Appendix to the working program

Federal State Budgetary Educational Institution of Higher Education
"Privolzhsky Research Medical University"
Ministry of Health of the Russian Federation

BANK OF ASSESSMENT TOOLS FOR DISCIPLINE

PHARMACEUTICAL CHEMISTRY

Training program (specialty): 33.05.01 PHARMACY

Department: Pharmaceutical Chemistry and Pharmacognosy

Mode of study: full-time

Nizhniy Novgorod
2023

1. Bank of assessment tools for the current monitoring of academic performance, mid-term assessment of students in the discipline "Pharmaceutical Chemistry"

This Bank of Assessment Tools (BAT) for the discipline **"Pharmaceutical Chemistry"** is an integral appendix to the working program of the discipline **"Pharmaceutical Chemistry"**. All the details of the approval submitted in the WPD for this discipline apply to this BAT.

(Banks of assessment tools allow us to evaluate the achievement of the planned results stated in the educational program.

Assessment tools are a bank of control tasks, as well as a description of forms and procedures designed to determine the quality of mastering study material by students.)

2. List of assessment tools

The following assessment tools are used to determine the quality of mastering the academic material by students in the discipline **"Pharmaceutical Chemistry"**:

No.	Assessment tool	Brief description of the assessment tool	Presentation of the assessment tool in the BAT
1	Test	A system of standardized tasks that allows you to automate the procedure of measuring the level of knowledge and skills of a student	Bank of test tasks
2	Course work (project)	A tool of verifying the ability to present the results of theoretical, calculated, analytical, experimental studies	List of coursework topics (projects)
3	Colloquium	A tool of controlling the mastering of study materials of a topic, section or sections of a discipline, organized as a class in the form of an interview between a teacher and students.	Questions on topics/sections of the discipline
4	Interview	A tool of control organized as a special conversation between the teacher and the student on topics related to the discipline being studied, and designed to clarify the amount of knowledge of the student on a specific section, topic, problem, etc.	Questions on topics/sections of the discipline
5	Situational tasks	A method of control that allows you to assess the criticality of thinking and the degree of the material comprehension, the ability to apply theoretical knowledge in practice.	List of tasks

3. A list of competencies indicating the stages of their formation in the process of mastering the educational program and the types of evaluation tools

Code and formulation of competence	Stage of competence formation	Controlled sections of the discipline	Assessment tools
UK-1. An ability to carry out critical analysis of problem situations based on a systematic approach and developing an action strategy.	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium
UK-2. An ability to manage a project at all stages of its life cycle.	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium
OPK-1. An ability to use basic biological, physico-chemical, chemical, mathematical methods for the development, research and examination of medicinal products, manufacturing of medicinal products	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization	Tests, situational tasks, colloquium

		and quality control of API. Validation of analytical procedures.	
OPK-3. An ability to carry out professional activities taking into account specific economic, environmental, social factors within the framework of the system of regulatory regulation of the sphere of circulation of medicines	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium
OPK-6 ability to understand the principles of modern information technologies and use them to solve professional tasks	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium
PK-4. ability to participate in monitoring the quality, effectiveness and safety of medicinal products and medicinal plant raw	Input,Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium

PK-7 implementation of operations related to the technological process in the production of medicines, and their control	Input, Current, Intermediate	Section 1. Fundamentals of Pharmaceutical Analysis Section 2. Inorganic medicinal products Section 3. Medicinal products of aliphatic and alicyclic structure. Section 4. Medicinal products of aromatic structure Section 5. Antibiotics Section 6. Medicinal products of heterocyclic structure. Section 7. Standardization and quality control of API. Validation of analytical procedures.	Tests, situational tasks, colloquium

4. The content of the assessment tools of entry, current control

Entry /current control is carried out by the discipline teacher when conducting classes in the form of: tests, situational tasks, colloquium.

4.1. Tests and situational tasks (UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7) are presented on the PRMU Educational Portal:

https://sdo.pimunn.net/course/view.php?id=3186
https://sdo.pimunn.net/course/view.php?id=3895
https://sdo.pimunn.net/course/view.php?id=4023
https://sdo.pimunn.net/course/view.php?id=4541

4.2. Questions for colloquiums and interviews (UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7) are presented on the PRMU Educational Portal:

https://sdo.pimunn.net/course/view.php?id=3186
https://sdo.pimunn.net/course/view.php?id=3895
https://sdo.pimunn.net/course/view.php?id=4023
https://sdo.pimunn.net/course/view.php?id=4541

4.3. Tasks (assessment tools) of the exam (UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7) are presented on the PRMU Educational Portal:

https://sdo.pimunn.net/course/view.php?id=4541

5. The content of the assessment tools of mid-term assessment

Mid-term assessment is carried out in the form of a differentiated exam.

