Thematic lesson plan of seminars
in the discipline "Special pharmaceutical chemistry"
for students for students in 2021 admission
according to the educational program
specialist degree
in the specialty of training 33.05.01 Pharmacy
direction (profile) Pharmacy,
form of study full-time (face to face)
for the 2024-2025 academic year

№	Thematic blocks	Hours (acad.)
7 semester		
1.	Safety precautions when working in a pharmaceutical chemistry laboratory. Residual knowledge test.	2
	Synthetic pharmaceuticals - pyridine and piperidine derivatives. Pyridine-3-carboxylic acid derivatives: nicotinic acid, nicotinamide, nicotinic acid diethylamide, picamilon.	2
2.	Synthetic pharmaceuticals - pyridine and piperidine derivatives. Pyridine-4-carboxylic acid derivatives: antitubercular agents (isoniazid, fthivazid, prothionamide). antidepressants (nialamide).	2
	Pyridine-4-carboxylic acid derivatives: antidepressants (nialamide). Dihydropyridine derivatives: nifedipine (phenygidine). Piperidine derivatives: cyclodol.	2
3.	Quinoline derivatives. Characterisation of quinoline derivatives. General method of synthesis of heterocyclic quinoline system.	2
	Quinozolol, cinchofen, enteroseptol, nitroxoline, sovcain. Synthetic antimalarials - quinine analogues. Plasmocide, quinocide, hingamine.	2
4.	Pyrimidine derivatives. Relationship between structure and action in the series of pyrimidine derivatives. Uracil and its derivatives - methylthiouracil, methyluracil, pentoxyl.	2
	Uracil derivatives - fluorouracil, fluorafur, hexamidine. Synthetic drugs of nucleoside nature: cytarabine, azidothymidine, iodoxuridine, lamivudine.	2
5.	Barbituric acid derivatives. Relation between chemical structure, narcotic and anticonvulsant action in the series of barbiturates. General methods of preparation of barbiturates.	2
	Barbituric acid derivatives. Barbital, phenobarbital, ethominal sodium, hexenal, thiopental sodium, benzonal.	2
6.	Benzothiazine derivatives. Non-steroidal anti-inflammatory	2

	drug piroxicam. Benzothiadiazine derivatives - diuretics: chlortiazide and dichlothiazide.	
	Chlorobenzenesulfonic acid amide derivatives. Analogues in action - derivatives of chlorobenzenesulfonic acid amide: furosemide, bufenox. Oxodoline.	2
7	Neuroleptic agents - phenothiazine derivatives. Alkylamine derivatives - aminazine, propazine, triphthazine.	2
	Acyl derivatives - ethocysine, ethmosine. Relationship between structure and action depending on the nature of substituents and nature of bonds.	2
8.	Benzodiazepine derivatives as targeted drugs. General methods of obtaining them.	2
	Structure of drugs. Influence of the structure of drugs on the directionality of their pharmacological action in the series: chlordiazeproxide, diazepam, oxazepam, nitrazepam, phenazepam.	2
9.	Solving test problems.	2
	Control of knowledge, skills and abilities (from lessons 1-8).	2
10.	General classification of vitamins. Chemical classification. Vitamins of the aliphatic series. Ascorbic acid (vitamin C). Methods of production, causes of instability, redox and acid-base properties. Chemical basis for stabilisation of ascorbic acid in dosage forms.	2
	Vitamins of the aliphatic series. Pantothenic acid (calcium pantothenate), pangamic acid (calcium pangamate - vitamin B_{15}).	2
11.	Alicyclic vitamins. Retinols (vitamins of group A). Retinol acetate. Calciferols (vitamins of group D) as products of transformation of sterols. Mechanism of formation of ergocalciferol (vitamin D_2) and cholecalciferol (vitamin D_3). Oxydevitol, dioxydevitol.	2
	Pterin vitamins (vitamins of folic acid group).Folic acid and its analogues. Relationship between structure and biological action. Methotrexate. Quality requirements, general physical and chemical methods of analysis.	2
12.	Aromatic vitamins are derivatives of naphthoquinones (K vitamins). Vikasol.	2
	Antivitamins K. Dicoumarin, neodicoumarin, fepromarone, phenylin.	2
13.	Vitamins of heterocyclic series. Chromic vitamins - tocopherols (E vitamins) as medicinal and prophylactic agents. Tocopherol acetate.	2
	Phenylchroman vitamins - bioflavanoids (P vitamins). Rutin,	2

