

**Assessment tools for conducting attestation
in discipline «Chemistry of biogenic elements»
for students of 2025 year of admission
under the educational programme
33.05.01 Pharmacy,
specialisation (profile) Pharmacy
(Specialist's degree),
form of study full-time correspondence
for the 2025 - 2026 academic year**

1. Assessment tools for conducting current attestation in discipline «Chemistry of biogenic elements».

The current attestation includes the following types of tasks: testing, control work, interview on control questions

1.1. Examples of test

Verifiable indicators of competence achievement: UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

Choose just one correct answer

1. Which element is more metallic?
 - A. sodium
 - B. potassium
 - C. magnesium
 - D. calcium
2. As you move from left to right on the periodic tables
 - A. atomic radius increases and ionization energy increase
 - B. atomic radius increases and ionization energy decreases
 - C. atomic radius decreases and ionization energy increases
 - D. atomic radius decreases and ionization energy decreases
3. The shape of d-orbital is
 - A. spherical
 - B. dumbbell or figure of eight shaped
 - C. donut shaped
 - D. cross shaped
 - E. none of the above
4. The maximum number of electrons allowed in a d sublevel is:
 - A. 10
 - B. 6
 - C. 8
 - D. 2
 - E. none of the above
5. The number of unpaired electrons in a oxygen atom is
 - A. 1
 - B. 3
 - C. 2
 - D. 7
 - E. oxygen has no unpaired electrons
6. Which of the following would be the most polar bond
 - A. H – H

- B. H – F
 - C. H – N
 - D. H – O
 - E. H – C
7. Which of the following atoms has a partly filled p sublevel?
- A. Ca
 - B. Zn
 - C. Ne
 - D. As
 - E. Ar
8. The number of electrons in the highest principal energy level of Sr is
- A. 85
 - B. 2
 - C. 8
 - D. 38
 - E. 1
9. Which of the following is true
- A. Na^+ is larger than Na
 - B. Cl^- is larger than Cl
 - C. He is larger than Ar
 - D. F^- is the same size as F
10. Which of the following properties generally does not increase as we go across the periodic table?
- A. atomic number
 - B. atomic size
 - C. number of electron shells
 - D. none of these
11. Which element has the lowest ionization energy?
- A. rubidium
 - B. argon
 - C. sulfur
 - D. chlorine
 - E. lithium
12. Which element has the smallest atomic size?
- a. carbon
 - b. xenon
 - c. lithium
 - d. sulfur
 - e. sodium
13. How many moles of HNO_3 are needed to prepare 5.0 liters of a 2.0 M solution of HNO_3 ?
- A 2.5
 - B 5
 - C 10
 - D 20
14. Find the pH of the following solution 0.0815 M NaOH
- A. 1.08
 - B. - 1.08
 - C. 12.9
 - D. - 12.9
15. Find the pOH of the following solution 0.0115 M HCl
- A. - 1.9
 - B. 12.1

C. 1.9

D. - 12.1

16. 23.45 mL of 0.275 M sodium hydroxide was used to titrate against 15 mL of acetic acid. What was the normality of acetic acid?

A. 0.430 N

B. 0.176 N

C. 0.275 N

D. 0.152 N

17. Which of the following combinations define a process that is always spontaneous?

A. $\Delta H < 0$, $\Delta S > 0$

B. $\Delta H < 0$, $\Delta S < 0$

C. $\Delta H = 0$, $\Delta S < 0$

D. $\Delta H > 0$, $\Delta S > 0$

E. $\Delta H > 0$, $\Delta S < 0$

18. The first law of thermodynamics is a restatement of which law?

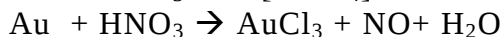
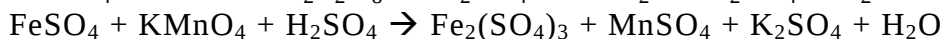
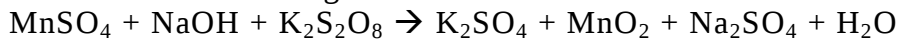
A. conservation of energy

B. second law of thermodynamics

C. kinetic-molecular law

D. gravity

19. Balance the following red-ox reactions



1.2. An example of a test case.

Verifiable indicators of competence achievement: UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

