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**Federal State Autonomous Educational Institution for Higher Education PEOPLES'
FRIENDSHIP UNIVERSITY OF RUSSIA
Agrarian and Technological Institute**

WORKING COURSE SYLLABUS

Inorganic and analytical chemistry

Recommended by the Methodological Council for the Education Field:

36.05.01 Veterinary medicine

2022 г.

1. GOALS AND OBJECTIVES OF THE DISCIPLINE

The aim of mastering the discipline "**Inorganic and analytical chemistry**" is to form a systematic knowledge of the structure of matter, the basic laws of chemical reactions, the basic classes of inorganic compounds, the basics of analytical chemistry to use this knowledge as a basis for the study of subsequent courses in organic chemistry, physical and colloid chemistry, biological chemistry.

2. REQUIREMENTS FOR THE RESULTS OF MASTERING THE DISCIPLINE

The development of the discipline "**Inorganic and analytical chemistry**" is aimed at creating the following competencies (parts of competencies) for students:

Table 2.1. List of competencies formed by students during the development of the discipline (results of the development of the discipline)

Code	Competence	Indicators of competence accomplishment (within the discipline)
UK -8	The ability to create and maintain safe living conditions in everyday life and in professional activities for the preservation of the natural environment, ensuring the sustainable development of society, including in the event of a threat and occurrence of emergencies and military conflicts.	UK-8.1 Analyzes the factors of harmful influence on the vital activity of elements of the habitat. (technical means, technological processes, materials, buildings and structures, natural and social phenomena);
		UK -8.2 Identifies dangerous and harmful factors within the scope of the task being performed;
		UK-8.3 Identifies and eliminates problems related to safety violations in the workplace;
		UK-8.4 Explains measures to prevent emergencies;
		UK -8.5 "Explains the rules of conduct in the event of emergencies of natural and man-made origin, as well as in the event of military conflicts;"
		UK-8.6 Provides first aid, participates in recovery activities.
GPC -4	The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting	GPC-4.1 Possesses the conceptual and methodological apparatus of basic natural sciences at a level sufficient for full-fledged professional activity at the modern level.
		GPC-4.2 He knows the methods of solving problems using modern equipment.

	experimental research and interpreting their results.	GPC-4.3 He is ready to use modern methodology in the development and conduct of experimental research.
		GPC-4.4 Uses modern professional methodology in interpreting research results.
PC -7	The ability to choose the necessary drugs of chemical and biological nature for the treatment of animals, taking into account their combined pharmacological effect on the body.	PC -7.1 He is able to choose medicines of chemical and biological nature necessary for the treatment of animals, guided by the principles of evidence-based medicine, taking into account their combined pharmacological effect on the body.
		PC-7.2 He is able to justify the prescription of a drug in a certain clinical case or the impossibility of using this drug in the situation under consideration.
		PC-7.3 He is able to calculate the dose, frequency and duration of the course of application of the drug to the patient, taking into account the form of release and the characteristics of the administration of the drug to the patient.
		PC-7.4 He is able to take into account drug interactions when prescribing a course of treatment to an animal already receiving medications and biologically active additives due to the presence of diseases identified earlier.
		PC-7.5 He is able to take into account economic, species and age characteristics, as well as the results of laboratory studies of the patient when choosing drugs for the treatment of the patient.
PC -17	Ability to organize disinfection and disinfection of livestock premises to ensure veterinary and sanitary well-being in accordance with the plan of veterinary and sanitary measures	PC-17.1 He is capable of collecting and analyzing information necessary for the organization and planning of veterinary and sanitary measures
		PC-17.2 He is able to choose the optimal equipment, consumables and medicinal and disinfecting preparations necessary and safe enough for the conduct of veterinary and sanitary measures
		PC-17.3 He is able to determine the procedure for disinfection, disinsection, deratization and other veterinary and sanitary measures, taking into account the peculiarities of animal husbandry,

		technical characteristics of premises and epizootic situation
		PC-17.4 He is able to monitor the results of veterinary and sanitary measures

3. COURSE IN HIGHER EDUCATION

The discipline "**Inorganic and analytical chemistry**" refers to the mandatory part of block B1 of the Educational Program of Higher Education.

As part of the Educational Program of Higher Education, students also master other disciplines and /or practices that contribute to achieving the planned results of mastering the discipline "**Inorganic and analytical chemistry**".