	quercetin.	
14.	Vitamins are derivatives of pyridine. Nicotinic acid, nicotinamide (vitamin B_5 or PP).	2
	Oxy-methylpyridine vitamins (B_6 vitamins). Pyridoxine hydrochloride, pyridoxal phosphate.	2
15.	Pyrimidine-thiazole vitamins (B_1 vitamins). Thiamine chloride and bromide, cocarboxylase, phosphothiamine, benfotiamine.	2
	Biotransformation of vitamins. Biotransformation of B_1 vitamins, stability, quality requirements, methods of analysis.	2
16.	Isoalloxazine derivatives (B_2 vitamins) as medicinal and prophylactic agents. Riboflavin, riboflavin mononucleotide. Biotransformation of B_2 vitamins. Quality requirements for vitamins, isoalloxazine derivatives, methods of analysis.	2
	Pyrrole derivatives (B_{12} vitamins). Cyancobalamin, oxycobalamin, cobamide.	2
17.	Solving test problems.	2
	Control of knowledge, skills and abilities (from lessons 10-17).	2
8 semester		
1.	Safety rules in the chemistry laboratory. Residual knowledge check. Alkaloids. History of discovery and medical use of alkaloids.	1
	Classification of alkaloids. General methods of isolation, purification and separation of alkaloids. Qualitative determination of alkaloids. General (group) reactions. Methods of quantitative determination of alkaloids.	1
2.	Pyridine and piperidine derivatives. Lobeline hydrochloride.	1
	Pyridine and piperidine derivatives. Cytisine, pachycarpine.	1
3.	Tropane derivatives. Classification. Atropine sulphate	1
	Tropane derivatives. Homatropine hydrobromide, scopolamine hydrobromide	1
4.	Tropane derivatives. Tropacin, tropafen, troventol	1
	Ecgonine derivatives. Cocaine hydrochloride. Conditions of storage and handling in production.	1
5.	Quinoline derivatives. Quinine, quinidine	1
	Synthetic analogue: isodibut.	1
6.	Benzylisoquinoline derivatives. Papaverine hydrochloride and Drotaverine hydrochloride (no-shpa). Quality requirements,	1

	general and special methods of analysis.	
	Analogues of papaverine in action: tifen, diprofen, aprofen.	1
7.	Imidazole derivatives. Pilocarpine hydrochloride.	1
	Benzimidazole derivatives. Dibazol, omeprozole.	1
8.	Solving test problems.	1
	Control of knowledge, skills, abilities (from lessons 1-7)	1
9.	Phenanthrenoisoquinoline derivatives. Morphine hydrochloride. Sources of morphine.	1
	Phenanthrenoisoquinoline derivatives. Codeine, codeine phosphate.	1
10.	Semisynthetic morphine derivatives. Apomorphine hydrochloride.	1
	Semisynthetic morphine derivatives. Ethylmorphine hydrochloride.	1
11.	The problem of creating morphine analgesics and its social significance. Promedol.	1
	Fentanyl. Storage conditions and release regulations.	1
12.	Indole derivatives. Reserpine.	1
	Physostegmine salicylate and its semi-synthetic analogue proserine. Specific quality requirements and methods of analysis depending on redox properties and isomerism ability. Strychnine nitrate.	1
13.	Purine derivatives. Caffeine, theophylline, theobromine.	1
	General methods of synthesis and analysis based on oxidation and hydrolytic cleavage reactions of pyrimidine and imidazole cycles.	1
14.	Salts of purine derivatives. Diprophyllin.	1
	Salts of purine derivatives. Xanthinol nicotinate, pentoxifylline.	1
15.	Synthetic drugs are purine derivatives. Allopurinol, etomizole	1
	Synthetic drugs - purine derivatives. Fopurin, riboxin.	1
16.	Alkaloids, derivatives of phenylalkylamines. Ephedrine hydrochloride, dephedrine.	1
	Guanidine derivatives. Spherofisin benzoate.	1

