Evaluation tools for certification
in the discipline "Special pharmaceutical chemistry"
for students for students in 2020, 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

Intermediate certification in the discipline 'Special Pharmaceutical Chemistry' is carried out according to the results of mastering the discipline 'Exam' in the IX semester.

Intermediate certification includes the following types of tasks: solving situational tasks and interview on control questions from the sections of the discipline.

Evaluation tools for current certification of the discipline.

Current certification includes the following types of assignments: testing, solving situational problems, preparation and defense of essays, assessment of mastering practical skills (abilities), control work, interview on control questions, preparation and defense of term papers.

Examples of multiple-choice tests

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1.,PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

1. The quantification of Drotaverine hydrochloride is determined:
   a) Nitritometrically
   b) Argentometrically
   c) Neutralization method
   d) Cerimetrically
2. When papaverine hydrochloride interacts with Frede's reagent, it appears:
   a) Red staining
   b) Green staining
   c) Blue staining
   d) Yellow-orange staining
3. The hydrolysis products of aprofen are:
   a) Diphenylacetic acid, 2-diethylaminoethanol
   b) 2,2-Diphenylpropionic acid, 2-diethylaminoethanol
   c) 2,2-Diphenylpropionic acid, 2-(di-n-propylamino)ethyl mercaptan

d) Diphenylacetic acid, 2-(diethylamino)ethylmercaptan

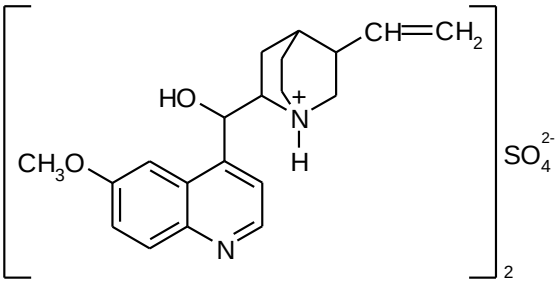
4. The Sobolev reaction is used to identify:
   a) Quinine hydrochloride
   b) Aprofen
   c) Dibazol
   d) Papaverine hydrochloride
5. The taleioquine test is based on the sequential action of the quinine salt on:
   a) Ammonia solution, bromine water
   b) Bromine water, ammonia solution
   c) Sulfuric acid, sodium hydroxide
   d) Potassium bichromate, sodium nitroprusside
6. The pharmacopoeial method for determining the authenticity of Drotaverine hydrochloride is:
   a) Interaction with concentrated sulfuric acid and formaldehyde
   b) Interaction with concentrated sulfuric acid in the presence of iron (III) chloride
   c) Interaction with Frede's reagent
   d) Interaction with iodine solution
7. When papaverine hydrochloride interacts with concentrated sulfuric acid, it appears:
   a) White precipitate
   b) Violet coloring
   c) Unchanging orange coloring
   d) Yellow coloration changing to orange coloration
8. The pharmacopoeial method for quantitative determination of Drotaverine hydrochloride is:
   a) Argentometric
   b) Method of neutralization in aqueous-alcoholic medium
   c) Method of non-aqueous titration
   d) Gravimetric method
9. The indicator in the mercurimetric method for the determination of dibazol is:
   a) Crystal violet
   b) Phenolphthalein
   c) Methyl orange
   d) Diphenylcarbazone
10. The specific impurity in bendazole hydrochloride is:
   a) Diphenylamine
   b) o-Phenylenediamine
   c) Diphenylacetic acid
   d) Veratrol

11. In the case of the inverse Argentometric titration of dibazole, the indicator is:
    a) Ammonium rhodanide
    b) Phenolphthalein
    c) Iron-ammonium alum
    d) Potassium chromate

Examples of situational tasks

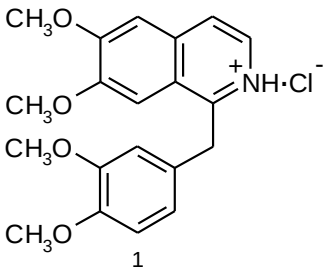
Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

1. Under conditions of industrial production, suppositories containing a medicinal substance with the following chemical structure are obtained:

