MINISTRY OF HEALTH OF THE RUSSIAN FEDERATION

Pirogov Russion National Research Medical University

Medical Faculty

Institute of Pharmacy and Medicinal Chemistry

Depatment of chemistry

Discipline General and bioorganic chemistry

For the first year students of international department (two diplomas)

"General and bioorganic chemistry" curriculum
for the 1st year English-speaking students of the international department
2023-2024 academic year. First semester

Week	Type of the lesson*	Topic	Plan			
			In-class exercises	lab work	assessment	points
1	ПЗ	Introduction. Quantitative description for the content of a solute in a solution. Colligative properties of solutions. Osmosis Strong electrolytes			Activity **Online test** «Solutions and osmosis»	10 10
2	ЛПЗ	Fundamentals of chemical thermodynamics		Standard enthalpy of neutralization	Activity **Online test** «Chemical thermodynamics»	10 10 10
3	ЛПЗ	Chemical equilibrium		The shift of chemical equilibrium	Activity **Online test** «Chemical equilibrium»	10 10 10
4	ЛПЗ	Chemical kinetics			Activity **Online test** «Chemical kinetics»	10 10
5	**К**	**Unit I (30 — online test; 20 – paper test and oral examination; 30 - additional control)**				80
6	ЛПЗ	Strong and weak electrolytes. Protolytic equilibria. pH of solution of strong and weak electrolytes		Identification of electrolytes	Activity **Online test** «Strong and weak electrolytes»	10 10 10
7	ЛПЗ	Buffer systems		Colorimetric determination of buffer capacity	Activity **Online test** «Buffer systems»	10 10 10
8	ПЗ	Electrode, redox and membrane potentials. The direction of a redox process			Activity **Online test** «Redox processes»	10 10
9	ЛПЗ	Heterogeneous equilibria precipitate-solution and gas-solution. Equilibria in solutions of complex compounds		Heterogeneous equilibria precipitate-solution and gas-solution. Equilibria in solutions of complex compounds	Activity **Online test** «Ksp and complex compounds»	10 10 10
10	**К**	**Unit II (30 — online test; 20 – paper test and oral examination; 30 - additional control)**				80

11	ПЗ	Classification and nomenclature of organic compounds	In-class exercises		Activity **Online test** «Nomenclature of organic compounds» **Paper test** «Nomenclature of organic compounds»	10 10 10
12	ПЗ	Electron structure of organic compounds. Acidity and basicity of organic compounds			Activity **Online test** «Electron structure of organic compounds. Acidity and basicity of organic compounds» **Paper test** «Acidity and basicity of organic compounds»	10 10 10
13	ПЗ	Stereoisomerism of organic compounds			Activity **Online test** «Stereoisomerism of organic compounds» **Paper test** «Stereoisomerism of organic compounds»	10 10 10
14	ПЗ	Radical (S_R) reactions and Electrophilic (A_E, S_E) reactions		.	Activity **Online test** «Radical and electrophilic reactions» **Paper test** « Radical and electrophilic reactions»	10 10 10

15	ПЗ	Reactivity of organic compounds with σ-bond carbon–heteroatom			Activity **Online test** «Reactivity of organic compounds with σ-bond carbon–heteroatom» **Paper test** «Reactivity of organic compounds with σ-bond carbon–heteroatom»	10 10 10
16	ЛПЗ	Reactivity of organic compounds with carbonyl group. Aldehydes and ketones		Reactivity of organic compounds	Activity	10 10
17	ПЗ	Reactivity of organic compounds with carbonyl group. Carboxylic acids and their derivates			Activity **Online test** «Reactivity of organic compounds with carbonyl group» **Paper test** «Reactivity of organic compounds with carbonyl group»	10 10 10
18	**К**	**Unit III (30 — online test; 20 – paper test and oral examination; 30 - additional control)**				80

*) All abbreviations are given in Russian

Online lectures

1. Introduction to chemical thermodynamics. Thermodynamics of chemical equilibrium. Colligative properties of solutions. Osmosis.
2. Equilibria in aqueous solutions of electrolytes. Protolytic equilibria. Calculation of pH for electrolytes solutions. Buffer systems.
3. Chemical kinetics. Redox equilibria. Potentials and E_{mf}.
4. Equilibria in aqueous solutions of complex compounds. Heterogeneous equilibria.
5. Electron structure of organic compounds. Acidity and basicity of organic compounds.
6. Factors affecting the reactivity of organic compounds. Mechanisms of reactions. Radical reactions and electrophilic reactions.
7. Reactivity of compounds with σ-bond carbon-heteroatom. S_N и E reactions.
8. Reactivity of compounds with carbonyl group