17.	Solving test problems.	1
	Control of knowledge, skills, abilities (for classes 9-17)	1
18.	Control of the level of formation of practical skills and abilities.	1
	Solving situational problems.	1
9 semester		
1.	Safety at work in the laboratory of pharmaceutical chemistry. Checking of residual knowledge.	2
	Hormones. Definition, biological role and classification of hormones.	2
2.	Iodinated derivatives of aromatic amino acids. Thyroid hormones: thyroxine, triiodothyronine.	2
	The complex drug is thyroidine. Antithyroid agents: diiodotyrosine.	2
3.	Hydroxyphenylalkylamines. Adrenal medullary hormones. (dopamine, adrenaline, noradrenaline and their salts).	2
	Synthetic analogues of catecholamines. Isoprenaline hydrochloride (isadrine). Mesaton.	2
4.	Biochemical role of steroids in the body as a prerequisite for drug preparation.1Classification and nomenclature. Sources of derivation. Conditional names of cycles and substances. Peculiarities of structure, stereochemistry of steroidal compounds and biological activity. General physicochemical properties. Methods of analysis of compounds of steroidal structure.	2
	Cardenolides (cardiac glycosides). Chemistry of cardenolides, their classification. Relation between structure and biological action, role of steric factors. Compounds of digitoxygenin series: digitoxin, acetyl digitoxin, digoxin. Strophanthin. Glycosides of lily of the valley: corglycone. Biological and physicochemical methods of quantitative assessment of glycosides activity.	2
5.	Current state and development of the chemistry of corticosteroids as medicinal substances.Biochemical prerequisites for obtaining medicinal substances of corticosteroid group. Interrelation of structure and biological activity. Mineralcorticosteroids, glucocorticosteroids.	2
	Deoxycorticosterone acetate, cortisone acetate, hydrocortisone and prednisolone, fluorosubstituted compounds: dexamethasone. Steroid esters.	2
6.	Androgens and anabolics. Androgenic hormones as drugs: testosterone propionate, methyltestosterone. Relationship	2

	between structure and biological action.	
	Biological prerequisites for obtaining semi-synthetic preparations with anabolic action. Methandrostenolone, methylandrostenediol, phenobolin. Quality requirements, methods of analysis.	2
7.	Gestagens and their synthetic analogues. Progesterone, pregnine.	2
	Estrogens. Estrone and estradiol as drug substances. Ethinyl estradiol, mestranol, estradiol esters.	2
8.	Solving test problems.	2
	Control of knowledge, skills, abilities (from lessons 1-7)	2
9.	Antibiotics as medicines. General concepts and terminology. Classification of antibiotics by orientation and mechanism of action.	2
	Chemical classification of antibiotics. Current state of the science of antibiotics. Requirements for the efficacy and safety of antibiotics. Rational antibiotic therapy. Standardisation of antibiotics.	2
10.	Penicillins. General chemical structure, its peculiarities. Relation between structure and biological action. Benzylpenicillin, its salts (sodium, potassium, novocaine). Phenoxymethylpenicillin. Directed semi-synthesis based on 6-aminopenicillanic acid.	2
	Semi-synthetic penicillins. Sodium salt of oxacillin, ampicillin. General physicochemical properties, comparative resistance to chemical reagents and enzymes. Products of chemical transformations as possible impurities, methods of their analysis. Semisynthetic penicillins: carbenicillin dynatrium salt, amoxicillin.	2
11.	Cephalosporins. Chemical transformation studies. Benzylpenicillin and the preparation of 7-dez-acetyl cephalosporanic acid. Natural cephalosporin C as a source of cephalosporins. Partial directed synthesis of cephalosporin antibiotics.	2
	Cephalexin, cephalothin. Chemical structure of cephalosporins, its peculiarities. Relationship between structure, biological action and stability. Quality requirements and methods of analysis.	2
12.	Aromatic antibiotics. Nitrophenylalkylamines. Levomycetin (chloramphenicol). Chemical synthesis of levomycetin.	2
	Antibiotics of the aromatic series. Syntomycin and its esters - stearate and succinate.	2

13.	Aminoglycosides. Streptomycin sulphate, kanamycin sulphate, gentamicin sulphate.	2
	Preparation of semi-synthetic aminoglycosides. Amikacin. General quality requirements and methods of analysis.	2
14.	Tetracyclines (partially hydrogenated naphthacene derivatives). General characterisation of chemical structure and properties. Relation between structure and biological action. Epimerisation of tetracyclines, epi- and anhydro derivatives of tetracycline, methods of control.	2
	Tetracyclines. Tetracycline, oxytetracycline and their semi-synthetic derivatives: metacycline and doxycycline. Quality requirements, methods of analysis.	2
15.	Antitumour antibiotics of different chemical groups. Anthracycline antibiotics - rubomycin hydrochloride. Aurelic acid derivatives - olivomycin.	2
	Quinoline-5,8-dione derivatives. Bruneomycin, reumycin. Actinomycins: dactinomycin.	2
16.	Contraindications. Side effects occurring when taking antibiotics.	2
	Therapy. Minimise the side effects of antibiotics.	2
17.	Solving test problems.	2
	Control of knowledge, skills, abilities (for classes 8-17)	2
	Intermediate certification	36
	Total	208

Considered at the meeting of the department of Pharmaceutical and Toxicological Chemistry, pharmacognosy and botany "28" August 2024, protocol No1

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