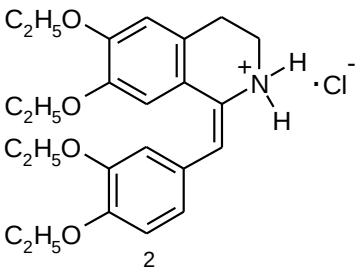


- ✓ When assessing the quality of this medicinal substance in samples of one series, the indicator "Content of other alkaloids of cinchona bark" did not meet the requirements of the regulatory documentation. Specify and explain the methodology for determining the impurity and suggest other tests characterizing its quality.
- ✓ Give the Russian, Latin and rational name of the drug. Characterize the physical and chemical properties (appearance, solubility, spectral and optical characteristics) and their use for quality assessment.
- ✓ According to the chemical properties, propose identification reactions and methods of quantification. Write the equations of reactions.

2. The analytical laboratory of the quality control department of the chemical-pharmaceutical enterprise received for analysis the substances of medicinal substances with the following chemical structure:



1



2

- ✓ When assessing the quality of substance "1" in samples of one series, the pH value of the solution did not meet the requirements of the State Pharmacopoeia - it was less than 3.0. Give a justification of the reasons for the change of its quality by this indicator in accordance with the properties. Suggest other tests characterizing its quality.
- ✓ Give the Russian, Latin and rational name of the medicinal product. Characterize physico-chemical properties (appearance, solubility, spectral and optical characteristics) and their use for quality assessment.
- ✓ According to the chemical properties, suggest identification reactions and quantification methods. Write the equations of the reactions. Suggest general and differentiating reactions for their detection. Write the equations of the reactions.
- ✓ Suggest methods of quantitative determination, give formulas for calculating the content of drug substances. What environmental factors affect the stability of drugs? Suggest rational storage conditions and methods of stabilization in dosage forms.

3. The pharmacy analytical supervisor analyzed the obtained substances quinine sulfate and quinine hydrochloride. He noted that both substances were slightly soluble in water, the pH of their aqueous extracts being 5.5. For authentication, he used the taleioquin test, which resulted in green coloration of the solution. Both drugs were quantified by alkalimetry.

- ✓ Do the obtained substances meet the requirements of the regulatory documentation in terms of water solubility and pH values? If not, explain the possible reasons for the changes in the values.
- ✓ Give a justification for the choice of reaction to establish authenticity and give the conditions for its conduct, write the reaction scheme. What additional reactions and physicochemical tests can you suggest?
- ✓ Is the method of quantification correct? If yes, explain why and characterize the conditions of its carrying out. What other methods can be used for this purpose?

Examples of tasks to evaluate the mastery of practical skills.

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

Objective of the work:

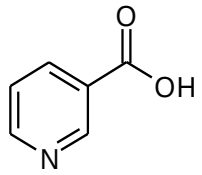
To determine the authenticity of pharmaceuticals - pyridine derivatives. To master the methods of chemical quality control established by the State Pharmacopoeia XIV.

Objects under test

Nicotinic acid

(acidum nicotinicum)

(pyridinecarboxylic-3 acid)



- ✓ As a β - pyridine carboxylic acid, nicotinic acid is readily decarboxylated when heated with anhydrous sodium carbonate and smells like pyridine.

Technique:

0.1 g of the preparation is heated with 0.1 g of anhydrous sodium carbonate; a pyridine odor develops.

- ✓ With copper sulfate CuSO4, nicotinic acid enters into a complexation reaction forming an insoluble blue-colored copper salt.

Technique:

To 3 ml of warm solution of the drug (1:100), 1 ml of copper sulfate solution is added; a blue precipitate precipitates.

- ✓ Nicotinic acid forms a soluble green complex with CuSO4 solution in the presence of ammonium rhodanide.

Technique:

To 10 ml of the same solution add 0.5 ml of copper sulfate solution and 2 ml of ammonium rhodanide solution; green coloration appears.

Example of a control work option

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

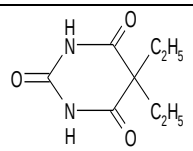
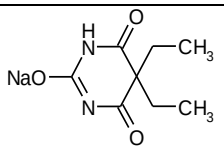
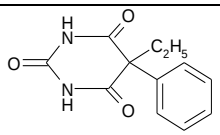
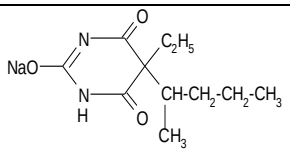
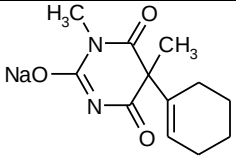
Chemical dictation
on the structures of drug compounds
BARBITURATES.

