HIGHER EDUCATION OF THE REPUBLIC OF UZBEKISTAN,

MINISTRY OF SCIENCE AND INNOVATION

KOKAND STATE UNIVERSITY

CURRICULUM
OF THE SUBJECT
"INORGANIC CHEMISTRY"

Field of Knowledge: 500000 – Natural Sciences, Mathematics and Statistics

Field of Education: 530000 – Physics and Natural Sciences

Educational Program: 60530100 – Chemistry

Subject/Module Code: NOK11212	Academic Year 2024-2025	Semester 1/2	Credits 6/6
Subject/Module Type: Compulsory Subject	Language of Instruction: Uzbek / rus		Weekly Class Hours 4/6

1.	Course Title	Classroom Instruction (hours)	Course Paper	Independent Study
	INORGANIC CHEMISTRY	60/90	210	360

2.

I. Course content

The purpose of the course *Inorganic Chemistry* is to provide students with in-depth knowledge about the properties of chemical elements and their compounds, based on D.I. Mendeleev's periodic law, using modern scientific data to explain the structure of matter and other fundamental concepts of theoretical chemistry, and to develop students' logical skills.

The objectives of the course *Inorganic Chemistry* are not only to familiarize students with the classes of inorganic substances and their properties, but also to introduce the theoretical foundations of the discipline. In addition, in order to deepen the knowledge acquired in inorganic chemistry, students are required to develop practical skills and competencies by performing experiments that can be carried out in practice, namely: working with chemical glassware and chemical reagents, using gas and electric heating devices, weighing on modern balances, conducting various laboratory works, performing different experiments using glass tubes and vessels, assembling apparatus, analyzing educational literature, and carrying out calculations using chemical formulas and equations. This, in turn, provides an important foundation for training teachers for general secondary schools and secondary specialized education institutions.

II. Theoretical part (lecture classes)

II.1. The course includes the following topics:

Module 1: Structure and Properties of Inorganic Compounds

Topic 1. Periodic Table of Chemical Elements and the Periodic Law of D.I. Mendeleev

Chemical elements. The concept of a chemical element. Radioactive transformations of chemical elements. Natural radioactive elements. Radioactivity and its types. Artificial radioactivity. Nuclear reactions. Electron shell of the atom of a chemical element. Basic concepts of quantum mechanics.

Electron cloud and atomic orbitals. Electronic structure of atoms. Structure of the periodic table of chemical elements. The periodic law. Periodicity of the properties of chemical elements. Ionization energies of atoms. Electron affinity. Electronegativity. Atomic and ionic radii. Secondary periodicity. The theory of cenosymmetry. Cenosymmetric elements.

Topic 2. Atomic Structure

The modern quantum-mechanical model of the atom: the state of the electron in the atom, quantum numbers, atomic orbitals. Laws governing the filling of atomic orbitals (Pauli exclusion principle, Hund's rule, order of filling atomic orbitals, Klechkowski rule). Ground and excited states of atoms. Bohr postulates and his nuclear model. X-ray spectra of elements and Moseley's law. Schrödinger equation.

Radioactive transformations of chemical elements. Natural radioactive elements. Discovery of radioactivity. Types of radioactivity. Half-life period. Radioactive decay