Table 3.1. List of Higher Education Program components disciplines that contribute to expected learning outcomes

Competence code	Competence	Previous Disciplines (Modules)	Subsequent Disciplines (Modules)
UK-8	The ability to create and maintain safe living conditions in everyday life and in professional activities for the preservation of the natural environment, ensuring the sustainable development of society, including in the event of a threat and occurrence of emergencies and military conflicts.	History	Organic chemistry Biological physics Physical and Colloidal Chemistry Life safety Biological chemistry Veterinary Microbiology and Mycology Virology and biotechnology Veterinary radiobiology Parasitology and invasive diseases Epizootology and infectious diseases Organization of veterinary affairs General and Veterinary Ecology Veterinary sanitation Veterinary deontology Laboratory diagnostics of infectious and invasive diseases Organization of state veterinary supervision

GPC-4	The ability to use methods of solving problems using modern equipment in the development of new technologies in professional activity and to use modern professional methodology for conducting experimental research and interpreting their results.	-	Organic chemistry Biological physics Computer science Physical and Colloidal Chemistry Cytology, Histology and Embryology Biological chemistry Veterinary Microbiology and Mycology Virology and biotechnology Physiology and ethology of animals Breeding with the basics of private animal husbandry Pathological physiology Veterinary radiobiology Clinical diagnostics Pathological anatomy Operative surgery with topographic anatomy Instrumental diagnostic methods Toxicology Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Parasitology and invasive diseases Epizootology and infectious diseases Maths Immunology Veterinary sanitation Processing technology for livestock products Medicinal and poisonous plants Fodder plants
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			<p>The basics of intellectual work</p> <p>Personality psychology and professional self-determination</p> <p>Clinical laboratory diagnostics</p> <p>Laboratory diagnostics of infectious and invasive diseases</p> <p>Horse diseases</p> <p>Diseases of Productive Animals</p> <p>Diseases of small pets</p> <p>Болезни мелких домашних животных</p> <p>Diseases of bees and entomophages</p> <p>Fish pathology and aquaculture</p> <p>Diseases of exotic animals</p> <p>Anesthesiology, resuscitation and intensive care</p> <p>Dermatology</p> <p>Cardiology</p> <p>Endocrinology</p> <p>Nephrology</p> <p>Reconstructive surgery</p> <p>Veterinary ophthalmology</p> <p>Animal Dentistry</p>
PC-7	The ability to choose the necessary drugs of chemical and biological nature for the treatment of animals, taking into account their combined pharmacological effect on the body.	-	<p>Organic chemistry</p> <p>Physical and Colloidal Chemistry</p> <p>Biological chemistry</p> <p>Veterinary Microbiology and Mycology</p> <p>Virology and biotechnology</p> <p>Pathological physiology</p> <p>Veterinary pharmacology</p> <p>Toxicology</p>

			<p>Obstetrics, gynecology and andrology Internal diseases General surgery Private Veterinary Surgery Surgery Parasitology and invasive diseases Epizootology and infectious diseases Medicinal and poisonous plants Horse diseases Diseases of Productive Animals Diseases of small pets Болезни мелких домашних животных Diseases of bees and entomophages Fish pathology and aquaculture Diseases of exotic animals Anesthesiology, resuscitation and intensive care Dermatology Cardiology Endocrinology Nephrology Veterinary ophthalmology Animal Dentistry</p>
PC-17	Ability to organize disinfection and disinfection of livestock premises to ensure veterinary and sanitary well-being in accordance with the plan of veterinary and sanitary measures	-	<p>Organic chemistry Physical and Colloidal Chemistry Life safety Veterinary Microbiology and Mycology Virology and biotechnology Veterinary pharmacology Veterinary sanitation</p>

			Здоровье и благополучие ЖИВОТНЫХ
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4. COURSE WORKLOAD AND TRAINING ACTIVITIES

Course workload of the discipline "**Inorganic and analytical chemistry**" is 3 credits.

Table 4.1. Types of academic activities during the period of the HE program mastering for full-time study

Types of academic activities		HOURS	Semesters				
			1	-	-	-	
Contact academic hours		54	54	-	-	-	
including							
Lectures		18	18	-	-	-	
Lab work		36	36	-	-	-	
Seminars (workshops/tutorials)		-	-	-	-	-	
Self-study		44	44	-	-	-	
Evaluation and assessment (exam/pass/fail grading)		10	10	-	-	-	
Course workload		Academic hour	108	108	-	-	-
		Credit unit	3	3	-	-	-

Table 4.2. Types of academic activities during the period of the HE program mastering for part-time study

Types of academic activities		HOURS	Semesters				
			1	-	-	-	
Contact academic hours		13	13	-	-	-	
including							
Lectures		-	-	-	-	-	
Lab work		13	13	-	-	-	
Seminars (workshops/tutorials)		-	-	-	-	-	
Self-study		68	68	-	-	-	
Evaluation and assessment (exam/pass/fail grading)		27	27	-	-	-	
Course workload		Academic hour	108	108	-	-	-
		Credit unit	3	3	-	-	-