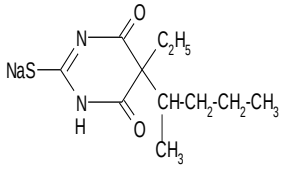
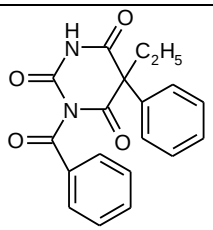
The teacher names the drug in any order and the student writes the name, structure, uses:

Drug substance

1	Barbital	5	Hexenal
2	Barbital sodium	6	Thiopental sodium
3	Phenobarbital	7	Benzonal
4	Etaminal sodium		

The answer:

№	Drug substance	Structure	Medical use
1	Barbital		Sleeping pill, sedative.
2	Barbital sodium		Sleeping pill, sedative (fast-acting).
3	Phenobarbital		Antisudorant, antiepileptic, sedative in small doses.
4	Etaminal sodium		Sleeping pills, in high doses has a narcotic effect
5	Hexenal		Sleeping pills, narcotic

6	Thiopental sodium		Sleeping pills. Used for anesthesia in surgical operations.
7	Benzonal		Antisudorant, antiepileptic.

Examples of essay topics

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

1. Vitamins. History of discovery. Finding in nature. Classification.
2. Alkaloids. Classification. Phenanthrenisoquinoline derivatives. Social significance.
3. Steroid compounds, their classification. Modification of steroidal compounds for obtaining drugs.

Examples of control questions for the interview:

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

Benzodiazepine Derivatives

1. Suggest the synthesis of oxazepam .
2. Write the authenticity reactions of nitrosepam.
3. What methods of quantification of fenozepam do you know.
4. Write the structural formulas of:
   - oxodoline;
   - aminazine;
   - etacizine.

Benzodiazepine Derivatives

1. Synthesis of chlordiazeproxide.
2. Authenticity of fenozepam.

3. Quantification of diazepam.
4. Write the structural formulas of:
   - dichlothiazide;
   - ethmosine;
   - furosemide.

Evaluation tools for intermediate certification in the discipline

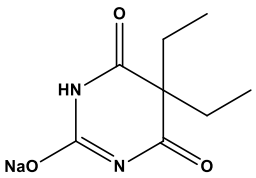
Intermediate certification is held in the form of an exam.

Intermediate certification includes the following types of tasks: solving situational tasks, interview.

Examples of situational tasks

Verifiable indicators of competence achievement: UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

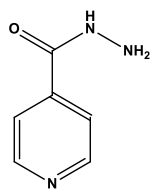
1. A trainee quality control analyst at a pharmaceutical company has received a substance of the following structure:

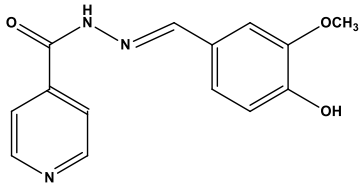


When assessing the quality of the preparation, the indicators "Solubility", "Transparency and color", "Free alkali content" did not meet the requirements of the regulatory documentation. The solution of the preparation opalesced immediately and the quantitative content of "free alkali" is significantly higher than specified in the regulatory documentation. The trainee needs to:

- Give a justification of the reasons for the change in its quality by this indicator according to its storage conditions and properties.
- Cite other tests characterizing its quality.
- Give the Russian and Latin names of this medicinal substance.
- Characterize its physical and chemical properties.
- According to the chemical properties, propose identification reactions and methods of quantification.

2. Provisor analyst of the pharmaceutical company delivered substances of drugs, received for the production of tablets of medicinal substances of several series of the following structure:





When determining the impurity of isonicotinic acid hydrazide in sample No. 2 according to the method State Pharmacopoeia, no stable blue staining on iodo-starch paper with sodium nitrite solution was observed. The Provisor Analyst should:

- Make a conclusion on the compliance of the impurity content with the requirements of the State Pharmacopoeia. Suggest other tests to characterize the quality of these drugs.
- Give the Russian, Latin and rational names of the drug. Characterize its physical and chemical properties.
- According to the chemical properties, propose identification reactions and methods of quantification. Write equations of reactions.

