

Federal State Autonomous Educational Institution of Higher Education
“Peoples' Friendship University of Russia”

Medical Institute

Recommended by MCSD

SYLLABUS
(STUDY GUIDE)

Subject

Chemistry

Recommended for the direction of training (specialty)

31.05.01 General Medicine

Program (profile, specialization)

General Medicine

1. Aims and objectives of discipline:

The purpose of studying the course of chemistry is to form system knowledge of the structure of a substance, the main laws governing chemical reactions, patterns in the chemical behavior of the main classes of inorganic and organic compounds in conjunction with their structure for using this knowledge as a basis for studying processes occurring in a living organism, and basic materials used in dental practice.

2. Place of discipline in the structure of OP VO:

Discipline **Chemistry** refers to **the basic** part of curriculum block 1

Table 1 shows the preceding and subsequent disciplines aimed at the formation of the competences of the discipline in accordance with the matrix competencies of the OP VO..

Table 1. Preceding and following the discipline aimed at creating competencies

No	Code and title of competence	Preceding disciplines	Following disciplines
General Cultural Competences			
1	OK-6. 1	not	Biological Chemistry Biochemistry
General Professional Competences			
2	OPIK-3.2	not	Biological Chemistry Biochemistry

3. Requirements for the entrance knowledge, skills and competencies of the student necessary for its study: for the successful study of the discipline, the student must have a basic level of knowledge of secondary (complete) education in chemistry. General, inorganic and analytical chemistry lays the physicochemical basis for studying the functioning of biological systems at various levels of organization, determines the possibility of an approach to considering life support processes and regulation of homeostasis of living organisms at the molecular level.

Requirements for the results of mastering the discipline: The process of studying the discipline is aimed at the formation of the following competencies:

Table 2. Formed competencies

Competencies	Competency name	Competence achievement indicators
UC-6	Being able to identify and implement the priorities of their own activities and the ways of improving them based on self-assessment and lifelong learning	UC-6.1. Assessing their own resources and their (personal, contextual, time) limits; using them in an optimal way to successfully perform the assigned task.
GPC-3.2	Being able to counter doping in sports and	GPC-3.2. Being able to analyse biochemical, physical and chemical, and molecular and

	fight against it	biological mechanisms of the development of pathological processes in the cells of the athlete's body tissues when taking prohibited drugs; defining the principles of the biochemical processes when taking illegal drugs
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As a result of studying the discipline, the student must:

Know:

- main chemical concepts and laws of general chemistry
- concepts about the structure of the atom and chemical bonds, the basis of classification, nomenclature, preparation and chemical properties of chemical elements and their inorganic and coordination compounds;
- Principles of classification, nomenclature and isomerism of organic compounds;
- the spatial and electronic structure of organic molecules and chemical transformations of substances, their connection with the biological function;
- structure and chemical properties of the main classes of biologically important organic compounds.

Be handy at

- Use the properties of chemicals in laboratory practice.
- Predict the direction and result of chemical transformations of inorganic compounds.
- Perform calculations related to the characterization of substances or solutions.
- Classify organic compounds according to the structure of the carbon skeleton and the nature of the functional groups.
- Allocate functional groups to determine the chemical behavior of organic compounds.
- Make formulas by name and call them by structure formula typical representatives of biologically important substances of the products.
- Predict the direction and result of chemical transformations of organic compounds.

Manage

- Handling chemical dishes skills.
- Safety skills in the chemical laboratory.
- The ability to handle caustic, toxic, volatile compounds.
- Skills of working with burners and electric heating devices, centrifuges, Photocolorimeters and other devices.

4. Volume of discipline and types of study

General credit value of the discipline is **3 credit units**.

Type of study load	Total hours	Semesters	
		I	II
Class hours (total)	68	-	68
Include:	-	-	-
<i>Lectures</i>		-	-
<i>Practical training (PT)</i>			

<i>Seminars (S)</i>			
<i>Laboratory research (LR)</i>	68	-	68
Independent work (total)	40	-	40
Total labor input	hours	108	-
	Credit Unit	3	-
			108
			3

