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| <b>Identification</b>                          | <b>Subject (code, title, credits)</b>  | CHEM 111 Chemistry 1, 6 ECTS       |                       |
|  | <b>Department</b>  | Chemistry and Chemical Engineering |                       |
|  | <b>Program (undergraduate, graduate)</b>   | Undergraduate                      |                       |
|  | <b>Term</b>  | Spring 2024                        |                       |
|  | <b>Instructor</b>  | Ayaz Mammadov                      |                       |
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|  | <b>Phone:</b>  | +994772288877                      |                       |
| <b>Prerequisites</b>                           |  |                                    |                       |
| <b>Language</b>                                | English  |                                    |                       |
| <b>Compulsory/Elective</b>                     | Compulsory   |                                    |                       |
| <b>Required textbooks and course materials</b> | <p>Core textbooks</p> <p>1. R.Chang, "General Chemistry", The Essential Concepts, fifth edition, New-York</p> <p>Additional References</p> <p>2. Darrell D. Ebbing, Steven D. Gammon, "General Chemistry", ninth edition, New York</p> <p>For class presentations and discussions, the student should utilize journal and internet materials. Moreover, the course does not limit the use of learning materials available at Khazar University library.</p>  |                                    |                       |
| <b>Course website</b>                          |  |                                    |                       |
| <b>Teaching methods</b>                        | <b>Lecture</b>   |                                    | x                     |
|  | <b>Group discussion</b>  |                                    | x                     |
|  | <b>Research from internet</b>  |                                    | x                     |
|  | <b>Others</b>  |                                    | x                     |
| <b>Evaluation</b>                              | <b>Methods</b>   | <b>Date/deadlines</b>              | <b>Percentage (%)</b> |
|  | <b>Midterm Exam</b>  | Week 7                             | 30                    |
|  | <b>Quizzes</b>   | Week 5                             | 10                    |
|  | <b>Presentation/Group work</b>   | Week 4-15                          | 15                    |
|  | <b>Participation</b>   | Every week                         | 5                     |
|  | <b>Final Exam</b>  |                                    | 40                    |
|  | <b>Total</b>   |                                    | 100                   |
| <b>Course outline</b>                          | <p>In this course, we study chemistry, beginning with the basics of the atom and its behavior, then progressing to the chemical properties of matter and the chemical changes and reactions that take place all the time in our world. General Chemistry 1 covers the nature of matter, stoichiometry, basic chemical reactions, Gases, thermochemistry, atomic structure and the periodic table, and chemical bonding, the properties of solutions. In this course, students will acquire fundamental knowledge such as the structure, nature, participation of substances in reactions, determination of precipitation in reactions, stoichiometric calculations and concentrations of solutions. This course will contribute to other courses in chemistry such as analytical, organic, petrochemical, physical chemistry, etc</p>  |                                    |                       |
| <b>Course objectives</b>                       | <p>Throughout this course, we will focus on the following learning objectives:</p> <p>Understand the fundamental concepts of chemistry.</p> <p>Composition, structure and properties of substances.</p> <p>The relationship between the structure of a molecule and its chemical properties.</p> <p>Stoichiometric calculations in chemical reactions.</p> <p>Direction, types of chemical reactions and determination of precipitation in reactions.</p> <p>Properties of gases, determination of concentrations of solutions.</p>  |                                    |                       |
| <b>Learning outcomes</b>                       | <p>Upon successful completion of this course, you will be able to:</p> <p>Distinguish between the physical and chemical properties of matter;</p> <p>Describe the arrangement of the periodic table;</p> <p>Identify and write electron configurations;</p> <p>Draw Lewis structures for molecules;</p> <p>Name ionic and covalent compounds using the rules for nomenclature of inorganic compounds;</p> <p>Perform stoichiometric calculations;</p> <p>Use the Ideal Gas Law to calculate properties of gases;</p> <p>Calculate enthalpy change for a given process, and explain the relationship between enthalpy change and the tendency for reactions to occur;</p> <p>Classify solutions as acidic, basic, or neutral; determination of concentrations of solutions.</p> <p>Write and balance oxidation-reduction reactions.</p> |                                    |                       |

