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 2025-2026 academic year

№	Thematic blocks	Practical training within the thematic block[3]	Hours (academic)[4]
7th semester			
1.	Safety precautions when working in the pharmaceutical chemistry laboratory. Verification of residual knowledge [1]. Synthetic drugs are pyridine and piperidine derivatives.[1] Pyridine-3-carboxylic acid derivatives: nicotinic acid, nicotinamide, nicotinic acid diethylamide, picamilon.[2]	PT	4
2.	Synthetic drugs are pyridine and piperidine derivatives.[1] Pyridine-4-carboxylic acid derivatives: anti-tuberculosis drugs (isoniazid, ftivazid, prothionamide).Antidepressants (nialamide).Pyridine-4-carboxylic acid derivatives: antidepressants (nialamide). Derivatives of dihydropyridine: nifedipine (phenigidine). Piperidine derivatives: cyclodol.[2]	PT	4
3.	Quinoline derivatives.[1] Characteristics of quinoline derivatives. A general method for the synthesis of a heterocyclic quinoline system.Quinosol, cinhophene, enteroseptol, nitroxoline, sovcaine. Synthetic antimalarial drugs are quinine analogues. Plasmocide, quinocide, hingamine.[2]	-	4
4.	Pyrimidine derivatives.[1]The relationship between structure and action in a number of pyrimidine derivatives. Uracil and its derivatives - methylthiouracil, methyluracil, pentoxyl. Uracil derivatives are fluorouracil, fluorafur, hexamidine. Synthetic drugs of nucleoside nature: cytarabine, azidothymidine, iodoxuridine, lamivudine.[2]	PT	4
5.	Derivatives of barbituric acid.[1]. The relationship between the chemical structure, narcotic and anticonvulsant effects of barbiturates. General methods of obtaining barbiturates. Barbital, phenobarbital, ethaminosodium, hexenal, thiopental-sodium, benzonal.[2]	-	4
6.	Benzothiazine derivatives.[1] Nonsteroidal anti–inflammatory drug - piroxicam. Benzothiadiazine derivatives are diuretics: chlortiazide and dichlothiazide.[2] Derivatives of chlorobenzenesulfonic acid amide.[1] Analogues in action are derivatives of chlorobenzenesulfonic acid amide: furosemide, bufenox. Oxodoline.[2]	PT	4

7.	Neuroleptics are phenothiazine derivatives.[1] Alkylamine Derivatives - aminazine, propazine, triphthazine.[2] Acyl derivatives – etacyzine, etmosine.[1] The relationship between structure and action depends on the nature of the substituents and the nature of the bonds.[2]	PT	4
8.	Benzodiazepine derivatives as targeted drugs.[1] General methods of obtaining.[2] The structure of drugs. The effect of the structure of drugs on the direction of their pharmacological action is as follows: chlordiazeproxide, diazepam, oxazepam, nitrazepam, phenazepam.[2]	-	4
9.	Control of knowledge, skills, and abilities in modular units 1 (thematic blocks 1-8)[1].	PT	4
10.	General classification of vitamins. Chemical classification. Vitamins of the aliphatic series.[1] Ascorbic acid (vitamin C). Production methods, causes of instability, redox and acid-base properties. Chemical bases of stabilization of ascorbic acid in dosage forms.[2] Vitamins of the aliphatic series.[1] Pantothenic acid (calcium pantothenate), pangamic acid (calcium pangamate - vitamin B15).[2]	PT	4
11.	Vitamins of the alicyclic series.[1] Retinols (vitamins of group A). Retinol acetate.[2] Calciferols (vitamins of group D) as products of sterol conversion.1 The mechanism of formation of ergocalciferol (vitamin D2) and cholecalciferol (vitamin D3). Oxidevite, dioxydevite.[2] Pteric vitamins (vitamins of the folic acid group).[1] Folic acid and its analogues. The relationship between structure and biological action. Methotrexate.Quality requirements, general physical and chemical methods of analysis.[2]	-	4
12.	Aromatic vitamins are derivatives of naphthoquinones (vitamins of group K).[1] Vikasol.[2] Antivitamins K.[1] Dicoumarin, neodicoumarin, fepromarone, phenyline.[2]	-	4
13.	Vitamins of the heterocyclic series.[1] Chromane vitamins – tocopherols (vitamins of group E) as medicinal and preventive agents. Tocopherol acetate.[2] Phenylchromanic vitamins - bioflavanoids (vitamins of group P).[1]Rutin, quercetin.[2]	-	4
14.	Vitamins are pyridine derivatives.[1] Nicotinic acid, nicotinamide (vitamin B5 or PP).[2] Hydroxy-methylpyridine vitamins (B6 vitamins).[1] Pyridoxine hydrochloride, pyridoxal phosphate.[2]	-	4
15.	Pyrimidino-thiazole vitamins (vitamins of group B1).[1] Thiamine chloride and bromide, cocarboxylase, phosphothiamine, benfotiamine. Biotransformation of vitamins.[1] Biotransformation of vitamins of group B1, stability, quality requirements, methods of analysis. [2]	-	4
16.	Isoalloxazine derivatives (B2 vitamins) as medicinal and preventive agents.[1] Riboflavin, riboflavin mononucleotide. Biotransformation vitamins of group B2. Quality requirements for vitamins, isoalloxazine derivatives, and methods of analysis.[2] Pyrrole derivatives (B12 vitamins).[1] Cyancobalamin, oxycobalamin, cobamide.[2]	-	4
17.	Control of knowledge, skills, and abilities in modular unit 1	PT	4