5. Content of the discipline

5.1. The content of the discipline sections

No.	The name of the section discipline	Content section
1	Basic laws and concepts in chemistry. The structure of the atom. Chemical bond	Chemical element. Simple substance. Complex chemicals. Mole. Molar mass of a substance equivalent. Gas laws. The law of equivalents. Electronic configurations of atoms and ions. Periodic law of D.I. Mendeleev. The method of valence bonds. Valence. Orbital hybridization. Chemical bond in complex compounds.
2	Thermochemistry. Chemical equilibrium	Basics of thermochemistry. Enthalpy. Hess law. Entropy. Gibbs free energy. The conditions of spontaneous reaction. The rate of chemical reaction. Reaction order Chemical equilibrium Speed constant and equilibrium constant. Displacement chemical equilibrium. The concepts of adsorption and catalysis.
3	Chemical reactions in solutions	General concepts of dispersed systems. Ways of expressing the concentration of solutions: mass fraction, titer, molar, normal concentration. Theory of electrolytic dissociation. The dependence of the acid-base properties of electrolytes on the nature of their dissociation. Amphoteric electrolytes (ampholytes). Ionic reactions. Conditions for the reactions of ion exchange.
4	Chemical equilibria in solutions	Weak electrolytes. The law of dilution. The effect of a common ion. Strong electrolytes. Activity and activity ratio. Ionic strength. Ionic product of water. Hydrogen indicator. Buffer solutions. Hydrolysis of salts. Constant hydrolysis. Dependence of hydrolysis on temperature and concentration of solutions. Constant solubility. Solubility. Conditions of dissolution and sediment formation. Electrolytic dissociation and the constant instability of complex compounds. Colloidal solutions.
5	Heterogeneous equilibria. Complex (coordination)	Solubility constant. Solubility. Conditions for dissolution and formation of a precipitate. Electrolytic dissociation and

	compounds	instability constant of coordination compounds
6	Redox reactions	Redox reactions. Oxidation-reduction potentials. Nernst equation. Condition for redox reactions
7	The main classes of inorganic compounds	The main classes of inorganic compounds. The relationship between the classes of inorganic compounds.
8	Qualitative Analysis	Basic concepts of Qualitative Analysis of Cations and Anions. Determination of cations of I - VI analytical groups and anions of I - III analytical groups in solutions
	Quantitative Analysis Basics	Basic concepts of Quantitative Analysis. Methods of neutralization, complexometry, oxidimetry and photolorimetry

5.2. Sections of disciplines and types of classes

№	Section Name, disciplines and topics	lecturers	<i>Practical training and Laboratory research</i>			Total hour.
			PC	LR	independent work	Total hour.
1.	Basic laws and concepts in chemistry. The structure of the atom. Chemical bond			2	4	6
2.	Thermochemistry. Chemical equilibrium			6	4	10
3.	Chemical reactions in solutions			8	4	12
4.	Chemical equilibria in solutions			8	4	12
5.	Heterogeneous equilibria. Complex (coordination) compounds			8	4	12
6.	Redox reactions			8	4	12
7.	The main classes of inorganic compounds			8	8	16
8.	Qualitative Analysis			8	4	12
9	Quantitative Analysis			12	4	16
Total:		-		68	40	108

6. Laboratory training (if available)

In a laboratory class, it is examined in detail, repeated, and a generalization of the main theoretical issues is carried out. Homework is checked. Tasks are solved that correspond to the content of the practical lesson. Laboratory work is carried out with a theoretical analysis of each experiment.

№	No. of section of discipline	Name of laboratory training	Labor capacity (hour.)

1.	General chemistry	1.The structure of the atom. Chemical bond 2. Thermochemistry. Chemical equilibrium 3. Electrolytic dissociation. Hydrolysis of salts 4. Buffer systems 5. Heterogeneous equilibria 6. Redox reactions. 7. Coordination connections.	40
2.	Inorganic chemistry	1. The main classes of compounds 2. The relationship of the main classes of inorganic compounds	8
3.	Analytical chemistry	1. Qualitative reactions of cations of groups I-III and anions. Analysis of a mixture of group I-III cations and anions 2. Qualitative reactions of cations of IV-VI groups. Analysis of a mixture of group IV-VI cations and anions 3. Preparation of HCl solution Standardization of hydrochloric acid solution. Determination of bicarbonate (temporary) water hardness 4. Standardization of Trilon B solution. Determination of total water hardness 5. Standardization of potassium permanganate working solution. Determination of iron content in Mohr's salt 6. Photocolorimetry. Determination of copper content in solution	20

7. Practical training -

8. Material and technical support of the discipline:

Educational laboratories: 620, 621, 622, 705. Laboratory work is carried out in specially equipped educational laboratories. General chemistry laboratories are equipped with standard equipment: a set of special chemical glassware, a set of necessary chemical reagents, an analytical balance, a distiller, and a centrifuge. All equipment in laboratories is quite modern. Students have access to electronic versions of the lecture course, homework, tests.