1. The specific gravity of 48 % HNO_3 solution equals 1.25. Calculate molarity and molality of this solution.
2. How much glucose ($\text{C}_6\text{H}_{12}\text{O}_6$) per liter should be used for an intravenous solution to match the 780 kPa at 37 °C osmotic pressure of blood?
3. Two processes flow with the same rates at 25°C. The temperature coefficient of the first reaction is equal to 3.2 and the second reaction 1.7. Find the ratio between rates of these reactions at 55°C.
4. 500 mL of 1 M citric acid has 0.1 mole of sodium citrate added to it. What is the pH of this buffer? ($K_a = 6.58 \cdot 10^{-4}$).

1.3. Examples of control questions for the interview.

Verifiable indicators of competence achievement: UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

1. What is the thermodynamic system? How can we classify the systems? Give some examples.
2. How do the buffer solutions work (if add a strong acid or a strong base)? Buffer capacity.
3. Find the molarity of OH^- ions in the solution in which the concentration of H^+ ions is equal to: a) $1.4 \cdot 10^{-10} \text{ mol/L}$, b) $2.3 \cdot 10^{-2} \text{ mol/L}$.
4. How many grams of magnesium sulfate do you need to make 250 ml of 1.6% MgSO_4 solution ($p=1.16$)?
5. Calculate ΔG° and equilibrium constant of the reaction: $\text{C}_{(\text{s})} + \text{CO}_{2(\text{g})} \rightleftharpoons 2\text{CO}_{(\text{g})}$ at 500°C.
6. Describe the osmosis process. Van't Hoff's Law. What are plasmolysis, hemolysis, lysis? What happens to red blood cells that are placed in the following solutions: 2% NaCl, pure water, 0.9% NaCl?
7. 15.0g of calcium carbonate is dissolved in 250g of water. If the water has a temperature of 30°C, what is the resulting vapor pressure of the water in solution? (The vapor pressure of pure water at 30°C is 53.196 kPa)

1.4 Assessment tools for students' independent work

The evaluation of independent work includes testing.

1.4.1. Examples of test tasks with a single answer

1. How many moles of HNO_3 are needed to prepare 5.0 liters of a 2.0 M solution of HNO_3 ?
A 2.5
B 5
C 10
D 20
2. Find the pH of the following solution 0.0815 M NaOH
A. 1.08
B. - 1.08
C. 12.9
D. - 12.9
3. Find the pOH of the following solution 0.0115 M HCl
A. - 1.9
B. 12.1
C. 1.9
D. - 12.1
4. 23.45 mL of 0.275 M sodium hydroxide was used to titrate against 15 mL of acetic acid. What was the normality of acetic acid?
A. 0.430 N
B. 0.176 N
C. 0.275 N
D. 0.152 N
5. Which of the following combinations define a process that is always spontaneous?
A. $\Delta H < 0, \Delta S > 0$
B. $\Delta H < 0, \Delta S < 0$
C. $\Delta H = 0, \Delta S < 0$
D. $\Delta H > 0, \Delta S > 0$
E. $\Delta H > 0, \Delta S < 0$

1.4.2. Examples of multiple choice test tasks and/or matching and/or sequencing

1. Thermodynamic systems are classified as:

- a) Isolated
- b) Open
- c) Closed
- d) Different

2. Living organisms are

- a) open systems
- b) systems which exchange mass only
- c) isolated systems

d) closed systems

e) systems which exchange mass and energy with environment.

2. Assessment tools for conducting intermediate attestation in a discipline «Chemistry of biogenic elements».

Intermediate attestation is carried out in the form of an exam. The intermediate attestation includes the following type of tasks: interview on control issues.