	(thematic blocks 10-15)[1].		
	Total		68
	8th semester		
1.	Safety rules in the chemical laboratory. Verification of residual knowledge. Alkaloids[1]. The history of the discovery and medical use of alkaloids.[2] 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.[2]	-	4
2.	Pyridine and piperidine derivatives.[1] Lobelin hydrochloride, cytisine, pachycarpine. [2]	-	4
3.	Derivatives of tropane.[1] Classification. Atropine sulfat[2] Derivatives of tropane.[1] Homatropin hydrobromide, Scopolamine hydrobromid[2]	-	4
4.	Derivatives of tropane.[1] tropacin,tropafen, troventol[2] Ecgonine derivatives. [1] Cocaine hydrochloride. Storage and handling conditions in production.[2]	-	4
5.	Quinoline derivatives. [1] Quinine, quinidine.Synthetic analog: isodibut.[2]	-	4
6.	Benzylisoquinoline derivatives.[1] Papaverine hydrochloride and Drotaverine hydrochloride (no-shpa). Quality requirements, general and special analysis methods. Papaverine analogues in action: typhen, diprofen, aprofen.[2]	-	4
7.	Imidazole derivatives.[1] Pilocarpine hydrochloride.[2] Benzimidazole derivatives. [1] Dibazole, omeprozole.[2]	PT	4
8.	Control of knowledge, skills, and modular units 2,3, 4[1]	PT	4
9.	Phenanthrenoisoquinoline derivatives.[1] Morphine hydrochloride. Sources of morphine. Codeine, codeine phosphate.[2]	-	4
10.	Semi-synthetic morphine derivatives. [1] Apomorphine hydrochloride.2 Ethylmorphine hydrochloride.[2]	-	4
11.	The problem of creating morphine-type analgesics and its social significance. [1] Promedol. Fentanyl. Storage conditions and release rules.[2]	-	4
12.	Indole derivatives.[1] Reserpine.[2] Physostegmine salicylate and its semi-synthetic analog proserin. Special quality requirements and analysis methods depending on the redox properties and isomerization ability. Strychnine nitrate. [2]	-	4
13.	Purine derivatives.[1] Caffeine, theophylline, theobromine.[2] General methods of synthesis and analysis based on oxidation reactions and hydrolytic cleavage of pyrimidine and imidazole cycles.[2]	-	4
14.	Salts of purine derivatives.[1] Diprophyllin. Xanthinol nicotinate, pentoxifylline. [2]	-	4
15.	Synthetic drugs are purine derivatives.[1] Allopurinol, etymisole, fopurin, riboxin.[2]	-	4
16.	Alkaloids, derivatives of phenylalkylamines.[1] Ephedrine hydrochloride, defedrine. 2 Derivatives of guanidine. 1 Spherophysin benzoate.2	-	4