5. CONTENT OF THE DISCIPLINE

Table 5.1 Content of the discipline (module) by type of academic work

Name of the discipline section	Content of the section (topics)	Types of academic activities
Section 1. Structure of the atom. Chemical bonding	Topic 1.1 Electronic configurations of atoms and ions.	Lectures, Lab work.
	Theme 1.2 The periodic law of D.I. Mendeleev.	Lectures, Lab work.
	Topic 1.3 The method of valence bonds.	Lectures, Lab work.
	Topic 1.4 Valence.	Lectures, Lab work.
	Topic 1.5 Hybridization of orbitals.	Lectures, Lab work.
	Topic 1.6 Chemical bonding in complex compounds.	Lectures, Lab work.
Section 2. Thermochemistry. Chemical equilibrium.	Topic 2.1 Fundamentals of thermochemistry.	Lectures, Lab work.
	Topic 2.2 Enthalpy.	Lectures, Lab work.
	Topic 2.3 Hess's Law.	Lectures, Lab work.
	Topic 2.4 Entropy.	Lectures, Lab work.
	Topic 2.5 Gibbs free energy.	Lectures, Lab work.
	Topic 2.6 Chemical equilibrium.	Lectures, Lab work.
	Topic 2.7 Law of Action of Masses.	Lectures, Lab work.
	Topic 2.8 Chemical equilibrium displacement.	Lectures, Lab work.
Section 3. Solutions. Electrolytic dissociation	Topic 3.1 General concepts of disperse systems.	Lectures, Lab work.
	Topic 3.2 Ways to express the concentration of solutions: mass fraction, molar concentration, molar concentration of equivalent substances.	Lectures, Lab work.
	Topic 3.3 The theory of electrolytic dissociation.	Lectures, Lab work.
Section 4. Dissociation of weak and strong electrolytes. Hydrolysis of salts	Topic 4.1 Weak electrolytes.	Lectures, Lab work.
	Topic 4.2 The law of dilution.	Lectures, Lab work.
	Topic 4.3 . The common ion effect.	Lectures, Lab work.
	Topic 4.4 Buffer solutions.	Lectures, Lab work.

	Topic 4.5 Strong electrolytes.	Lectures, Lab work.
	Topic 4.6 Activity and activity coefficient.	Lectures, Lab work.
	Topic 4.7 Ionic force.	Lectures, Lab work.
	Topic 4.8 Ionic product of water.	Lectures, Lab work.
	Topic 4.9 Hydrogen Index.	Lectures, Lab work.
	Topic 4.10 Hydrolysis of salts.	Lectures, Lab work.
	Topic 4.11 Dependence of hydrolysis on temperature and solution concentration.	Lectures, Lab work.
Section 5. Heterogeneous equilibria. Coordination compounds.	Topic 5.1 Solubility constant.	Lectures, Lab work.
	Topic 5.2 Solubility.	Lectures, Lab work.
	Topic 5.3 Dissolution and precipitation conditions.	Lectures, Lab work.
	Topic 5.4 Electrolytic dissociation and the instability constant of coordination compounds.	Lectures, Lab work.
Section 6. Redox Reactions	Topic 6.1 Oxidation-reduction reactions.	Lectures, Lab work.
	Topic 6.2 Redox potentials.	Lectures, Lab work.
	Topic 6.3 Nernst equation.	Lectures, Lab work.
	Topic 6.4 Conditioning of redox reactions.	Lectures, Lab work.
Section 7. Basic Classes of Inorganic Compounds	Topic 7.1 Main classes of inorganic compounds.	Lectures, Lab work.
	Topic 7.2 Relationship of inorganic compounds.	Lectures, Lab work.
Section 8. Basics of Qualitative Analysis	Topic 8.1 Fundamentals of qualitative analysis of cations and anions.	Lectures, Lab work.
	Topic 8.2 Determination of cations of analytical groups I - VI and anions of analytical groups I - III in solutions.	Lectures, Lab work.
Section 9. Basics of Quantitative Analysis	Topic 9.1 Fundamentals of Quantitative Analysis.	Lectures, Lab work.