	constant. Fundamental laws of radioactive transformations. Displacement law. Artificial radioactivity. Production of artificial radioactive isotopes. Fission of heavy atomic nuclei. Types of nuclear reactions. Nuclear energy. Applications of radioactive isotopes. **Topic 3. Theory of Chemical Bonding** Basic concepts of chemical bonding. Some parameters of molecules. Nature of the chemical bond. Molecular orbital theory. Molecular orbitals. Comparison of orbital diagrams of molecules with different structures. Valence bond theory. Saturation and directionality of covalent bonding. Bond multiplicity (order). Bond polarity and polarizability. Types of covalent molecules. Ionic bonding and types of ionic bonds. Metallic bonding. Intermolecular interactions. Hydrogen bonding. Complex formation. **Topic 4. Aggregation States of Matter. Solutions** Solid state. Crystals. Types of chemical bonding in crystals. Main structural types of inorganic compounds. Solid solutions. Amorphous state. Liquid state. General concept of solutions. Colligative properties of solutions: diffusion, osmosis and osmotic pressure, vapor pressure above a solution and its composition. Van't Hoff law. Raoult's laws. Freezing and boiling points of solutions; cryoscopy and ebullioscopy. Solubility. Henry's law. Heat of dissolution. Interaction between solute and solvent. Solvation. Non-aqueous solvents. **Topic 5. Theory of Electrolytic Dissociation. Hydrolysis of Salts** Electrolytic dissociation. Dissociation of weak electrolytes. Ostwald's dilution law. Dissociation of water. pH (hydrogen index). Indicators. Buffer solutions. Calculation of pH in buffer solutions. Hydrolysis of salts. Degree and constant of hydrolysis. Shift of equilibrium in hydrolysis processes. Solubility product. Salt effect. Dissociation of strong electrolytes. Activity coefficient. Ionic strength. Acid–base theories: Arrhenius, Brønsted–Lowry, and Lewis acids and bases. **Topic 6. Chemical Kinetics** Energetics of chemical transformations. Heat effect of reactions. Thermochemical calculations. Direction of chemical reactions. Entropy. Gibbs free energy. Chemical kinetics. Rate of chemical reactions. Activation energy. Reaction mechanism. Physical methods of accelerating chemical processes. Catalysis. Chemical equilibrium. Equilibrium constant. Le Chatelier's principle. Ionization constant. Stability constant of complex formation. Autoprotolysis constant of water. Equilibria in heterogeneous systems. **Topic 7. Oxidation–Reduction Reactions** Reactions involving changes in oxidation states of elements. Direction of redox reactions. Writing redox reaction equations. Electron balance method and ion-electron half-reaction method. Effect of reaction medium on redox processes. Nernst equation. Redox potential. Latimer and Frost diagrams. **Topic 8. Electrochemistry. Electrolysis** Concept of a galvanic cell. Standard electrode. Standard electrode potentials of hydrogen and metals. Series of standard electrode potentials. Electromotive force (EMF). Calculation of EMF. Processes occurring at the cathode and anode. Laws of electrolysis. Electrolysis processes. Electrolysis of melts and solutions. Chemical current sources. Accumulators. Dry batteries. **Topic 9. The Most Important Classes of Inorganic Compounds** Simple substances: metals and non-metals. Preparation, physical and chemical properties of oxides, bases, acids, and salts. Classification of complex substances by composition. Binary (two-element) compounds. **Topic 10. Introduction to the Chemistry of Elements**

Abundance of chemical elements. Geochemistry and cosmochemistry. Chemical elements in the Earth's crust. Simple substances: structure, properties, and methods of preparation. Binary compounds and their characteristics according to the type of chemical bonding. Comparison of the stability of binary compounds. Acid–base properties of binary compounds. Metal compounds. Ternary compounds. Derivatives of anionic complexes. Mixed compounds, solid solutions, eutectics.
Non-stoichiometric compounds. Compounds with variable composition. Cluster compounds.
Chemistry of s- and p-elements. Fundamental regularities of s- and p-element chemistry. Primary and secondary periodicity. Oxidation states and coordination numbers of s- and p-elements.

MODULE 2: INFORMATION ON S-ELEMENTS
Topic 11. Elements of the First Group

Hydrogen is the first element of the periodic system. Peculiarities of the structure of the hydrogen atom. Occurrence in nature. Physical and chemical properties. Compounds of hydrogen and their physical and chemical properties. Water and its properties. Hydrogen peroxide and its properties. Alkali metals. Peculiarities of atomic structure. Valency and oxidation states of atoms. Ionization potential.
General characteristics of first-group s-elements. Atomic structure. Nature of chemical bonding in compounds. Chemical activity of metals. Change in basic strength in the series of lithium to cesium hydroxides.