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Week	Type of the lesson*	Topic	Plan			
				lab work	assessment	points
1	ПЗ	Oxidation and reduction of different classes of organic compounds	In-class exercises		Activity	10
2	ПЗ	Reactivity of poly- and heterofunctional organic compounds			Activity **Online test** «Reactivity of poly- and heterofunctional organic compounds» **Paper test** «Hetero- and polyfunctional compounds»	10 10 10
3	ЛПЗ	Chemical structure of mono-, di and polysaccharides		Reactivity of poly- and heterofunctional organic compounds	Activity	10
4	ПЗ	Chemical properties of carbohydrates			Activity **Online test** «Chemical properties of carbohydrates» **Paper test** «Carbohydrates»	10 10 10
5	ПЗ	Heterocyclic organic compounds. Nucleosides, nucleotides			Activity **Online test** «Heterocycles» **Paper test** «Nucleotides»	10 10 10
6	**К**	**Unit IV (30 — online test; 20 – paper test and oral examination)**				50
7	ПЗ	Lipids and related compounds	In-class exercises		Activity Online test «Hydrolyzable lipids Online test «Hydrolyzable lipids	10 10 10
8	ПЗ	α-Amino acids, peptides			Activity **Online test** «α-Amino acids, peptides» **Paper test** «α-Amino acids, peptides»	10 10 10
9	ПЗ	Structure of proteins. Acid-base properties of proteins. Denaturation			Activity **Online test** «Peptides and protein - structure and properties	10 10
10	**К**	**Unit V (30 — online test; 20 – paper test and oral examination)**				50

11	ЛПЗ	Surface tension and adsorption	In-class exercises	Determination of surface tension by stalagmometric method	Activity **Online test** «Surface phenomena»	10 10
12	ЛПЗ	Ultramicroheterogeneous systems (lyophobic sols), formation and coagulation		Preparing sols of iron(III) hexacyanoferrate(II). Determining the sign of the charge of colloidal particles	Activity	10 10
13	ЛПЗ	Lyophilic sols. Microheterogeneous and coarse dispersed systems		Determination of cmc by stalagmometric method	Activity **Online test** «Ultramicroheterogeneous and microheterogeneous systems. Lyophilic sols»	10 10 10
14	ЛПЗ	Solutions of biopolymers. Factors affecting the stability of protein solutions		Denaturation and salting out of proteins	Activity **Online test** «Protein solutions»	10 10 10
15	ЛПЗ	Methods for separation and analysis of biopolymers. Chromatography		Chromatography	Activity **Online test** «Chromatography»	10 10
16	**К**	**Unit VI (30 — online test; 20 – paper test and oral examination)**				50
17	**ПА**	**Exam «General and bioorganic chemistry »(30 — online test; 50 – paper test)**				80

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Online lectures

1. Reactivity of poly- and heterofunctional organic compounds.
2. Carbohydrates.
3. Heterocyclic organic compounds. Nucleosides, nucleotides, and nucleic acids.
4. Lipids and related compounds. Hydrophilic sols. Microheterogeneous systems.
5. α-Amino acids, peptides, and proteins
6. Solutions of biopolymers. Methods of isolation and purification of biopolymers. Chromatography

Monitoring and assessment for the discipline "General and bioorganic chemistry"

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						1 semester		2 semester	
№	Monitoring and assessment (ФТКУ)	Name and abbreviation		Student activity (ВРО)	Control	Plan %	Plan %	Plan %	Plan %
1	Attendance recording (КП)	Attendance	КП	Attendance	Attendance	1	0,04	1	0,05
2	Activity monitoring (A)	Activity	А	In-class exercises	Activity	5	0,03	5	0,04
3	Paper test (ОП)	Short paper test	ОП	Completing a paper test	Required	16	0,32	21	0,42
4	Online test (ТЭ)	Short online test	ТЭ	Completing an online test	Required	15	0,11	10	0,10
5	Lab work assessment (ЛР)	Lab work	ЛР	Completing a lab work	Required	12	0,24	12	0,20
6	Written and oral examination (ОК)	Unit paper test and oral examination	ОК	Answering questions in writing and orally	Required	28	0,47	28	0,47
7	Online test (ТЭ)	Unit online test	ТЭ	Completing an online test	Required	1	0,01	23	0,26
8	**Preparation for additional control**	Additional control	ПО	Required		22	0,24	-	-

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