

REPUBLIC OF UZBEKISTAN
MINISTRY OF HIGHER EDUCATION, SCIENCE AND INNOVATIONS
FERGANA STATE TECHNICAL UNIVERSITY

General Chemistry
MODULE HANDBOOK

Field of knowledge: 700 000 – Engineering, manufacturing and construction sciences
Educational field: 730 000 – Architecture and Construction
Education program: 60730300 – Civil Engineering

Module title	<i>General Chemistry</i>
Code (if available)	<i>GChemM16</i>
Semesters of study	<i>1,2</i>
Responsible for the module	<i>Abdullazhanov Kholmadzhon, Senior Lecturer, Department of Chemical Engineering Tozhiev Ergasali Akhadovich, Assistant, Department of Chemical Engineering Turdiyboev Ilkhamjon Khaetjonovich, Assistant, Department of Chemical Engineering</i>
Language of instruction	<i>Uzbek, Russian</i>
Connection to the curriculum	<i>Compulsory</i>
Teaching methods	<i>Lectures, practical classes, laboratory work, independent study</i>
Study load (including classroom hours and independent work))	<i>Total: 180 hours Auditorium hours: 72 hours lectures – 30 hours, practical classes – 18 hours, laboratory work – 18 hours, independent work – 114 hours</i>
Credit units	<i>6</i>
Required and recommended prerequisite disciplines for completing the module	<i>Physics, mathematics, electrical engineering, strength of materials, building materials and products</i>
Module objectives / Expected learning outcomes	<i>The aim of the module is to familiarise students with the basic concepts of general chemistry, the laws governing the equilibrium and motion of liquids, and to improve the chemical knowledge of future mechanics, power engineers, geologists, miners and electronics engineers. This is a relevant task, as it contributes to the formation of skills in the application of new materials in technology and their practical use.</i> <i>To achieve this goal, the discipline provides students with theoretical knowledge, practical skills, methodological approaches to the assessment of chemical processes, and the development of a scientific worldview.</i> <i>As a result of studying the discipline, students should:</i> <i>master the concepts, theories and laws of chemistry and understand their essence;</i> <i>know the structure, composition and properties of substances, as well as the causes and consequences of the transition of substances from one state to another;</i> <i>be able to perform chemical calculations;</i> <i>be able to plan and conduct chemical experiments, correctly use the necessary substances and equipment, and possess the relevant knowledge and skills;</i> <i>have experience in collecting and exchanging chemical information, as well as information processing skills.</i>
Content	<i>Module 1. Introduction to Chemistry.</i> <i>The concept of chemistry. Historical approach and modern development of chemistry.</i> <i>Matter and motion. The relationship between matter and motion.</i> <i>Chemistry as a science that explains substances and their transformations into different states.</i> <i>Basic concepts of chemistry and stoichiometric laws.</i> <i>Module 2. Main classes of inorganic chemistry.</i> <i>Classification, production, properties and significance of oxides and bases. Basic, acidic, amphoteric, neutral, complex and peroxides. Soluble, insoluble and amphoteric bases. Classification, production, properties and significance of acids and salts.</i> <i>Oxygen-containing and oxygen-free acids.</i>

	<i>Salts and their classification.</i> <i>Module 3. Structure of the atom.</i> <i>Nucleus, protons, neutrons, their charges and masses.</i> <i>The dual nature of electron motion: wave-particle duality. Quantum mechanics and the de Broglie equation. The essence of the Schrödinger equation, Heisenberg's uncertainty principle. Explanation of the structure of the atom from the perspective of quantum mechanics.</i> <i>Characterisation of electron energies using quantum numbers.</i> <i>Atomic orbitals. Distribution of electrons among orbitals in multi-electron atoms. The energy advantage rule (Klechkovsky's rule). The Pauli principle. Hund's rule. Maximum number of electrons in energy levels and sublevels.</i> <i>Formation of atomic spectra. Ionisation energy and electron affinity, electronegativity.</i> <i>Module 4. The modern periodic table of elements.</i> <i>The periodic table of elements. The physical meaning of the atomic number of an element. The relationship between the structure of an atom and the position of an element in the periodic table.</i> <i>Molecular structure and chemical bonding. The concept of chemical bonding. Characterisation of chemical bonding through the distribution of electrons in atoms. Types of chemical bonds, covalent bonding and theories of its formation.</i> <i>Fluid flow through a small hole and a tube.</i> <i>Module 5. Thermochemical processes.</i> <i>The thermal effect of chemical reactions. Exothermic and endothermic reactions. Internal energy and enthalpy. Calculation of the thermal effects of thermochemical reactions. Hess's law and its consequences.</i> <i>Module 6. The rate of chemical reactions. Kinetics and equilibrium.</i> <i>Chemical kinetics. Chemical equilibrium in homogeneous and heterogeneous reactions.</i> <i>Module 7. Formation of solutions.</i> <i>Properties of solutions. Osmosis, osmotic pressure and its role in nature. Properties of electrolyte solutions. Solubility product. Electrolytic dissociation of water.</i> <i>Module 8. Oxidation-reduction reactions.</i> <i>Writing equations for oxidation-reduction reactions and their classification. General properties of metals. Electrolysis. Electrolysis processes. Classification and nomenclature of coordination compounds.</i> <i>Module 9. General properties of group elements.</i> <i>General properties of elements in groups I and II. General properties of elements in group XIII of the periodic table. Properties of elements in groups XIV, XV, XVI and XVII of the periodic table.</i> <i>Module 10. Lanthanides and actinides.</i> <i>General properties of lanthanides. Prevention of environmental pollution.</i>
Forms of assessment	<i>Oral questioning, presentations, written assignments, practical assignments, laboratory work and final exams.</i>
Requirements for study and assessment	<i>To successfully complete the module, students must attend classes and achieve the minimum required marks in the current, interim and final assessments.</i>