Topic 12. Elements of the Second Group

Inorganic characteristics of second-group s-elements. Atomic structure. Nature of chemical bonds in compounds. Hydroxides, their structure and acid–base properties. Amphoteric nature of beryllium hydroxide. Magnesium: position in the periodic system, occurrence in nature, isotopes. Physical and chemical properties. Oxides and hydroxides and their properties. Alkaline earth metals. Structure of calcium, strontium, and barium atoms, isotopic composition, occurrence in nature. Physical and chemical properties. Oxides and hydroxides and their properties. Water hardness. Temporary and permanent hardness.

MODULE 3: INFORMATION ON NONMETALS
Topic 13. Elements of the Seventeenth Group

Position of p-elements in the periodic system. Atomic structure. Changes in atomic radii, ionization potentials, electron affinity, and electronegativity across periods and down groups. Changes in metallic and nonmetallic properties of elements in groups and periods.
General characteristics of the seventeenth group elements. Atomic structure.

	Changes in atomic radius, ionization potential, electron affinity, and electronegativity within the group. Valency and oxidation states of atoms. Hydrogen halides, their physical and chemical properties. Reactivity. Acidity and reducing properties. Methods for obtaining hydrogen halides. Oxides of fluorine, chlorine, bromine, and iodine. Oxygen-containing acids of halogens. Oxidizing and acidic properties. Inorganic methods of preparation. Salts of oxygen-containing halogen acids. Oxidizing properties. Relative stability of salts and acids. Applications of hypochlorites, chlorates, and perchlorates. Interhalogen compounds. Topic 14. Elements of the Sixteenth Group General characteristics of the elements. Atomic structure. Changes in atomic radii, ionization potentials, electron affinity, valency, and oxidation states within the group. Chemical properties of simple substances. Oxidation–reduction properties. Hydrides of the H_2E type and their physical and chemical properties. Oxygen-containing compounds of the sixteenth group elements. Structural features. Oxidizing–reducing properties. Methods of preparation. Sulfurous, selenous, and tellurous acids. Changes in oxidizing–reducing properties in the series of sulfurous to tellurous acids. Sulfuric, selenic, and telluric acids. Changes in acidity and oxidizing properties. Topic 15. Elements of the Fifteenth Group General properties of the elements. Atomic structure. Changes in atomic radii, ionization potential, electron affinity, and electronegativity within the group. Valency and oxidation states of atoms. Changes in the stability of compounds at the highest oxidation states. Nature of chemical bonding in compounds. Nitrogen and its hydrogen compounds. Nitrogen oxides (I, II, III, IV, V). Molecular structure. Oxidizing–reducing properties. Nitrous acid and its oxidizing–reducing properties. Nitric acid, structure of its molecule and nitrate ion. Oxidizing properties of concentrated and dilute nitric acid. Nitrates. Oxides of phosphorus, arsenic, antimony, and bismuth. Their specific structural features. Behavior toward water, acids, and alkalis. Methods of preparation. Oxygen-containing acids of phosphorus and their salts. Hypophosphorous acid and hypophosphites. Phosphorous acid and phosphites. Meta-, pyro-, and orthophosphoric acids and their salts. Hydroxides of arsenic, antimony (III, V), and bismuth (III). Meta- and ortho-forms. Acid–base and oxidizing–reducing properties. Halides of elements (III, V) and their relative stability. Sulfides of arsenic, antimony, and bismuth. Thiosalts of arsenic and antimony.

Topic 16. Elements of the Fourteenth Group

General characteristics of the elements. Atomic structure. Changes in atomic radii, ionization potentials, and electronegativity within the group. Changes in the stability of compounds with different valency and oxidation states. Nature of chemical bonding in compounds, chemical properties, and reactivity. Hydrides of the EH_4 type. Carbon (II) oxide. Carbon (IV) oxide. Carbonic acid and its salts, properties. Silicon (II, IV) oxides. Quartz glass. Silicic acids. Oxides of germanium, tin, and lead (II, IV) and their properties. Hydroxides of germanium, tin, and lead (II, IV) and their properties. Cationic and anionic forms of hydroxides of elements (II, IV), their relative stability, and hydrolysis.

