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**Budgetary institution of higher education**

Khanty-Mansiysk Autonomous Okrug-Ugra  
"Surgut State University"

Approved by  
Deputy Rector for Academic

\_\_\_\_\_ E.V.

Кновалова 11 June 2026 г.,

Record No 5

# Chemistry

## Syllabus

Department **Chemistry**  
Curriculum s310501-ЛечДелоИн-25-1.plx  
Specialty 31.05.01 General Medicine  
Qualification **General Practitioner**  
Form of education **Full-time**  
Total (in credit units) **3**

Hours according to the 108  
including:  
Classes 64  
Self-study 17  
Hours for control 27

Types of control in terms:  
Exams 2

### Distribution of hours

Academic year (term)	2 (1.2)		Total	
	Cur	Syl	Cur	Syl
Weeks	17 2/6			
Types of classes	Cur	Syl	Cur	Syl
Lectures	16	16	16	16
Laboratory	16	16	16	16
Practical	32	32	32	32
Total classes	64	64	64	64
Control work	64	64	64	64
Self-study	17	17	17	17
Control hours	27	27	27	27
Total	108	108	108	108

Work program was made by:

*PhD of biology science Mironova K.A.*

## **Work program of the discipline**

### **Chemistry**

Made by Federal Law dd.:

Federal state educational standard of higher education - specialty in specialty 05/31/01 General Medicine (order of the Ministry of Education and Science of Russia from 12.08.2020, № 988)

based on the curriculum:

05/31/01 General medicine

Specialization: General Medicine

approved by the educational and methodological council of the university dated June 11, 2026, protocol No. 5.

The work program was approved at a department meeting

### **Chemistry**

1. COURSE OBJECTIVES	
1.1	The objectives of studying the discipline are: to study theoretical basis and principles of modern chemistry; to study main classes of chemical compounds and their properties; to study physical and chemical points of bio- and medical processes, role of biogenic elements and essential compounds in human systems; to form the idea of main biochemical reactions.
2. COURSE OVERVIEW	
Cycle (section) GE:	B1.O.01
<b>2.1</b>	<b>Requirements for preliminary preparation of the student:</b>
2.1.1	Assumed background: For the study of Chemistry, the student must know: the high school level chemistry, biology and natural sciences.
<b>2.2</b>	<b>Disciplines and practices for which mastering this discipline (module) is necessary as a prerequisite:</b>
2.2.1	Biochemistry
2.2.2	Microbiology, Virusology
2.2.3	Pharmacology
3. COMPETENCIES UPON COMPLETION OF THE COURSE (MODULE)	
<b>GPC-5.3 Demonstrates knowledge and understanding of the chemistry of bioorganic compounds and their participation in metabolism;</b>	
<b>By the end of the course students must</b>	

**GPC-5.4 Demonstrates knowledge of the classification and structure of biochemical compounds, mechanisms of biochemical processes in the body, and understands their importance in maintaining homeostasis, metabolism, and pathogenesis of human disease;**

<b>3.1</b>	<b>Know:</b>					
3.1.1	Student has incomplete, unsystematic knowledge of physico-chemical nature of the processes occurring in a living organism at the molecular, cellular, tissue and organ levels; theoretical content of the course has been fractionally acquired, but the gaps are not significant, some of the performed tasks contain errors.					
3.1.2	Student does not fully know the educational material content; does not always clearly set out his position on the described issues, but he knows the physico-chemical essence of the processes occurring in a living organism at the molecular, cellular, tissue and organ levels.					
3.1.3	The theoretical content of the course is completely acquired, without gaps; necessary knowledge of the physico-chemical essence of the processes occurring in a living organism at the molecular, cellular, tissue and organ levels is fully formed.					
<b>3.2</b>	<b>Be able to:</b>					
3.2.1	Ability to use chemical equipment; to make calculations according to the results of the experiment; to conduct elementary static processing of experimental data formed at the minimum acceptable level.					
3.2.2	The ability to use chemical equipment; to make calculations according to the results of the experiment, to carry out elementary static processing of experimental data is formed for the most part.					
3.2.3	The ability to use chemical equipment; to make calculations according to the results of the experiment, to carry out elementary static processing of experimental data is fully formed.					
4. STRUCTURE AND CONTENTS OF THE COURSE (MODULE)						
Class code	Topics /Class type	Term /	Academic	Competences	Literature	Notes

		Academic year	hours			
	<b>Section 1. Basics of chemical thermodynamics and bioenergy. Laws of thermodynamics.</b>					
1.1	Lecture /Lec/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
1.2	Laboratory /Lab/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	

1.3	Practical work /Pr/	2	4	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
1.4	Self-study /Self-study/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 2. Solutions. Protolytic reactions. Buffer solutions. Colligative properties of solutions.</b>					
2.1	Lecture /Lec/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
2.2	Laboratory /Lab/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
2.3	Practical work /Pr/	2	4	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
2.4	Self-study /Self-study/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 3. Chemical kinetics and catalysis. Chemical equilibrium. Basics of Electrochemistry.</b>					
3.1	Lecture / Lec /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
3.2	Laboratory / Lab /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
3.3	Practical work / Pr /	2	4	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
3.4	Self-study / Self-study /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 4. Physical chemistry of dispersed systems.</b>					
4.1	Lecture / Lec /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	