The fund of assessment tools for conducting current monitoring and intermediate certification of students in this discipline is presented on the PRMU Educational portal:

https://sdo.pimunn.net/course/view.php?id=3186
https://sdo.pimunn.net/course/view.php?id=3895
https://sdo.pimunn.net/course/view.php?id=4023
https://sdo.pimunn.net/course/view.php?id=4541

5.1 The list of control tasks and other materials necessary for the assessment of knowledge, skills and work experience.

5.1.1. Questions for the Pharmaceutical Chemistry exam

1. Acid-base titration. Neutralization method. Rules for selecting an indicator.

2. Acidimetry. Direct and reverse titration options. Acidimetry in a protogenic solvent medium.

3. Alkalimetry. Direct titration. Displacement method (direct titration), a variant of reverse titration with alkaline hydrolysis, indirect method. Alkalimetry in a protophilic solvent medium.

4. Fundamentals of complexometry. Complexons and indicators used in pharmacopoeial analysis. Complexometry (direct, reverse, indirect titration).

5. Argentometry. Mohr, Faience, Folgard, Kolthof's method.

6. Iodometry. Oxidation options. Unified iodometric method. Recovery option (indirect titration).

7. Bromatometry. Direct titration option. Back titration option.

8. Nitritometry.

9. Permanganatometry.

10. Physic-chemical methods of analysis.

11. Drugs of elements of groups II and III of the periodic table of elements.

12. Alcohols, aldehydes and esters. Ethyl alcohol, glycerol (glycerin), nitroglycerin, formaldehyde solution.

13. Carbohydrates (mono- and polysaccharides). Glucose.

14. Drugs of the phenol group.

15. Aromatic acids and their derivatives

16. Derivatives of p-aminobenzoic acid.

17. Pharmacopeial analysis of beta-lactam antibiotics Penicillins, Cephalosporins, Carbopenems, Monobactams, beta-lactamase inhibitors.

18. Pharmacopoeial analysis of Aminoglycosides. Tetracyclines.

19. Pharmacopoeial analysis of nitrophenylalkylamine derivatives (Levomycetin). Pharmacopoeial analysis of Macrolides.

20. Furan derivatives. Derivatives of 5-nitrofuran. Nitrofural, furagin.

21. Pyrazole derivatives. Phenazone (antipyrine), metamizole sodium (analgin), phenylbutazone (butadione).

22. Indole derivatives.

23. Imidazole derivatives. Pilocarpine hydrochloride, bendazole hydrochloride (dibazole), clonidine hydrochloride (clopheline), metronidazole, naphazoline nitrate (naphthyzine), clotrimazole, omeprazole.

24. Histamine dihydrochloride. Antihistamines: diphenhydramine hydrochloride (diphenhydramine), ranitidine.

25. Piperidine derivatives: loratadine, loperamide hydrochloride.

26. Derivatives of dihydropyridine: nifedipine, amlopidine.

27. Derivatives of pyridine-3-carboxylic acid: nicotinic acid, nicotinamide.

28. Derivatives of pyridine-4-carboxylic acid: isoniazid, ftivazid.

29. Pyridinemethanol derivatives. Pyridoxine hydrochloride (B6 vitamins), pyridoxal phosphate.

30. Derivatives of pyrimidine-2,4,6-trione (barbituric and thiobarbituric acids). Phenobarbital, sodium thiopental, benzonal (benzobarbital).

31. Pyrimidine-2,4-dione derivatives. Methyluracil, fluorouracil.

32. Xanthine derivatives: caffeine, theophylline, theobromine, sodium caffeine benzoate, aminophylline (eufillin).

33. Derivatives of phenothiazine. Alkylamino derivatives.

34. Benzodiazepine derivatives. nitrazepam, phenazepam.

35. 1,2-benzothiazine derivatives: piroxicam. Derivatives of 1,5-benzothiazepine: diltiazem.