Topic 17. Elements of the Thirteenth Group

General characteristics of the elements. Atomic structure. Nature of chemical bonding in compounds. Chemical properties of boron. Boron oxide, its specific structure and properties. Ortho-, meta-, and polyborates. Physical and chemical properties of metals in the aluminum–thallium series. $E(OH)_3$ compounds, their structure and properties. Behavior of hydroxides toward acids and alkalis in the aluminum–thallium series.

Topic 18. Elements of the Eighteenth Group

Helium and the elements of the eighteenth group. General characteristics of the elements. Atomic structure, possibilities of exhibiting valency and oxidation states. Changes in atomic radius and ionization potential within the group. Reasons for chemical inertness.

MODULE 4: INFORMATION ON METALS

Topic 19. Coordination Compounds

Werner's coordination theory. Basic principles of coordination theory: central atom and addends (ligands), inner and outer coordination spheres, coordination number. The coordination core and its primary and secondary valencies.

The nature of chemical bonding in coordination compounds, electrostatic and covalent interactions between the central ion and ligands. Explanation of the structure of coordination compounds from the standpoint of valence bond theory. Low-spin and high-spin complexes. The spectrochemical series.

Topic 20. General Overview of d-Elements

	General characteristics of metals. The electrochemical series of metals. Peculiarities of atomic structure. Crystal structure of metals. Metallic bonding and its specific features. Metallic bonding, conductors, semiconductors, and dielectrics based on band theory. General methods of metal production. Pyrometallurgy. Hydrometallurgy. Electrometallurgy. Corrosion of metals. Chemical and electrochemical corrosion. Corrosion mechanisms. Factors affecting the corrosion rate. Methods of protecting metals from corrosion. Electrochemical protection methods. Topic 21. Elements of the Third Group Atomic structure. Changes in atomic radii and ionization potentials in groups and periods. Valency and oxidation states of atoms. Changes in the stability of compounds at high oxidation states within groups. Similarities in chemical properties of elements across periods and groups. Peculiarities in the change of properties of d-elements compared to p-elements within groups. Specific features of the chemical properties of d-elements of the V and VI periods. Acid–base properties of oxides and hydroxides of d-elements at different oxidation states. Topic 22. Elements of the Fourth Group d-Elements of Group IV. General characteristics of the elements. Atomic structure. Changes in atomic radii and ionization potentials within the group. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Physical and chemical properties of simple substances. Chemical activity at normal and elevated temperatures. Compounds of titanium at oxidation states (II, III) and their properties. Oxides of hafnium (IV), titanium (IV), and zirconium (IV) and their properties. Acid–base properties of $E(OH)_4$-type hydroxides in the Ti–Zr–Hf series. Topic 23. Elements of the Fifth Group d-Elements of Group V. General characteristics of the elements. Atomic structure. Changes in atomic radii and ionization potentials within the group. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Physical and chemical properties of simple substances. Oxides of tantalum (V), vanadium (V), and niobium (V). Their aqueous solutions. Acid–base properties. Properties of vanadium (II, III, IV) oxides and hydroxides. Topic 24. Elements of the Sixth Group d-Elements of Group VI. General characteristics of the elements. Atomic structure. Changes in atomic radii, valency, and ionization potentials

within the group. Valency and oxidation states of atoms. Compounds at high oxidation states and changes in their stability within the group. Oxidation–reduction properties of compounds at various oxidation states. Interaction with oxygen, water, acids, and alkalis. Chromium (II, III, VI) oxides and their relative stability. Acid–base and redox properties. Interaction with water, acids, and alkalis.

