IRAN UNIVERSITY OF MEDICAL SCIENCES

School of Pharmacy

Department of Medicinal Chemistry

Course title: General Chemistry

Credit (Theory or Practical): 3 Credits (Theory)

Prerequisite: ---

Responsible Lecturer: Dr.Golsanamlu

Course Lecturers: Dr. Mokhtari, Dr. Asadi, Dr.Golsanamlu

Field of Study: Master of Pharmacy (M.Pharm)

Course Instructor Information

Academic Rank: Assistant Professor

Field of Specialization: Medicinal Chemistry

Workplace: Faculty of Pharmacy

Email Address: golsanamlou.z@iums.ac.ir

Course Description:

This course provides a comprehensive introduction to the fundamental principles of chemistry, exploring the relationship between the macroscopic properties of matter and their atomic-scale explanations. Key topics include atomic structure, chemical bonding, states of matter, and thermochemistry, with an emphasis on quantitative problem-solving. Designed as a foundation for further study in science and engineering, this course is essential for students majoring in pharmacy, chemistry, and the health professions.

• Course objectives (Competency):

- Master the fundamental principles of atomic structure and the classification of matter.
- Predict molecular geometry and chemical bonding based on atomic properties and quantum theory.
- Apply the laws of stoichiometry to perform quantitative calculations for chemical reactions.
- Analyze energy changes in chemical processes using the principles of thermochemistry and thermodynamics.

- Classify states of matter and explain their properties using kinetic molecular theory and intermolecular forces.

- Evaluate chemical reactivity and predict the behavior of systems at dynamic equilibrium.

● Specific Objectives (Core Competency)

- Explain the structure of the atom and how it defines the properties of an element.

- Relate the electronic structure of atoms, as described by quantum mechanics, to the periodic trends observed in the periodic table.

- Distinguish between elements, compounds, and mixtures at the particulate level.

- Predict the type of chemical bond (ionic, covalent, metallic) and the resulting three-dimensional molecular geometry using established models (Lewis structures).

- Connect molecular structure and intermolecular forces to the observed macroscopic properties of substances (e.g., boiling point, solubility, surface tension).

- Apply the mole concept to convert between the mass, number of particles, and volume of a substance.

- Solve quantitative problems related to chemical reactions, including stoichiometry, limiting reactants, and percent yield.

- Calculate solution concentrations (e.g., molarity) and perform dilution calculations.

- Apply gas laws to predict and explain the behavior of gases under changing conditions.

- Analyze energy changes (enthalpy) in chemical reactions and phase transitions using the principles of thermochemistry.

- Describe the characteristics of solids, liquids, and gases based on the energy and motion of their particles.

- Explain the concept of dynamic equilibrium, particularly in the context of chemical reactions.

Educational Approach:

Virtual approach □ In-person approach ■ Blended approach □

Teaching-Learning Methods (according to the chosen educational approach):

-Interactive Lecture (Q&A, Quizzes, Group Discussion, etc.)
-Small group discussions
-Problem-Based Learning (PBL)

IRAN UNIVERSITY OF MEDICAL SCIENCES

General Chemistry Course Plan (M-Pharm)