List of questions to prepare for the intermediate attestation:

№	EXAMINATION QUESTIONS IN CHEMISTRY	Verifiable general professional competencies
1.	Solutions and types	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
2.	Chemical equivalent and calculation. The Law of equivalent weight.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
3.	The methods of expressing concentrations (mass (percentage) concentration, molar concentration, molal concentration, normal (equivalent) concentration)	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
4.	The subject of chemical thermodynamics. The main definitions: the system, the parameters of the condition, the functions of the condition	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
5.	The Ist Law of Thermodynamics. Internal energy. Enthalpy. The Hess's Law and its effects.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
6.	The IInd Law of Thermodynamics. Entropy. Gibbs free energy.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
7.	Spontaneous processes. The criteria and directions of spontaneous processes.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
8.	Caloricity of food. Caloric intake	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

9.	Strong and weak acids. Strong and weak bases. Ionization degree and ionization constant. The calculation of pH for strong and weak acids/bases.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
10.	Ionic product of water. pH and pOH: definition and calculations for strong and weak acids and bases	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
11.	Buffer solutions. Their classification and mechanism of their action.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
12.	Calculation of pH of buffer solutions	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
13.	Buffer capacity and its determination	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
14.	Buffer systems in a human body. Regulation of acid-base balance in the organism. Alkalosis and acidosis	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
15.	The vapour pressure lowering. The Raoult's Law	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
16.	Effects of the Raoult's Law. Ebullioscopy and cryoscopy.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
17.	Osmosis, its mechanism. Osmotic pressure of the solution. The Van't Hoff's Law. Dialysis	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
18.	The isotonic, hypo- and hypertonic solutions. Plasmolysis. Hemolysis. Dialysis. Their practical use in medicine	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
19.	The structure of coordination compounds. The Werner's theory.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
20.	Classification of complexes. Naming with examples. Types of isomerism in complexes (examples).	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
21.	Bonding in complex ions, types of hybridization	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

22.	Ionization of complexes and their stability of complexes. Stability constant	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
23.	Importance of complex compounds in nature. Their use in medicine.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
24.	Redox reactions. Oxidation and reduction processes. Main oxidants and reductants. EMF.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
25.	Electron configuration of atoms: The Aufbau Principle: Pauli's Principle, the Hund's rule, Klechkovsky's Rule and their application to arrange the electrons.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
26.	The main principles of quantum mechanics. The equations of De Broglie, Schrödinger and the uncertainty principle of Heisenberg. The atomic model in accordance to the quantum mechanics.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
27.	The principle of quantum numbers: n, l, m and s.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
28.	Chemical bond and its properties: energy, length, polarity, order and angle.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
29.	Covalent bonding. Two mechanisms of covalent bonding with examples. Hybridization of atomic orbitals: SP, SP ² , SP ³	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
30.	Ionic bond, its properties	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
31.	Hydrogen bonding, mechanism of formation and an importance in associated processes.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
32.	Heterogeneous equilibria and K _{sp} . Calculations of solubility and solubility product. Condition of precipitation and condition of dissolution. Biological importance of heterogeneous processes in living matter. Disorders.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
33.	Prevalence of elements in Nature. Classification of elements. Organogens. Accumulation of elements in the human body. Chemical bases of inorganic compounds in their application as medicines.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1

34.	Pharmacopea.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
35.	Physical and chemical properties of Lithium, its oxides and acids. Biological role of Lithium and compounds, and their application in medicine. Identification of Lithium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
36.	Physical and chemical properties of Sodium, its oxides and acids. Biological role of Sodium and compounds, and their application in medicine. Identification of Sodium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
37.	Physical and chemical properties of Potassium, its oxides and acids. Biological role of Potassium and compounds, and their application in medicine. Identification of Potassium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
38.	Hydrogen, atomic structure and characteristics. Interaction with oxygen, halogens, active metals and oxides.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
39.	Physical and chemical properties of Calcium, its oxides and acids. Biological role of Calcium and compounds, and their application in medicine. Identification of Calcium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
40.	Physical and chemical properties of Magnesium, its oxides and acids. Biological role of Magnesium and compounds, and their application in medicine. Identification of Magnesium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
41.	Physical and chemical properties of IA group elements. Biological role of alkali metals and compounds, and their application in medicine. Identification of IA element compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
42.	Physical and chemical properties of IIA group elements. Biological role of alkaline earth metals and compounds, and their application in medicine. Identification of IIA element compounds	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1,