4.2	Laboratory / Lab /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
4.3	Practical work / Pr /	2	4	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
4.4	Self-study / Self-study /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 5. Chemistry of biogenic elements. Complex compounds.</b>				L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
5.1	Lecture / Lec/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
5.2	Laboratory / Lab /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
5.3	Practical work / Pr /	2	4	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
5.4	Self-study / Self-study /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 6. Organic compounds. Mutual influence of atoms and reaction mechanisms. Stereochemistry.</b>					
6.1	Lecture / Lec /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
6.2	Laboratory / Lab /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
6.3	Practical work / Pr /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
6.4	Self-study / Self-study /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2	

	<b>Section 7. Structure, biomedical properties of poly-and heterofunctional compounds. Chemistry of biologically active heterocyclic compounds.</b>					
7.1	Lecture / Lec /	2	1	GPC -5.3 GPC -5.4	L1.1 L1.2 L1.3 L2.1 L3.1 L1 L2	
7.2	Laboratory / Lab /	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
7.3	Practical work / Pr/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
7.4	Self-study / Self-study /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 8. Amino acids, peptides and proteins.</b>					
8.1	Lecture /Lec/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
8.2	Laboratory /Lab/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
8.3	Practical work /Pr/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
8.4	Self-study / Self-study /	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 9. Carbohydrates: mono-, oligo- and polysaccharides.</b>					
9.1	Lecture /Lec/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
9.2	Laboratory /Lab/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
9.3	Practical work /Pr/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
9.4	Self-study /Self-study/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
	<b>Section 10. Nucleic acids. Lipids.</b>					
10.1	Lecture /Lec/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	

10.2	Laboratory /Lab/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
10.3	Practical work /Pr/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
10.4	Self-study /Self-study/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1	
	<b>Section 11. Steroids and terpenoids. Enzymes. Vitamins.</b>					
11.1	Lecture /Lec/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
11.2	Laboratory /Lab/	2	1	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
11.3	Practical work /Pr/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
11.4	Self-study /Self-study/	2	2	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	
11.5	Control work /Cont. work./	2	0	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	Control work
11.6	Exam /Ex/	2	27	GPC -5.3 GPC -5.4	L1.5 L1.1 L1.4 L1.2 L1.3 L2.2 L3.1 E1 E2	Exam

## 5. FUND OF ASSESSMENT TOOLS

### 5.1. Assessment materials for ongoing monitoring and intermediate certification

Presented as a separate document

### 5.2. Diagnostic Testing Assessment Materials

Presented as a separate document

<b>6. EDUCATIONAL-METHODOLOGICAL AND INFORMATION SUPPORT OF DISCIPLINE (MODULE)</b>				
<b>6.1. Recommended reading</b>				
<b>6.1.1. Main literature</b>				
	Authors	Title	Publish, year	Quality
L1.1	Zurabyan S. E.	Fundamentals of bioorganic chemistry: textbook for medical students	Electronic resource	5
L1.2	Zurabyan S.E.	Fundamentals of bioorganic chemistry: Гриф Минобрнауки России.	Electronic resource	1
L1.3	Zurabyan S.E.	Fundamentals of bioorganic chemistry:	Electronic resource	1
L1.4	Selivanova N. M., Bezrukov A. N., Galyametdinov Y. G.	Physical Chemistry: Educational aid	Electronic resource	1
L1.5	Selivanova N.M., Bezrukov A.N., Galyametdinov Y.G.	Physical Chemistry	Electronic resource	2
<b>6.1.2. Additional literature</b>				
	Authors	Title	Publish, year	Quality
L2.1	Zurabyan, Sergej Eduardovic.	Fundamentals of bioorganic chemistry:	Electronic resource	1
<b>6.1.3. Methodological developments</b>				
	Authors	Title	Publish, year	Quantity
L2.2	Bezrukov A.N., Ziyatdinova Iu. N., Valeeva E.E.	Polymer Structure and Chemistry	Electronic resource	1
<b>6.2. Internet sources</b>				
L1	НБ СурГУ <a href="http://lib.surgu.ru/index.php?view=s&amp;sid=30">http://lib.surgu.ru/index.php?view=s&amp;sid=30</a>			
L2	<a href="http://www.chem.msu.ru/">http://www.chem.msu.ru/</a>			
<b>6.3.1 Software</b>				
Operational systems "Microsoft", Software package Microsoft Office				
<b>6.3.2 Information Referral systems</b>				
<a href="http://www.garant.ru">http://www.garant.ru</a>				
<a href="http://www.consultant.ru">http://www.consultant.ru</a>				
<b>7. MATERIAL AND TECHNICAL SUPPORT OF DISCIPLINE (MODULE)</b>				

Classrooms for practical classes, group and individual consultations, monitoring and intermediate certification are equipped with: typical classroom furniture, technical teaching aids, employees for the presentation of educational information.