List of interview questions

№	Questions for intermediate certification	Verifiable indicators of competence achievement
1.	Subject and objectives of pharmaceutical chemistry. Basic terminology (biologically active substance, pharmacological agent, medicinal substance, drug, medicinal product, dosage form). Interrelation with chemical and biomedical disciplines.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
2.	Drugs of heterocyclic series - derivatives of pyridine and piperidine. Pyridine-3-carboxylic acid derivatives: nicotinic acid, nicotinamide, nicotinic acid diethylamide, picamilon.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
3.	Pyridine-4-carboxylic acid derivatives:	UC-8.1.1., UC-8.1.2., UC-8.2.1.,

	antitubercular agents (isoniazid, fthivazid, prothionamide), antidepressants (nialamide). Dihydropyridine derivatives: nifedipine (phenigidine). Piperidine derivatives: cyclodol.	UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
4.	Quinoline derivatives. Characterisation of quinoline derivatives. General method of synthesis of heterocyclic quinoline system. Quinozol, cinchofen, enteroseptol, nitroxoline, sovcaine	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
5.	Synthetic antimalarials - quinine analogues. Plasmocide, quinocide, hingamine.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
6.	Pyrimidine derivatives. Relationship between structure and action in the series of pyrimidine derivatives. Uracil and its derivatives - methylthiouracil, methyluracil. Uracil derivatives - pentoxyl, fluorouracil, fluorofur, hexamidine.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
7.	Synthetic drugs of nucleoside nature: cytarabine, azidothymidine, iodoxuridine, lamivudine.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
8.	Barbituric acid derivatives. Relation between chemical structure, narcotic and anticonvulsant action in the series of barbiturates. General methods of preparation of barbiturates. Barbital, phenobarbital, ethominal sodium, hexenal, thiopental	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-

	sodium, benzonal.	12.3.1.
9.	Benzothiazine derivatives. Non-steroidal anti-inflammatory agent - piroxicam. Benzothia-diazine derivatives - diuretics: chlortiazide and dichlothiazide. Derivatives of chlorobenzenesulfonic acid amide. Analogues in action - derivatives of chlorobenzenesulfonic acid amide: furosemide, bufenox. Oxodoline.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
10.	Neuroleptic agents - phenothiazine derivatives. Alkylamino derivatives - aminazine, propazine, triphthazine	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
11.	Acyl derivatives of phenothiazine - ethocyzine, ethmosine. Relationship between structure and action depending on the nature of substituents and nature of bonds	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
12.	Benzodiazepine derivatives as targeted drugs. General methods of preparation. Influence of the structure of drugs on the directionality of their pharmacological action in the series: chlordiazeproxide, diazepam, oxazepam, nitrazepam, phenazepam.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
13.	Classification of vitamins. Vitamins of aliphatic series. Ascorbic acid (vitamin C). Methods of production, causes of instability, redox and acid-base properties.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
14.	Vitamins of the aliphatic series. Pantothenic acid (calcium pantothenate), pangamic acid (calcium pangamate - vitamin B15).	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-

		4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
15.	Vitamins of the alicyclic series. Retinols (vitamins of group A). Retinol acetate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
16.	Calciferols (vitamins of the D group) as products of the transformation of sterols. Mechanism of formation of ergocalciferol (vitamin D2) and cholecalciferol (vitamin D3). Oxydevitol, dioxydevitol.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
17.	Aromatic vitamins - derivatives of naphthoquinones (K vitamins). Vikasol.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
18.	Antivitamins K. Dicoumarin, neodicoumarin, fepromarone, phenylin.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
19.	Vitamins of heterocyclic series. Chromic vitamins - tocopherols (vitamins of group E) as medicinal and prophylactic agents. Tocopherol acetate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
20.	Phenylchroman vitamins - bioflavanoids (P	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1.,

	vitamins). Rutin, quercetin.	GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
21.	Vitamins are derivatives of pyridine. Nicotinic acid, nicotinamide (vitamin B5 or PP).	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
22.	Oxy-methylpyridine vitamins (B6 vitamins). Pyridoxine hydrochloride, pyridoxal phosphate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
23.	Pyrimidine-thiazole vitamins (B1 vitamins). Thiamine chloride and bromide, cocarboxylase, phosphothiamine, benfotiamine. Biotransformation of vitamins. Biotransformation of B1 vitamins, stability, quality requirements, methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
24.	Pterin vitamins (vitamins of the folic acid group). Folic acid and its analogues. Relationship between structure and biological action. Methotrexate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
25.	Isoalloxazine derivatives (B2 vitamins) as medicinal and prophylactic agents. Riboflavin, riboflavin mononucleotide.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

