
23. Nootropics. GABA derivatives: Piracetam, Ainalon, Picamilon. Identification, quantitative analysis.
24. Local anesthetics. Para-amino benzoic acid derivatives: Novocain, Novocainamide, Dicaine, Anesthesine. Chemical structure, physical properties, identification, quantitative analysis. Acetanilide derivatives: Lidocaine, Trimecaine, synthesis, physical properties, identification, quantitative analysis.
25. Non-narcotic analgesics. Pyrazole derivatives: phenazone (antipyrine), methimazole (analgin), phenylbutazone (buthadion), chemical structure, synthesis, identification, quantitative analysis.

26. Salicylic acid derivatives: Salicylic acid, Acetylsalicylic acid, Salicylamide, Phenylsalicylate. Synthesis, identification, quantitative analysis.
27. Para aminophenol derivatives : Paracetamol, structure, identification, quantitative analysis.
28. Narcotic analgesics. Phenanthrene isochinoline /morphinan/ derivatives. Morphine hydrochloride. Chemical structure, physicochemical properties, identification, quantitative analysis. Morphine derivatives: Codeine, Codeine phosphate, Apomorphine hydrochloride, Naltrexone hydrochloride, Promedol. Chemical structure, physicochemical properties, identification, quantitative analysis.
29. Antihistaminic products- H1 histamine receptor blockers. Diphenylhydramine hydrochloride /dimedrol/, chemical structure. Synthesis, identification, quantitative analysis, usage. H2 histamine receptor blockers: Ranitidine hydrochloride, synthesis, physical properties, identification, quantitative analysis.
30. Calcium antagonists. Nifedipine chemical structure, synthesis, identification, quantitative analysis, usage. Verapamil chemical structure, identification, quantitative analysis.
31. Drugs acting on blood system. Neodicoumarin, Phepromaron, Warfarin. Identification, quantitative analysis. Indandione derivatives, Phenyllin. Identification, quantitative analysis.
32. Spasmolytics: Benzylisoquinoline derivatives. Papaverin, Drotaverin /no-spa/ hydrochloride, chemical structure, physical properties. Papaverin hydrochloride synthesis, physical properties. Identification, quantitative analysis, storage conditions.
33. Benzimidazole derivatives: Dibazole /Bendazol/. Dibazole hydrochloride chemical structure, synthesis, identification, quantitative analysis, storage conditions.
34. Nitrates- Nitroglycerine, Nitrosorbit, Isosorbit mono-nitrate, Eritrate, synthesis, physical properties, identification, quantitative analysis, storage conditions.
35. Anti-metabolites. Pyrimidine derivatives. Uracil derivatives, fluorine-uracil, methyl-uracil, tegafur-uracil (ftorafur), zidovudine, stavudine. Fluorine-uracil synthesis, physical properties, identification, quantitative analysis. Methyl-uracil, synthesis, physical properties, identification, quantitative analysis.
36. Purine synthetic derivatives. Mercaptopurine, synthesis, identification, quantitative analysis. Azathioprine, riboxin, allopurinol, physical properties, identity, quantitative analysis.
37. Hormones. Corticosteroids: cortison, deoxycorticosteron, hydrocortison, prednisolon, prednisone. Cortison industrial synthesis. Physical properties, identity, quantitative analysis. Corticosteroids, fluorine derivatives /semi-synthetic dexamethasone, triamcinolon, flumethasone pivalate, fluocinolon acetonide, synthesis, identity, quantitative analysis.
38. Female sex hormones. Hestagen and semi-synthetic derivatives. Progesterone and its semi-synthetic derivatives norethisterone and met-oxy-progesterone acetate. Progesterone synthesis, identification quantitative analysis.
39. Estrogen hormones- estrone, estriol, estradiol, estradiol di-propionate, ethinyl estradiol, synthesis, physical properties, identification, quantitative analysis. Synthetic estrogens: hexestrol, diethylstilbestrol, synthesis, physical properties, identification, quantitative analysis.
40. Male sex hormones. Androgens. Natural androgen hormones androsterone, dehydroandrosteron, testosterone. Testosterone industrial synthesis. Testosterone semi-synthetic derivatives- testosterone propionate and methyl-testosterone, synthesis, physical properties, identification,

quantitative analysis. Androgens synthetic derivatives: methandriol, methandienon, physical properties, identification, quantitative analysis. Synthetic anabolic compounds: 19-nortestosteron derivatives. Nandrelon phenyl propionate, nandrelon deaconate. Identification, quantitative analysis.