Tungsten (IV) and molybdenum (IV) oxides and their interaction with water, acids, and alkalis. Changes in oxidizing power, acidity, and stability in the series of chromium–tungsten (VI) oxides. Chromium (II, III, VI) hydroxides. Acid–base and redox properties. Chromium (II, III) salts. Chromates and polychromates. Oxidizing properties of chromates and dichromates.

Topic 25. d-Elements of the Seventh Group

d-Elements of Group VII. Inorganic characteristics of the elements. Atomic structure. Changes in atomic radii and ionization potentials. Valency and oxidation states of atoms. Nature of chemical bonding within the group. Physical and chemical properties of simple substances and their chemical activity; interaction with oxygen, water, acids, and alkalis. Manganese (II, III, IV, VII) oxides: stability, acid–base, and redox properties. Manganese (II, III, IV, VII) hydroxides: stability, acid–base, and redox properties. Technetium and rhenium (VII) hydroxides. Manganese (II, III, IV, VII) salts. Oxidizing properties of permanganates in acidic, neutral, and alkaline media.

Topic 26. Elements of the Eighth Group

General characteristics of the elements. Changes in atomic radii and ionization potentials in the iron–osmium series. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Physical and chemical properties of iron, ruthenium, and osmium. Iron (II, III, VI) compounds and their redox properties. Iron oxides and mixed oxides and their properties. Iron (II, III) hydroxides and their redox properties. Ferrates: stability, hydrolysis, and oxidizing properties. Coordination compounds of iron. High oxidation state compounds of ruthenium and osmium. Halogen compounds. Oxyhalogen compounds. Oxides and related anions. OsO_4 and RuO_4 oxides. Low oxidation state compounds of ruthenium and osmium. Coordination compounds of osmium and ruthenium. Fremy’s salt.

Topic 27. Elements of the Ninth Group

General characteristics of the elements. Changes in atomic radii and ionization potentials, valency, and oxidation states in the cobalt–iridium series. Physical and chemical properties of cobalt, rhodium, and iridium and their interaction with acids and bases. Coordination compounds of cobalt,

rhodium, and iridium.

Topic 28. Elements of the Tenth Group

General characteristics of the elements. Changes in atomic radii and ionization potentials in the nickel–platinum series. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Physical and chemical properties of nickel, palladium, and platinum and their interaction with acids and alkalis. Nickel (II, III, VI) compounds and their redox properties. Coordination compounds of nickel. Specific features of platinum and palladium. Oxygen-containing and halogen-containing compounds of platinum and palladium. Coordination and organometallic complexes of palladium and platinum.

Topic 29. Elements of the Eleventh Group

Elements of the eleventh group and their general characteristics. Changes in atomic radii and ionization potentials within the group. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Chemical properties of simple substances. Dissolution of gold in aqua regia. Copper (I, II) and silver oxides and their properties. Interaction with acids, alkalis, and water.

Topic 30. d-Elements of the Twelfth Group

Elements of the twelfth group. General characteristics of the elements. Changes in atomic radii and ionization potentials within the group. Valency and oxidation states of atoms. Nature of chemical bonding in compounds. Chemical properties of simple substances. Zinc and cadmium oxides and hydroxides. Acid–base properties.

III. Recommended Topics for Laboratory Work

During laboratory classes, students acquire practical skills and competencies in determining various parameters of chemical processes, performing experiments related to the conditions under which chemical processes occur, carrying out calculations, and drawing tables and graphs. The recommended topics are selected depending on available possibilities and adapted to the conditions.

Rules for working in the laboratory. First aid in case of accidents in a chemistry laboratory.

Familiarization with laboratory equipment. Types of glassware commonly used in a chemistry laboratory.