	Topic 9.2 Methods of neutralization, complexometry, oxidimetry and photolorimetry.	Lectures, Lab work.
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6. CLASSROOM INFRASTRUCTURE AND TECHNOLOGY SUPPORT REQUIREMENTS

Table 6.1. Material and technical support of the discipline

<i>Classroom for Academic Activity Type</i>	<i>Equipping the classroom</i>	Specialized educational/laboratory equipment, software and materials for the development of the discipline (if necessary)
Lecture	An auditorium for conducting lecture-type classes, equipped with a set of specialized furniture; a board (screen) and technical means of multimedia presentations.	<ul style="list-style-type: none"> - <i>Chemical Tables</i> - <i>Sets of special chemical tableware</i> - <i>Sets of chemicals</i> - <i>Exhaust cabinets</i> - <i>Drying cabinets</i> - <i>Distillers</i> - <i>Centrifuges</i> - <i>Water baths</i> - <i>Chemical scales</i> - <i>Photolorimeters</i> - <i>Potentiometers</i>
Laboratory	An auditorium for laboratory work, individual consultations, routine monitoring and interim certification, equipped with a set of specialized furniture and equipment.	<ul style="list-style-type: none"> - <i>Chemical Tables</i> - <i>Sets of special chemical tableware</i> - <i>Sets of chemicals</i> - <i>Exhaust cabinets</i> - <i>Drying cabinets</i> - <i>Distillers</i> - <i>Centrifuges</i> - <i>Water baths</i> - <i>Chemical scales</i> - <i>Photolorimeters</i> - <i>Potentiometers</i>
Self-studies	An auditorium for independent work of students (can be used for seminars and consultations), equipped with a set of specialized furniture and computers with access to an electronic information and educational environment.	-

7. RECOMMENDED SOURCES FOR COURSE STUDIES

Main reading:

1. General, inorganic and analytical chemistry : lecture notes for the 1st year students of Agrarian and Technological Institute and Environmental Faculty / M.A. Ryabov, R.V. Linko. - 2nd ed., revised. ; Publishing house of PFUR, 2020. - 93 c. : <https://lib.rudn.ru/MegaPro/Download/MObject/7840>
2. General and inorganic chemistry : in 2 volumes. Volume 1 : Laws and concepts / E. V. Savinkina, V. A. Mikhailov, Y. M. Kiselev [et al] ; edited by A. Yu. Tsivadze. - 2nd ed. - Moscow : Laboratory of knowledge, 2022. - 491 c.
3. Handbook of inorganic chemistry / M.N. Kurasova, M.G. Safronenko, N.Y. Esina [et al.], Moscow : PFUR, 2020. - 105 c. : <https://lib.rudn.ru/MegaPro/Download/MObject/7797>

Additional Reading:

1. Ryabov M. A., Nevskaya E. Yu., Sorokina E. A., Sheshko T.F. Collection of basic formulas in chemistry. - M.: AST: Astril, 2009. 319 c. - (Short reference book of the student).

Resources of the Internet information and telecommunication network:

1. Electronic library system of RUDN and third-party Electronic library systems to which university students have access on the basis of concluded contracts:

- Electronic library system of RUDN - ELS RUDN <http://lib.rudn.ru/MegaPro/Web>
- ELS "University Library online" <http://www.biblioclub.ru>
- ELS Yurayt <http://www.biblio-online.ru>
- ELS "Student Consultant" www.studentlibrary.ru
- ELS "Lan" <http://eZlanbook.com/>
- ELS "Trinity Bridge" <http://www.trmost.com/>

2. Databases and search engines:

- electronic fund of legal and regulatory and technical documentation <http://docs.cntd.ru/>
- search engine Yandex <https://www.yandex.ru/>
- search engine Google <https://www.google.ru/>
- abstract database SCOPUS <http://www.elsevierscience.ru/products/scopus/>

Educational and methodological materials for independent work of students during the development of the discipline/ module*:

1. A course of lectures on the discipline "**Inorganic and analytical chemistry**".
2. Laboratory workshop on the discipline "**Inorganic and analytical chemistry**".

* - All educational and methodological materials for independent work of students are placed in accordance with the current procedure on the discipline page in the **Telecommunication educational and Information System!**

8. MID-TERM ASSESSMENT

Evaluation materials and a point-rating system* for assessing the level of competence formation (part of competencies) based on the results of mastering the discipline "**Inorganic and analytical chemistry**" are presented in the Appendix to this Work Program of the discipline.

* - Assessment Materials and a Point Rating System are formed based on the requirements of the relevant local regulatory act of the RUDN.

DEVELOPER:

Associate Professor, Department of General
Chemistry

Position, Basic curriculum

Ryabov M.A.

Signature

Full name.

HEAD OF THE DEPARTMENT:

Department of General Chemistry

Name Basic Curriculum

Signature

Davydov V.V.

Full name.

HEAD OF THE HIGHER EDUCATION PROGRAM:

Director of the Department of Veterinary Medicine

Position, Basic curriculum

Signature

Vatnikov Yu.A.

Full name