26.	Pyrrole derivatives (B12 vitamins). Cyancobalamin, oxycobalamin, cobamide. Features of the structure of vitamins B12. Quality requirements, methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
27.	Alkaloids. Classification. General methods of isolation, purification and separation of alkaloids. Qualitative determination of alkaloids. General (group) reactions. Methods of quantitative determination of alkaloids.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
28.	Pyridine and piperidine derivatives. Lobelina hydrochloride, cytisine, pachycarpine	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
29.	Tropane derivatives. Atropine sulphate	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
30.	Synthetic analogues of atropine. Homatropine hydrobromide, scopolamine hydrobromide, tropacin, aprofen, troventol. Ecgonine derivatives. Cocaine hydrochloride. Characteristics of the drug. Social significance.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
31.	Quinoline derivatives. Quinine, quinidine, isodibut.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-

		12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
32.	Benzylisoquinoline derivatives. Papaverine hydrochloride and Drotaverine hydrochloride (no-shpa). Analogues of papaverine in action: tifen, diprofen, aprofen.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
33.	Phenanthrenoisoquinoline derivatives. Morphine, codeine. Sources of morphine. Semisynthetic derivatives of morphine. Apomorphine hydrochloride, ethylmorphine hydrochloride. The problem of creation of analgesics of morphine type and its social significance. Promedol, fentanyl.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
34.	Indole derivatives (raupholfia alkaloids). Reserpine.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
35.	Physostegmine salicylate and its semi-synthetic analogue proserine. Peculiarities of quality requirements and methods of analysis depending on redox properties and ability to isomerism. Strychnine nitrate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
36.	Imidazole derivatives. Pilocarpine hydrochloride. Benzimidazole derivatives. Dibazol, omeprozole.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
37.	Purine derivatives. Caffeine, theophylline, theobromine. General methods of synthesis and analysis based on oxidation and hydrolytic cleavage reactions of pyrimidine	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-

	and imidazole cycles.	10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
38.	Salts of purine derivatives. Diprophyllin, xanthinola nicotinate, pentoxifylline.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
39.	Synthetic drugs are purine derivatives. Allopurinol, etomizole, fopurin, riboxin.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
40.	Guanine derivatives. Acyclovir, ganciclovir.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
41.	Alkaloids, derivatives of phenylalkylamines. Ephedrine hydrochloride, dephedrine. Guanidine derivatives. Spherofisin benzoate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
42.	Hormones. Concept, biological role and classification of hormones.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
43.	Iodinated derivatives of aromatic amino acids. Thyroid hormones: thyroxine,	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1.,

	triiodothyronine. Complex drug - thyroidine. Antithyroid agents: diiodotyrosine.	PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
44.	Hydroxyphenylalkylamines. Adrenal medullary hormones (dopamine, adrenaline, noradrenaline and their salts). Synthetic analogues of catecholamines. Isoprenaline hydrochloride (isoprenaline). Mesaton.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
45.	Derivatives of substituted hydroxypropanolamines (betaadrenoblockers). Anapriline, atenolol	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
46.	Biochemical role of steroids in the body. Classification and nomenclature. Cardenolides (cardiac glycosides). Compounds of digitoxigenin series: digitoxin, acetyl digitoxin, digoxin. Strophanthin. Glycosides of lily of the valley: corglycone.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
47.	Corticosteroids. Relationship between structure and biological activity. Mineralcorticosteroids, glucocorticosteroids.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
48.	Deoxycorticosterone acetate, cortisone acetate, hydrocortisone and prednisolone, fluorosubstituted compounds: dexamethasone. Steroid esters	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