9. Information support of the discipline:

- a) Microsoft Word, Microsoft Office software (Excel, Power Point), ACD Chemoffice
- b) resources information and telecommunication network "Internet"
 1. EBS PFUR and third-party EBS, to which university students have access on the basis of concluded contracts:
 - Electronic library system RUDN - EBS RUDN
<http://lib.rudn.ru/MegaPro/Web>
 - EBS "University Library Online" <http://www.biblioclub.ru>

- EBS Yurayt <http://www.biblio-online.ru>
- EBS "Student Consultant" www.studentlibrary.ru
- EBS "Lan" <http://e.lanbook.com/>

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation

<http://docs.cntd.ru/>

- Yandex search engine <https://www.yandex.ru/>
- search system Google <https://www.google.ru/>
- http://web-local.rudn.ru/web-local/prep/prep_1844/,
- <http://www.chemistry.ssu.samara.ru/>
- <http://www.chem.msu.su/rus/library/welcome.html>
- www.xumuk.ru
- <http://www.ch.ic.ac.uk/local/organic/>
- <http://www.chemport.ru> Chemical encyclopedia
- <http://ru.wikipedia.org>

10. Educational and methodical support of the discipline:

a) Main literature

- Slesarev V.I. Chemistry. The basics of living chemistry. St. Petersburg: Himizdat, 2005.
- Glinka N.L. Tasks and exercises in general chemistry M.: Higher. shk., 1988.
- Kovalchukova O.V, Avramenko O.V Laboratory work in general and bioorganic chemistry. Part 1. General chemistry. M.: publishing house of RUDN, 2007
- Kovalchukova O.V Lectures on general and bioorganic chemistry. Part 1. General chemistry. M.: Publishing house RUDN, 2011.
- Kovalchukova O.V, Avramenko O.V Lectures on general and bioorganic chemistry. Part 2. Bioorganic chemistry. M.: Publishing house of RUDN, 2010.
- Kolyadina N.M., Kovalchukova O.V., Shebaldina L.S. Laboratory work in general and bioorganic chemistry. Part 2. Bioorganic chemistry. M.: publishing house of RUDN, 2008.

b) additional literature

- Khomchenko G.P., Tsitovich I.K. Inorganic chemistry. -M.: Higher School, 1986, and others.
- Tyukavkina N.A., Baukov Yu.I. Bioorganic chemistry. "Drofa", Moscow, 2005, 2011.
- Grandberg I.I., Organic Chemistry. "Bustard", Moscow, 2002.

c) List of educational electronic materials:

- Lectures on general chemistry for the specialty "Dentistry".
- Lectures on organic chemistry for the specialty "Dentistry".

11. Guidelines for students on the development of the discipline (module)

In laboratory classes and lectures, the relevant topics are analyzed using multimedia technology (computer, projector). For each lecture there are presentations prepared in Microsoft PowerPoint,

containing from 10 to 60 slides. The main purpose of laboratory studies is to perform experimental experiments in order to consolidate the theoretical material.

Students are required to attend laboratory classes, weekly consultations, obligatory participation in certification tests, perform assignments within the framework of classroom and independent work using recommended textbooks and teaching aids, electronic educational resources, databases, information and reference and electronic search systems.

During certification, the quality of students' work in the classroom, the completeness and quality of laboratory work and assignments for independent work, control and test work is assessed. Preparation and subsequent implementation of laboratory work is a prerequisite for admitting a student to test work, including the subject of laboratory work. The postponement of laboratory work and the writing of test papers is considered valid only in the event of a student's illness, which is confirmed by the presence of a medical certificate. Unfinished laboratory work must be completed within ten days after the closing date of the medical certificate.

Educational materials in electronic form on all topics studied, as well as virtual laboratories are posted on the RUDN University Training Portal, in TUIS, on the local resources of the RUDN University electronic library system. Presentations on the topics of classes can be recorded on CDs or flash cards for independent work of students on a home computer.

For the final certification, a point-rating system for assessing knowledge is used. Students are required to submit all assignments within the timeframe established by the curriculum. Works submitted with a delay are not evaluated, tests are not rewritten.

12. Fund of estimated means for the interim assessment of students in the discipline (module)

Materials for assessing the level of mastering the educational material of the discipline "Chemistry" (evaluation materials), including a list of competencies indicating the stages of their formation, a description of indicators and criteria for evaluating competencies at various stages of their formation, a description of the assessment scales, standard control tasks or other materials, necessary for assessing knowledge, abilities, skills and (or) experience of activities that characterize the stages of the formation of competencies in the process of mastering the educational program, methodological materials that determine the procedures for assessing knowledge, abilities, skills and (or) experience of activity that characterize the stages of formation of competencies, are developed in full and are available for students on the discipline page at TUIS RUDN University.

The program is compiled in accordance with the requirements of the FSES HE.

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