Bibliography	1. <i>Introductory Chemistry 2E (IE)</i> by K. REVELL. 2021. https://www.angusrobertson.com.au/books/introductory-chemistry-2e-ie-k-revell/p/9781319383831 2. <i>Chemistry, Theory and Practice, Metals and Alloys</i>, Gurov A.A., Slitkov P.V., Mednykh Zh.N., 2019 https://obuchalka.org/20210722134486/himiya-teoriya-i-praktika-metalli-i-splavi-gurov-a-a-slitkov-p-v-mednih-j-n-2019.html 3. Akhmerov K., Turobjono S., Saparov S. <i>'Laboratory Classes in General and Inorganic Chemistry'</i> Tashkent, 2019. http://ilmiy.bmti.uz/blib/files/62/Umumiy%20va%20anorganik%20kimyodan%20laboratoriya%20mashg%60ulotlari.pdf 4. <i>General Chemistry</i>, Masharipov S., 2018 https://obuchalka.org/20220601144477/umumy-himiya-11-synp-maaripow-s-2018.html <i>Additional literature</i> 1. <i>Academic and Professional Communication in a Foreign Language, Materials for Natural Science Studies: Chemistry in Focus</i>, Baiburova O.V., Akbasheva E.R., 2021 https://obuchalka.org/20220110140186/akademicheskaya-i-professionalnaya-kommunikaciya-na-inostrannom-yazike-materials-for-natural-science-studies-chemistry-in-focus-baiburova-o-v-akbasheva-e-r-2021.html 2. <i>Introduction to Chemistry, lectures for the course 'Chemistry with Interest'</i>, Isaev I.D., 2021 https://obuchalka.org/20211208139182/vvedenie-v-himiu-lekcii-k-kursu-himiya-s-interesom-isaev-i-d-2021.html 3. <i>Welcome to Chemistry</i>, Levitsky M.M., 2021 https://obuchalka.org/20220707145451/dobro-pojalovat-v-himiu-levickii-m-m-2021.html 4. <i>Laboratory work on environmental chemistry, Chemistry of water</i>, Sutyagin A.A., Menshikov V.V., Levina S.G., 2021 https://obuchalka.org/20220119140481/laboratornie-raboti-po-himii-okruzhayushchei-sredi-himiya-vodi-sutyagin-a-a-menshikov-v-v-levina-s-g-2021.html 5. <i>Theoretical Foundations of Chemical Technology, Textbook for Secondary Vocational Education</i>, Ignatenkov V.I., 2019 https://obuchalka.org/20210727134660/teoreticheskie-osnovi-himicheskoi-tehnologii-uchebnoe-posobie-dlya-spo-ignatenkov-v-i-2019.html 6. <i>Series of classes 'General Chemistry' as part of the supplementary general education programme in natural sciences 'Chemistry in Research'</i>, Bakshevnikova A.P., 2018 https://obuchalka.org/20211011137319/cikl-zanyatii-obschaya-himiya-v-ramkah-dopolnitelnoi-obscheobrazovatelnoi-programmi-estestvennonauchnoi-napravlenosti-himiya-v-issledovaniyah-bakshevnikova-a-p-2018.html 7. Eminov A.M., Akhmerov K.A., Turobjono S.M. <i>Laboratory classes in general and inorganic chemistry</i>. Tashkent, 2020. 8. Karapetyants M.Kh., Drakina S.I. <i>General and inorganic chemistry, textbook</i>. M.: Chemistry, 2020. – 631 p. 9. Akhmetov N.S. <i>Laboratory and seminar classes in general and inorganic chemistry, textbook</i>. M., 2020. – 380 p. <i>Internet resources</i> http://ziyonet.uz http://www.sciencedirect.com http://www.chem.msu.su http://www.uz http://www.chem.vsu.ru
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