49.	Androgens and anabolics. Androgenic hormones as drugs: testosterone propionate, methyltestosterone.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
50.	Biological prerequisites for the production of semi-synthetic drugs with anabolic action. Methandrostenolone, methylandrostenediol, phenobolin. Quality requirements, methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
51.	Gestagens and their synthetic analogues. Progesterone, pregnine.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
52.	Estrogens. Estrone and estradiol as drug substances.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
53.	Estrogenic hormones. Ethinyl estradiol, mestranol, estradiol esters.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-

		12.3.1.
54.	Synthetic non-steroidal estrogen analogues.1 Synestrol, diethylstilbestrol. Synthetic anti-estrogenic agents - tamoxifen citrate (nolvadex).	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
55.	Antibiotics as medicines. Classification of antibiotics. Standardisation of antibiotics.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
56.	Penicillins. General chemical structure, its peculiarities. Relation between structure and biological action. Benzylpenicillin, its salts (sodium, potassium, novocaine). Phenoxymethylpenicillin. Semisynthetic penicillins: carbenicillin dynatrium salt, amoxicillin.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
57.	Cephalosporins. Partial directed synthesis of cephalosporin antibiotics. Cephalexin, cephalothin. Quality requirements and methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
58.	Antibiotics of the aromatic series. Nitrophenylalkylamines. Levomycetin (chloramphenicol). Syntomycin and its esters - stearate and succinate.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-

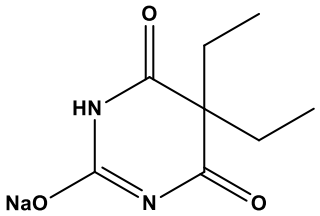
		10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
59.	Aminoglycoside antibiotics Streptomycin sulphate, kanamycin sulphate, gentamicin sulphate. Semisynthetic aminoglycosides. Amikacin. General quality requirements and methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
60.	Tetracyclines (partially hydrogenated naphthacene derivatives). Relationship between structure and biological action. Tetracycline, oxytetracycline and their semi-synthetic derivatives: metacycline and doxycycline. Quality requirements, methods of analysis.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
61.	Antitumour antibiotics of different chemical groups. Anthracycline antibiotics - rubomycin hydrochloride. Aurelic acid derivatives - olivomycin.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.
62.	Quinoline-5,8-dione derivatives. Bruneomycin, reumycin. Actinomycins: dactinomycin.	UC-8.1.1., UC-8.1.2., UC-8.2.1., UC-8.3.1., GPC-1.1.1., GPC-1.2.1., GPC-1.2.2., GPC-1.3.1., PC-4. 1.1., PC-4.2.1., PC-4.2.2., PC-4.3.1., PC-4.3.2., PC-10.1.1., PC-10.2.1., PC-10.3.1., PC-11.1.1., PC-11.2.1., PC-11.2.2., PC-11.3.1., PC-11.3.2., PC-12.1.1., PC-12.2.1., PC-12.3.1., PC-12.3.1.

Example of an exam card

Federal State Budgetary Educational Institution of Higher Education
"Volgograd State Medical University"
Ministry of Health of the Russian Federation
Department of Pharmaceutical and Toxicological Chemistry, pharmacognosy and botany

EXAMINATION CARD № 1
in the discipline " Special pharmaceutical chemistry "
for students of 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

1. Subject and objectives of pharmaceutical chemistry. Basic terminology (biologically active substance, pharmacological agent, drug substance, drug product, drug form). Interrelation with chemical and biomedical disciplines.
2. Antitumor antibiotics. Anthracyclines: rubomycin and its analogs.
3. Situational task. A trainee pharmacist-analyst of quality control of a pharmaceutical company received a substance of the following structure:



When assessing the quality of the preparation, the indicators "Solubility", "Transparency and color", "Free alkali content" did not meet the requirements of the regulatory documentation. The solution of the preparation opalesced immediately and the quantitative content of "free alkali" is significantly higher than specified in the regulatory documentation. The trainee needs to:

- Give a justification of the reasons for the change in its quality by this indicator according to its storage conditions and properties.
- Cite other tests characterizing its quality.
- Give the Russian and Latin names of this medicinal substance.
- Characterize its physical and chemical properties.
- According to its chemical properties, propose identification reactions and methods of quantification.

Seal place Head of department

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https://elearning.volgmed.ru/course/view.php?id=10063

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

Head of the Department  Ozerov A.A.