Tuesdays 13-17

	Subject	Teaching-Learning method	Lecturer	Date
1	-Course Introduction, Overview of Syllabus, and Policies. -Keys to the study of chemistry -The components of Matter -Measurement and Chemical Problem Solving	Interactive Lecture Problem-Based Learning	Dr. Asadi	30 Sep. 2025
2	- **Stoichiometry of formulas and Equations** **The Mole** -Determining the Formula of an Unknown Compound -Writing and Balancing Chemical Equations -Calculating Quantities of Reactant and Product	Interactive Lecture Problem-Based Learning	Dr. Asadi	7 Oct. 2025
3	- **Stoichiometry of formulas and Equations** **The Mole** -Solving problems	Problem-Based Learning	Dr. Asadi	14 Oct. 2025
4	**Three major Classes of Chemical reactions** - Precipitation Reactions - Acid-Base Reactions - Oxidation-Reduction (Redox) Reactions	Interactive Lecture Problem-Based Learning Small group discussions	Dr. Asadi	21 Oct. 2025
5	**Gases and the Kinetic-Molecular Theory** - Gas Pressure and Its Measurement -The Gas Laws and Their Experimental Foundations -Rearrangements of the Ideal Gas Law	Interactive Lecture Problem-Based Learning Small group discussions	Dr. Asadi	28 Oct. 2025
6	**Gases and the Kinetic-Molecular Theory** -The Kinetic-Molecular Theory: A Model for Gas Behavior -Real Gases: Deviations from Ideal Behavior -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Asadi	4 Nov. 2025
	Midterm Exam (1-6)	-	Dr. Asadi	11 Nov. 2025
7	**Thermochemistry: Energy flow and Chemical** -Forms of Energy and Their Interconversion - Enthalpy: Changes at Constant Pressure -Calorimetry: Measuring the Heat of a Chemical or Physical Change	Interactive Lecture Problem-Based Learning	Dr. Mokhtari	11 Nov. 2025
8	**Thermochemistry: Energy flow and Chemical** -Stoichiometry of Thermochemical Equations -Hess's Law: -Standard Enthalpies of Reaction -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Mokhtari	18 Nov. 2025
9	**Models of Chemical Bonding** -The Ionic Bonding Model -The Covalent Bonding Model -Bond Energy and Chemical Change	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	25 Nov. 2025
10	**Models of Chemical Bonding** -Between the Extremes: Electronegativity and Bond Polarity -An Introduction to Metallic Bonding -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	2 Dec. 2025
11	**The shapes of Molecules** -Depicting Molecules and Ions with Lewis Structures -Solving problems -Valence-Shell Electron-Pair Repulsion (VSEPR) Theory	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	9 Dec. 2025

12	**The shapes of Molecules** -Valence-Shell Electron-Pair Repulsion (VSEPR) Theory - Molecular Shape and Molecular Polarity - Solving problems	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	16 Dec. 2025
	Midterm Exam 2 (7-12)	-	Dr. Mokhtari Dr. Golsanamlu	24 Dec. 2025
13	**Covalent Bonding** -Valence Bond (VB) Theory and Orbital Hybridization	Interactive Lecture Problem-Based Learning	Dr. Mokhtari	24 Dec. 2025
14	**Covalent Bonding** -Modes of Orbital Overlap and the Types of Covalent Bonds -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Mokhtari	31 Dec. 2025
15	**Covalent Bonding** - Molecular Orbital (MO) Theory and Electron Delocalization -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Mokhtari	7 Jan. 2026
16	**Intermolecular Forces:** - Quantitative Aspects of Phase Changes - Phase Diagrams	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	14 Jan. 2026
17	**Intermolecular Forces:** -Properties of the Liquid State -The Solid State: Structure, Properties, and Bonding -Solving problems	Interactive Lecture Problem-Based Learning	Dr. Golsanamlu	21 Jan. 2026

Student responsibilities:

-The set of activities that the student is obligated to complete in this course are as follows:

Regular class attendance

Participating in class discussions

Submit the assigned project by the specified date

Participating in teaching and problem-solving

Taking the midterm exams

Taking the final exam

Note: Attendance is mandatory for all students. The maximum allowable justified absences are a maximum of 5 sessions, which corresponds to the instructor's sessions.

Note: All students in the course must submit the assignments specified by the instructors (project, report preparation, exercise solutions, etc.) by the stipulated deadline.

Student Assessment Method:

Type of assessment mentioned: Formative and summative assessment (question and answer each session, class quizzes, midterm exam, and final exam).

Grading contribution of the course instructors:

Professors	Class Activity	Midterm Exam 1	Midterm Exam 2	Final Exam	Sum
Dr Asadi	۰,۷	۶,۴	-	-	7.1
Dr Golsanamlu	0.7	-	۴,۲	۲,۲	7.1
Dr Mokhtari	۰,۶	-	۲,۱	۳,۱	5.8

References:

-Chemistry: the molecular nature of matter and change, *Martin S. Silberberg, Patricia Amateis, Virginia Polytechnic. Seventh edition*.

-Chemistry: A Conceptual Approach**,** *Charles E. Mortimer, University of California, Berkeley. Ninth edition.*