	Weighing on a balance. Heating devices. Filtration and methods of purification of substances. Purification of substances by recrystallization. Experiments on the law of conservation of mass and determination of the chemical equivalent of elements. Experiments on periodic changes in the periodic law. Experiments on the rate of chemical reactions. Experiments on chemical equilibrium. Solutions. Experiments on determining solubility. Preparation of solutions of various concentrations. Experiments on preparing normal-concentration solutions. Solving problems related to normal concentration. Experiments on preparing percent and molar concentration solutions. Solving problems on solution concentration and solubility product. Determination of the mass fraction of water of crystallization in barium chloride. Electrolytic dissociation. Electrical conductivity of solutions. Experiments on the course of ionic reactions. Characteristics of solution media. Indicators. Solving problems related to the hydrogen index (pH). Experiments on salt hydrolysis. Redox reactions. Experiments on redox reactions. Oxidizing properties of potassium permanganate. Electrochemical properties of solutions. Determining the activity of metals. Preparing a galvanic cell. Electrolysis of aqueous solutions. Electrochemical properties of solutions. Determining the activity of metals. Preparing a galvanic cell. Electrolysis of aqueous solutions.

	The most important classes of inorganic compounds. Experiments on obtaining oxides and their chemical properties. Experiments on obtaining acids and their chemical properties. Experiments on obtaining bases and their chemical properties. Experiments on obtaining salts and their chemical properties. Experiments on obtaining hydrogen and its chemical properties. Experiments on sodium, potassium, lithium, and their compounds. Experiments on calcium, magnesium, and their compounds. Experiments on chlorine and its compounds. Experiments on bromine, iodine, and their compounds. Experiments on oxygen, ozone, and their compounds. Experiments on sulfur and its compounds. Experiments on sulfur and its compounds. Experiments on nitrogen and its compounds. Experiments on phosphorus and its compounds. Experiments on carbon, silicon, and their compounds. Experiments on tin, lead, and their compounds. Experiments on boron, aluminum, and their compounds. Experiments on obtaining coordination compounds and studying their chemical properties. Experiments on studying the general properties of metals. Experiments related to the activity series of metals. Comparing metal activity. Experiments on chromium and its compounds. Experiments on manganese and its compounds.

	Experiments on iron and its compounds. Experiments on cobalt, nickel, and their compounds. Experiments on copper and its compounds. Experiments on silver and its compounds. Experiments on zinc, cadmium, mercury, and their compounds. Laboratory classes should be conducted in a laboratory room equipped with devices, by one instructor for one laboratory group. It is advisable that classes be conducted using active and interactive methods, and that appropriate pedagogical and information technologies be applied accordingly. IV. Independent Study and Independent Assignments Independent work carried out outside classroom hours is recommended to be implemented in the following forms: essay — written expression of one's personal opinion on a relevant topic in critical, journalistic, and other genres; preparing reports; writing a course paper; writing a synopsis/summary notes; compiling a glossary; individual and group educational projects; completing case assignments; compiling thematic portfolios; working with information-analytical materials; working with sources; creating infographics; creating schematic and visual models (mind maps, frames, logical graphs,

	etc.); creating multimedia presentations; preparing methodological lesson plans; preparing materials for extracurricular classes. Depending on the specific features of the field of study (specialization), other types of independent work may also be used. **Recommended Topics for Independent Study** **Hess's law. The concept of standard enthalpy of formation under standard conditions. Change in Gibbs energy and the direction of a reaction. Helmholtz free energy.** **Catalysis and catalysts. Homogeneous and heterogeneous catalysis. Use of standard-state enthalpy and entropy values of reactions in calculating the equilibrium constant.** **Periodic variation of the properties of elements. Horizontal similarity.** **Order of filling of orbitals with electrons. Electron configurations of atoms of elements of periods I–IV.** **Band theory of crystals. Semiconductors. Solid solutions.** **Valence bond theory. Molecular orbital method. Study of the formation of heteroatomic molecules using the MO method.** **Explanation of the structures of CO, CO_2, BF_3, and NO_3 molecules using the molecular orbital method.** **Concepts of saturated, unsaturated, supersaturated, concentrated, and dilute solutions.** **Salt effect. Precipitate formation in sparingly soluble salts and conditions for dissolution of the precipitate. Factors affecting the**