41. Sulfonamides: Streptocide, Sulfacetamide sodium, Sulfadimethoxine, Sulfalen, Phthalazole, Salazodin, soluble Streptocide. Synthesis of Streptocide, Sulfacetamide sodium. General and specific identification methods, quantitative determination methods. Bactrim.
42. Isonicotinic acid derivatives: synthesis of Isoniazid, Phtivazid, Metazid. Synthesis of Isoniazide and phtivazide. Physicochemical properties, identification methods, quantitative determination methods, usage. Isonicotinic acid thiomide derivatives: Ethionamide and prothionamide identification methods. Isonicotinic acid thiomide derivatives: Ethionamide and Prothionamide. Physical properties, identification methods, quantitative determination methods.
43. β -lactames: penicillins and cephalosporins. Natural penicillines: Benzylpenicillin and Phenoxymethylpenicillin. Biological synthesis of penicillines. Semisynthetic derivatives, Ampicillin, Oxacilline, Amoxicilline, Carbenicilline. Synthesis. General and specific identification methods, quantitative determination methods. β -lactamase inhibitors, clavulanic acid, sulbactam sodium salt.
44. Cefalosporins. Structure of Cefalosporine-C. Semisynthetic derivatives, Cephalotin, Cephalexin. Cephalotin synthesis, physical properties. Identification methods, quantitative determination methods.
45. Tetracyclines. Natural tetracyclines: Oxitetracyclin, Tetracycline, their general structure, biological synthesis, physicochemical properties. Semisynthetic tetracyclines: Doxycycline hydrochloride, Metacycline hydrochloride. Physical properties. Identification and quantitative determination methods of tetracycline.
46. Aminoglycosides: Streptomycin, Neomycin, Monomycin, Canamycin, Gentamycin, Tobramycin, Amicacin. Biological synthesis, identification and quantitative determination methods.
47. Nitrophenylalkylamines. Levomycetin and its' medicinal forms, synthesis, identification reactions, quantitative determination methods.
48. 8-oxyquinoline derivatives: Quinzol synthesis, identification reactions, quantitative determination methods, usage. Nitroxoline synthesis, identification reactions, quantitative determination methods. Chlorxhinaldol. Hydroxyquinoline derivatives: FLomefloxacin, Ofloxacin, Norfloxacin, Ciprofloxacin. Lomefloxacin synthesis, identification reactions, quantitative determination methods, usage. Identification of Ofloxacin and Ciprofloxacin.
49. Nitrofuran derivatives: Furacilin, Furadonin, Furasolidon. Physical properties, general and specific identification reactions, quantitative determination methods.
50. Nitroimidazole derivatives: Synthesis of metronidazole, identification reactions, quantitative determination methods.
51. Tocopherols: Vitamin E, synthesis of Tocopherol acetate, identification reactions, quantitative determination methods.
52. Pyrimidine-thiazole derivatives: Vitamin B₁, structure and activity. Thiamine bromide, Thiamine chloride, Phosphothiamine, Cocarboxilasa. Identification reactions, quantitative determination methods.

53. Bioflavonoids, Vitamin P: Rutine, Cvercetin. Identification reactions, quantitative determination methods.
54. Vitamin C: Ascorbinic acid. Synthesis, physical properties. Identification reactions, quantitative determination methods.
55. Oxymethylpyridine derivatives: Vitamin B₆ synthesis, Pyridoxin, Pyridoxamin, Pyriditol. Pyridoxin hydrochloride, synthesis, identification reactions, quantitative determination methods, usage. Pyriditol synthesis, identification reactions, quantitative determination methods, usage. Parmidin synthesis, identification reactions, quantitative determination methods, usage.
56. Pyridine derivatives: Vitamin PP. Nicotinic acid, Nicotinamide, Vitamin PP coenzyme . Nicotinic acid synthesis, identification reactions, quantitative determination methods, usage. Nicodin, Niketamid, Cordiamin. Synthesis, identification reactions. Coamide, Feramide. Synthesis, identification reactions, quantitative determination methods.
57. Isoalloxazine derivatives. Riboflavin Vitamin B₂ synthesis, identification reactions, quantitative determination methods.
58. Pterin derivatives, Folic acid, synthesis, identification reactions, quantitative determination methods.
59. Vitamin K: Vikasol synthesis, identification reactions, quantitative determination methods.
60. Corrin Vitamins, Cyanocobalamin: Vitamin B₁₂ synthesis, identification reactions, quantitative determination methods..
61. Retinols: A group vitamins. Vitamin A. Structure and activity. Retinol acetat, Retinol palmitat. identification reactions, quantitative determination methods.
62. Calciferoles, Vitamin D. Synthesis, identification reactions, quantitative determination methods.

Literature

1. «Drug chemistry», Zhamharyan A.G., Sargsyan F.A., Ericyan E.L., YSMU, 2014.
2. “Pharmaceutical chemistry” V.G. Belikov, 2007
3. “Fundamentals of Medicinal Chemistry” Gareth Thomas, 2003.
4. “Pharmaceutical chemistry” Akobyan R., 2007.
5. Lectures of Pharmaceutical chemistry III and IV year.

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