Question	Code of competence (according to the RAA)
1	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
2	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
3	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
4	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
5	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
6	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
7	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
8	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
9	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
10	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
11	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
12	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
13	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
14	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
15	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
16	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
17	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
18	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
19	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
20	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
21	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
22	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
23	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
24	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
25	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
26	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
27	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
28	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
29	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
30	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
31	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
32	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
33	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
34	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7
35	UK-1, UK-2, OPK-1, OPK-3, OPK-6, PK-4, PK-7

5.1.3. Subject of coursework

1. Synthesis, biotransformation and pharmaceutical analysis of vancomycin.
2. Synthesis, biotransformation and pharmaceutical analysis of telavancin.
3. Synthesis, biotransformation and pharmaceutical analysis of bleomycin.
4. Synthesis, biotransformation and pharmaceutical analysis of ramoplanin.
5. The relationship between the chemical structure and activity in the group of fluoroquinolones. Synthesis, biotransformation and pharmaceutical analysis.
6. The structure–activity relationship in the carbapenem group. Synthesis, biotransformation and pharmaceutical analysis.
7. The structure–activity relationship in the dihydropyrimidine group. Synthesis, biotransformation, and pharmaceutical analysis of drugs.
8. The structure–activity relationship in the macrolide group. Synthesis, biotransformation and pharmaceutical analysis of peparates.

9. Beta-lactamase inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
10. Polyenes. Synthesis, biotransformation and pharmaceutical analysis.
11. Phenanthrene derivatives analgesics. Synthesis, biotransformation and pharmaceutical analysis.
12. Piperidine derivatives analgesics. Synthesis, biotransformation and pharmaceutical analysis.
13. Antiviral drugs that act on extracellular forms of the virus. Synthesis, biotransformation and pharmaceutical analysis.
14. Antiviral viropexis inhibitors (M2 channel blockers). Synthesis, biotransformation and pharmaceutical analysis.
15. Antiviral neuraminidase inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
16. Antiviral DNA polymerase inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
17. Antiviral RNA polymerase inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
18. Antiviral reverse transcriptase inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
19. Antiviral protease inhibitors. Synthesis, biotransformation and pharmaceutical analysis.
20. Fusidic acid. Synthesis, biotransformation and pharmaceutical analysis.
21. Pharmaceutical analysis of vitamin B1 and B2 preparations.
22. Water-soluble forms of vitamin D. Their pharmaceutical analysis.
23. Approaches to the synthesis of new antibiotics that active against multi-resistant bacteria.
24. The structure–activity relationship of lincosamides. Synthesis, biotransformation and pharmaceutical analysis.
25. Antifungal antibiotics. Synthesis, biotransformation and pharmaceutical analysis.
26. Monobactams. Synthesis, biotransformation and pharmaceutical analysis.
27. Polyene antifungal antibiotics. Synthesis, biotransformation and pharmaceutical analysis.

Coursework as an element of an academic discipline should contribute to the formation of competencies provided for in the competence matrix for this discipline and specified in the WPD.

6. Criteria for evaluating learning outcomes

Learning outcomes	**Assessment of competence developed**			
	unsatisfactory	**satisfactory**	**good**	**excellent**
Completeness of knowledge	The level of knowledge is below the minimum requirements. There were bad mistakes	The minimum acceptable level of knowledge. A lot of light mistakes were made	The level of knowledge in the volume corresponding to the training program. A few light mistakes were made	The level of knowledge in the volume corresponding to the training program, without errors
Availability of skills	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	Basic skills are demonstrated. Typical problems with light mistakes have been solved. All tasks have been completed, but not in full.	All basic skills are demonstrated. All the main tasks have been solved with light mistakes. All tasks have been completed, in	All the basic skills were demonstrated, all the main tasks were solved with some minor shortcomings, all the tasks were completed in full

Learning outcomes	Assessment of competence developed			
	unsatisfactory	**satisfactory**	**good**	**excellent**
			full, but some of them with shortcomings	
Availability of skills (possession of experience)	Basic skills are not demonstrated when solving standard tasks. There were bad mistakes	There is a minimal set of skills for solving standard tasks with some shortcomings	Basic skills in solving standard tasks with some shortcomings are demonstrated	Skills in solving non-standard tasks without mistakes and shortcomings are demonstrated
Characteristics of competence formation*	The competence is not fully formed. The available knowledge and skills are not enough to solve professional tasks. Repeated training is required	The formation of competence meets the minimum requirements. The available knowledge and abilities are generally sufficient to solve professional tasks, but additional practice is required for most practical tasks	The formation of competence generally meets the requirements, but there are shortcomings. The available knowledge, skills and motivation are generally sufficient to solve professional tasks, but additional practice is required for some professional tasks	The formation of competence fully meets the requirements. The available knowledge, skills and motivation are fully sufficient to solve complex professional tasks
The level of competence formation*	Low	Below average	Intermediate	High

For testing:

Mark "5" (Excellent) - points (100-90%)
Mark"4" (Good) - points (89-80%)
Mark "3" (Satisfactory) - points (79-70%)

Less than 70% – Unsatisfactory – Mark "2"

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