	in Pharmacopeia.	GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
43.	Calcium and Magnesium as antagonists. Biological importance of these elements in physiological processes	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
44.	Physical and chemical properties of Nitrogen, its oxides and acids. Biological role of Nitrogen and compounds, and their application in medicine. Identification of Nitrogen compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
45.	Physical and chemical properties of Oxygen. Biological role of Oxygen and compounds, and their application in medicine. Identification of Oxygen compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
46.	Physical and chemical properties of Phosphorus, its oxides and acids. Biological role of Phosphorus and compounds, and their application in medicine. Identification of Phosphorus compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
47.	Physical and chemical properties of Carbon, its oxides and acids. Biological role of Carbon and compounds, and their application in medicine. Identification of Carbon compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
48.	Physical and chemical properties of Sulfur, its oxides and acids. Biological role of Sulfur and compounds, and their application in medicine. Identification of Sulfur compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
49.	Physical and chemical properties of Boron, its oxides and acids. Biological role of Boron and compounds, and their application in medicine. Identification of Boron compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
50.	Physical and chemical properties of Aluminum, its oxides and acids. Biological role of Aluminum and compounds, and their application in medicine. Identification of Aluminum compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-

		1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
51.	Chemistry of biogenic elements of VII A group (general characteristics).	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
52.	Physical and chemical properties of Fluorine, its oxides and acids. Biological role of Fluorine and compounds, and their application in medicine. Identification of Fluorine compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
53.	Physical and chemical properties of Bromine, its oxides and acids. Biological role of Bromine and compounds, and their application in medicine. Identification of Bromine compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
54.	Physical and chemical properties of Chlorine, its oxides and acids. Biological role of Chlorine and compounds, and their application in medicine. Identification of Chlorine compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
55.	Chemistry of biogenic elements of VI A group (general characteristics).	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
56.	Physical and chemical properties of Selenium, its oxides and acids. Biological role of Selenium and compounds, and their application in medicine. Identification of Selenium compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
57.	Chemistry of biogenic elements of V A group (general characteristics).	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
58.	Physical and chemical properties of Arsenic, its oxides and acids. Biological role of Arsenicum and compounds, and their application in medicine. Identification of Arsenicum compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1

59.	Chemistry of biogenic elements of IV A group (general characteristics).	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
60.	Physical and chemical properties of Silicon, its oxides and acids. Biological role of Silicon and compounds, and their application in medicine. Identification of Silicon compounds in Pharmacopeia.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
61.	General characteristics of VIII B group. Cobalt. Properties and chemical behavior of its compounds (oxide, acids\bases). Biological importance and application of Cobalt.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
62.	General characteristics of VIII B group. Iron. Properties and chemical behavior of its compounds (oxide, acids\bases). Biological importance and application of Iron.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
63.	Qualitative Tests on 3d-metal Ions (Fe, Co)	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
64.	General characteristics of I B group. Copper. Properties and Identification in Pharmacopea. Properties and chemical behavior of its compounds (oxide, acids\bases). Biological role of Copper and compounds, and their application in medicine.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
65.	General characteristics of I B group. Silver. Properties and Identification in Pharmacopea. Properties and chemical behavior of its compounds (oxide, acids\bases). Biological role of Silver and compounds, and their application in medicine.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
66.	General characteristics of II B group. Zinc. Properties and Identification in Pharmacopea. Properties and chemical behavior of its compounds (oxide, acids\bases). Biological role of Zinc and compounds, and their application in medicine.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
67.	General characteristics of VII B group. Manganese. Biological importance and application of Manganese. Identification of Manganese compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-

		1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
68.	General characteristics of VI B group. Chromium. Biological importance and application of Chromium. Identification of Chromium compounds in Pharmacopeia	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
69.	Qualitative Tests on 3d-metal Ions (Cr, Mn)	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1
70.	Radioactive forms of elements. A radionuclide (radioactive nuclide, radioisotope or radioactive isotope) in Nature. Radionuclides in Medicine and Pharmacy	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
71.	Therapeutic radionuclides in nuclear medicine	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1
72.	Natural healthy concepts. Vitamins and minerals suppliments.	UC-1.1.1, UC-1.2.1, UC-1.3.1, GPC-1.1.1, GPC-1.2.1, GPC-1.3.1, PC-4.1.1, PC-4.2.1, PC-4.3.1

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Head of the Department of Chemistry, professor



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