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| <b>Policy</b> |              | <ul style="list-style-type: none"> <li>▪ <b>Participation</b><br/>Actively participating in class discussions, asking questions, and contributing to group activities can enhance your understanding of complex concepts. It allows you to clarify doubts, exchange ideas, and learn from your peers and the instructor. Students lose 0.17 marks for each lesson they miss.</li> <li>▪ <b>Quiz</b><br/>Quizzes are a form of assessment that helps instructors gauge students' understanding of key concepts and topics. They provide a quick snapshot of whether students have grasped the material presented in lectures or readings. Students will have two quizzes (tests) during the course. They will get maximum 10 marks for quizzes.</li> <li>▪ <b>Presentation/Group work</b><br/>The field of chemistry often involves collaborative projects and presentations in a professional setting. Engaging in group work and presentations during the class helps students develop skills that are directly transferable to their future careers. Students will present their work in the form of a presentation.</li> <li>▪ <b>Withdrawal (pass/fail)</b><br/>The School of Science and Engineering grading guidelines are carefully adhered to throughout this course. In order to pass, a student must typically receive a mark of at least 60%. If the student fails, the course must be retaken.</li> <li>▪ <b>Cheating/plagiarism</b><br/>Any form of plagiarism or cheating on a test, quiz, or project will result in the cancellation of the assignment. In this scenario, the student will receive a score of zero (zero) without any further consideration.</li> <li>▪ <b>Professional behavior guidelines</b><br/>During class hours, students are expected to conduct themselves in a way that fosters a positive academic and professional atmosphere. Discussions without permission and unethical conduct are absolutely forbidden.</li> <li>▪ <b>Ethics</b><br/>In class, students shouldn't be late. During class, all electronic devices must be put away and turned off.</li> </ul> |                             |
| <b>Week</b>   | <b>Topic</b> | <b>Topics</b>  | <b>Textbook/Assignments</b> |
| 1             | 1            | <b>Introduction to Chemistry (1-12)</b><br>The Study of Chemistry (2)<br>The Scientific Method (2)<br>Classifications of Matter (4)<br>Physical and Chemical Properties of Matter (7)<br>Measurements (8)  | [1]                         |
| 2             | 2            | <b>Atoms, Molecules and Ions (28-52)</b><br>The Atomic Theory (29)<br>The Structure of the Atom (30)<br>Atomic Number, Mass Number, and Isotopes (35)<br>The Periodic Table (36)<br>Molecules, and Ions (38)<br>Chemical Formulas (39)<br>Naming Compounds (43)<br>Introduction to Organic Compounds (52)  | [1]                         |
| 3             | 3            | <b>Stoichiometry (58-84)</b><br>Atomic Mass (59)<br>Avogadro's Number and the Molar Mass of an Element (61)<br>Molecular Mass (64)<br>Percent Composition of Compounds (67)<br>Experimental Determination of Empirical Formulas (70)<br>Chemical Reactions and Chemical Equations (73)<br>Amounts of Reactants and Products (77)<br>Reaction Yield (83)  | [1]                         |
| 4             | 4            | <b>Reaction in Aqueous Solutions (94-114)</b><br>General Properties of Aqueous Solutions (95)<br>Precipitation Reactions (97)<br>Acid-Base Reactions (101)<br>Oxidation-Reduction Reactions (106)  | [1]                         |

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| 5  | 5  | <b>Gases (132-152)</b><br>Substances That Exist as Gases (133)<br>Pressure of a Gas (134)<br>The Gas Laws (136)<br>The Ideal Gas Equation (142)<br>Dalton's Law of Partial Pressures (148)   | [1] |
| 6  |    | <b>Review</b>  |     |
| 7  |    | <b>Midterm exam</b>  |     |
| 8  | 6  | <b>Energy Relationships in Chemical Reactions (171-195)</b><br>The Nature of Energy and Types of Energy (172)<br>Energy Changes in Chemical Reactions (173)<br>Introduction to Thermodynamics (174)<br>Enthalpy of Chemical Reactions (180)<br>Calorimetry (185)<br>Standard Enthalpy of Formation and Reaction (191)    | [1] |
| 9  | 7  | <b>The Electronic Structure of Atoms (206-233)</b><br>From Classical Physics to Quantum Theory (207)<br>Quantum Mechanics (219)<br>Quantum Numbers (221)<br>Atomic Orbitals (222)<br>Electron Configuration (226)  | [1] |
| 10 | 8  | <b>The Periodic Table (245-271)</b><br>Periodic Classification of the Elements (246)<br>Periodic Classification of the Elements (247)<br>Periodic Variation in Physical Properties (250)<br>Ionization Energy (256)<br>Electron Affinity (259)<br>Variation in Chemical Properties of the Representative Elements (261)  | [1] |
| 11 | 9  | <b>Chemical Bonding I (279-304)</b><br>Lewis Dot Symbols (280)<br>The Ionic Bond (281)<br>Lattice Energy of Ionic Compounds (283)<br>The Covalent Bond (285)<br>Electronegativity (287)<br>Writing Lewis Structures (291)<br>The Concept of Resonance (296)<br>Exceptions to the Octet Rule (298)<br>Bond Enthalpy (302) | [1] |
| 12 | 10 | <b>The properties of solutions (425-446)</b><br>Types of Solutions (426)<br>A Molecular View of the Solution Process (426)<br>Concentration Units (429)<br>Effect of Temperature on Solubility (432)<br>Effect of Pressure on the Solubility of Gases (433)<br>Colligative Properties (435)                              | [1] |
| 13 | 11 | <b>Introduction to Organic Chemistry (355-381)</b><br>Classes of Organic Compounds (356)<br>Aliphatic Hydrocarbons (356)<br>Aromatic Hydrocarbons (370)<br>Chemistry of the Functional Groups (374)  | [1] |
| 14 | 12 | <b>Organic Polymers—Synthetic and Natural (739-754)</b><br>Properties of Polymers (740)<br>Synthetic Organic Polymers (740)<br>Proteins (744)<br>Nucleic Acids (752)   | [1] |
| 15 |    | <b>Review</b>  |     |
|    |    | <b>Final exam</b>  |     |