17.	Control of knowledge, skills, and abilities in the modular unit 4[1].	-	4
18.	Control of the level of formation of practical skills and abilities in modular units 3 and 4[1].	PT	4
	Total		72
	9th semester		
1.	Safety precautions when working in the pharmaceutical chemistry laboratory. Verification of residual knowledge. Hormones.[1] Definition, biological role and classification of hormones. [2]	-	4
2.	Hydroxyphenylalkylamines.[1] Hormones of the adrenal medulla. (dopamine, adrenaline, norepinephrine and their salts).[2]	-	4
3.	Synthetic analogues of catecholamines.[1] Isoprenaline hydrochloride (isadrine). Mezaton. [2]	-	4
4.	The biochemical role of steroids in the body as a necessary condition for the preparation of drugs.[1] Classification and nomenclature. Features of the structure, stereochemistry of steroid compounds and biological activity. General physico-chemical properties. Methods of analysis of compounds of steroid structure.[2] Cardenolides (cardiac glycosides).[1]. Chemistry of cardenolides and their classification. The relationship between structure and biological action, the role of steric factors. Compounds of the digitoxigenin series: digitoxin, acetyldigitoxin, digoxin. Strophanthine. Lily of the valley glycosides: corglicon. Biological and physico-chemical methods for quantifying glycoside activity.[2]	-	4
5.	Synthetic hormonal drugs.[1] Synthetic corticosteroid drugs - triamcinolone, locacorten, sinalar.[2]	-	4
6.	Progestogens and their synthetic analogues.[1] Progesterone, pregnin.[2] Estrogens[1]. Estrone and estradiol as medicinal substances. Ethinyl Estradiol, mestranol, estradiol esters.[2]	-	4
7.	Synthetic nonsteroidal estrogen analogues.[1] Synestrol, diethylstilbestrol. Synthetic antiestrogenic agents are tamoxifen citrate (nolvadex).[1]	-	4
8.	Control of knowledge, skills, and modular units 5,6,7[1].	-	4
9.	Antibiotics as medicines.[1] General concepts and terminology. Classification of antibiotics by focus and mechanism of action. Chemical classification of antibiotics. The current state of antibiotic science. Requirements for the effectiveness and safety of antibiotics. Rational antibiotic therapy. Standardization of antibiotics.[2]	-	4
10.	Penicillins.[1] General chemical structure, its features. The relationship between structure and biological action. Benzylpenicillin, its salts (sodium, potassium, novocaine). Phenoxymethylpenicillin. Directed semi-synthesis based on 6-aminopenicillanic acid. [2] Semi-synthetic penicillins.[1] sodium salt of oxacillin, ampicillin. General physico-chemical properties, comparative resistance to chemical reagents and enzymes. Products of chemical transformations as possible impurities, methods of their analysis. Semi-synthetic penicillins: disodium salt of carbenicillin, amoxicillin.[2]	PT	4

11.	Cephalosporins.[1] Research on chemical transformation. Benzylpenicillin and the production of 7-dez-acetylcephalosporanic acid. Natural cephalosporin C as a source of cephalosporins. Partial targeted synthesis of cephalosporin antibiotics. Cephalexin, cephalotin. The chemical structure of cephalosporins, its features. The relationship between structure, biological action and stability. Quality requirements and methods of analysis.[2]	PT	4
12.	Aromatic antibiotics.[1] Nitrophenylalkylamines. Levomycetin (chloramphenicol). Chemical synthesis of levomycetin. Syntomycin and its esters - stearate and succinate. [2]	PT	4
13.	Aminoglycosides.[1] Streptomycin sulfate, kanamycin sulfate, gentamicin sulfate.[2] Production of semi-synthetic aminoglycosides.[1] Amikacin. General quality requirements and methods of analysis.[2]	PT	4
14.	Tetracyclines (partially hydrogenated naphthacine derivatives)[1]. General characteristics of the chemical structure and properties. The relationship between structure and biological action. Epimerization of tetracyclines, epi- and anhydro derivatives of tetracycline, control methods. Tetracycline, oxytetracycline and their semi-synthetic derivatives: metacycline and doxycycline. Quality requirements, methods of analysis.[2]	PT	4
15.	Antitumor antibiotics of various chemical groups.[1] Anthracycline antibiotics - rubomycin hydrochloride. Aurelic acid derivatives are olivomycin. [2] Derivatives of quinoline-5,8-dione.[1] Bruneomycin, rheumycin. Actinomycins: dactinomycin. [2]	PT	4
16.	Macrolides.[1] Erythromycin. Azithromycin.[2]	PT	4
17.	Control of knowledge, skills, and abilities in the module unit 8[1].	-	4
	Total		68
	TOTAL		208

[1] - topic
[2] - essential content
[3] – PT (practical training)
[4] – one thematic block includes several classes, the duration of one lesson is 45 minutes, with a break between classes of at least 5 minutes

Considered at the meeting of the department of Pharmaceutical, Toxicological Chemistry, pharmacognosy and botany "30" May 2025, protocol No1

Head of the Department Ozerov A.A.