	equilibrium of hydrolysis reactions. Solubility product. **Theories of acids and bases. Solvo-system theory.** **Actinoids.** **Construction and balancing of oxidation–reduction reactions.** **Sources of electric current. Accumulators. Dry batteries.** **Fuel cells.** **Electrochemistry. Processes occurring in solutions and melts.** **Corrosion of metals and methods of protection against it.** **Hydrogen electrode. Concept of a galvanic cell.** **Isomerism of coordination compounds. Electrostatic interaction of the central ion with ligands.** **Sulfides of halogens. Oxoacids of halogens.** **Selenite and tellurite acids. Changes in oxidizing–reducing properties in the series of sulfite–tellurite acids.** **Nitrides, hydrazine, hydroxylamine, hydrazoic acid, and their properties. Oxoacids of nitrogen.** **Oxoacids of phosphorus. Halogen compounds at low oxidation states. Oxo-compounds of arsenic and their properties.** **Isopoly, peroxo, and heteropoly compounds of d-elements and their properties.** **Actinoids. Radiochemistry. Transuranium elements. Natural and artificial radioactivity.** **Factors affecting the equilibrium of hydrolysis reactions.**

	Construction of oxidation–reduction reactions and determination of coefficients. **Distribution of halogens in nature. Physical and chemical properties of bromine, iodine, and their compounds.** **Properties of selenium, tellurium, and their compounds.** **Carbon and its compounds. Preparation and properties.** **Silicon and its compounds. Preparation and properties.** **Corrosion of metals and methods of protection against it.** **Concept of galvanic cells. Overpotential.** **Group II s-elements. Water hardness and methods of softening.** **Methods for solving problems related to solutions.** **Balancing oxidation–reduction reactions using the ion–electron balance method.**
3	**V. Learning Outcomes (Formed Competencies)** As a result of mastering the course, the student shall: • have knowledge of the current state of inorganic chemistry, its directions of development, the properties of chemical elements and their compounds, be able to apply and use the laws of theoretical chemistry in the synthesis of substances with new properties, possess information on the modern concept of the structure of matter, and have an understanding of the types and nature of chemical bonding; • know and be able to use the theoretical foundations of inorganic chemistry, chemical laws and concepts, the properties of chemical elements, issues related to the distribution and abundance of elements in the Earth's crust, as well as the practical significance of elements and their compounds.

	The student should possess skills in applying methods for analyzing chemical phenomena and processes, making decisions on chemical problems, preparing solutions of various concentrations, synthesizing inorganic compounds, isolating, purifying, and studying them; conducting experiments using established methods, and solving problems related to the studied topics.
4.	• **VI. Teaching Technologies and Methods** • • Teamwork and project defense. Interactive case studies (logical thinking, rapid question-and-answer sessions); • lectures; • individual projects; • giving presentations; • working in groups; • practical classes; • projects for teamwork and defense; • creating creative works**.**
5.	**VII. Requirements for Earning Credits** To earn credits, students are required to fully master the theoretical and methodological concepts of the course, be able to correctly present the results of analyses, independently reflect on the studied processes and concepts, complete the tasks and assignments given in current and interim assessments, and submit a written paper for the final assessment
6.	• **VIII. Main References** • • Berdiqulov R.Sh., Mirkomilov Sh.M., Iskandarov A.Yu. Inorganic Chemistry. Tashkent: Uzbekistan, 2018. • • Lutfullayev E. Practical Classes in Inorganic Chemistry. Tashkent: Uzbekistan, 2006. • • Karimova D., Sodiqov M. Inorganic Chemistry. “Ilm va Fan” Publishing House. Tashkent: Uzbekistan, 2023. • • Daminova Sh.Sh. Laboratory Classes in Inorganic Chemistry. Tashkent: Uzbekistan, 2006. • • Daminova Sh.Sh. Laboratory Classes in Inorganic Chemistry. Tashkent: Uzbekistan, 2006. • • Parpiyev N.A., Raximov X.R., Muftaxov A.G. Theoretical Foundations of Inorganic Chemistry. Tashkent: Uzbekistan, 2000.

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