

Course Code	Course Name	Credits
26CH906	GENERAL CHEMISTRY	04

Course Objectives

- To understand the fundamentals of atomic structure, electronic configuration, and periodic properties of elements.
- To explain basic concepts of chemical bonding and introductory organic chemistry, including structure, reactivity, and types of reactions.
- To develop foundational knowledge of physical and analytical chemistry, including photochemistry and volumetric analysis.

Learning Outcomes

Upon successful completion of this course it is intended that a student will be able to:

- Explain atomic structure and electronic configuration using quantum numbers and basic principles.
- Analyze periodic properties and trends across different element groups.
- Describe chemical bonding and predict molecular structures using bonding theories.
- Interpret basic organic chemistry concepts and reaction types.
- Apply principles of photochemistry and volumetric analysis to solve numerical problems.

Unit 1 - Atomic Structure & Electronic Configuration (12 Hrs.)

Structure of atom and electronic configuration; Fundamental principles: Aufbau Principle, Pauli's Exclusion Principle, Hund's Rule (n + l) Rule, Quantum numbers: Principal, Azimuthal, Magnetic, Spin; Stability of: Half-filled and fully-filled orbitals

Unit 2 – Periodic Properties: Modern periodic table and trends (12 Hrs.)

Classification of elements: s-block elements, p-block elements, d-block elements, f-block elements; General characteristics of each block; Variation across periods and down groups: Atomic size (atomic and ionic radii), Ionization energy, Electron affinity, Electronegativity, C. Factors Affecting Periodic Properties, Nuclear charge, Shielding effect, Penetration of orbitals

Unit 3 - Chemical Bonding & Molecular Structure (12 Hrs.)

Types of bonding: Ionic bond; Covalent bond and polarity; Fajan's Rules (covalent character in ionic bonds); Hydrogen bonding (types, properties, importance); Orbital overlap: s-s and s-p; Hybridization: sp, sp², sp³; VSEPR theory and shapes: BeCl₂, NH₃, H₂O, PCl₅, SF₆, IF₇

Unit 4 – Basic Organic Chemistry (12 Hrs.)

IUPAC Nomenclature; Bond cleavage: Homolytic and heterolytic fission; Nucleophiles and electrophiles; Reaction intermediates: Carbocations, Carbanions, Free radicals (structure & stability); Types of reactions: Substitution, Addition, Elimination, Polymerization.

Unit 5 - Basic Physical & Analytical Chemistry (12 Hrs.)

Photochemistry: Definition of photochemical reactions; Difference between thermal and photochemical reactions; Basic laws: Grothuss-Draper Law, Einstein's Law, Quantum yield; Examples of: Fluorescence, Phosphorescence

Solutions & Volumetric Analysis: Concentration terms: Molarity, Normality; Standard solutions: Primary and secondary standards; Equivalence point and end point; Types of titrations: Acid-base, redox

Reference Books:

- J. D. Lee, A New Concise Inorganic Chemistry, 5th Ed., 2014, Oxford Publishers.
- Bahl, B. S. Bhal, A Textbook of Organic chemistry, 22nd Ed, 2016. S. Chand and Company Ltd., New Delhi,
- P. L. Soni, Text book of Organic Chemistry, 28th Ed., 2004. S. Chand and Company Ltd., New Delhi,
- R. T. Morrison and R. N. Boyd., Organic Chemistry, 7th Ed., 2011. Prentice Hall of India Pvt. Ltd., New Delhi
- B. R. Puri, L.R. Sharma and M. S. Pathania, Principles of Physical Chemistry, 47th Ed., 2016. Vishal Publishing Co.
- Carey, Francis A., Sundberg, Richard J., Advanced Organic Chemistry Part A: Structure and Mechanisms Springer, New York,
- Peter Atkins, Julio de Paula, and James Keeler, —Atkins' Physical Chemistry 11th Ed., 2017. Oxford University Press, UK

Websites and eLearning Sources:

- <https://nptel.ac.in/courses/104103071> <https://nptel.ac.in/courses/104105086>
- <http://www.digimat.in/nptel/courses/video/104105084/L01.html>
- <https://nptel.ac.in/courses/104101121>

COs and Bloom's Taxonomy Mapping – 26CH906

Course Outcomes	On completing U.G. program the students will be able to	BTL
CO1	Understand atomic structure, electronic configuration, quantum numbers, and principles governing electron distribution.	K1, K2
CO2	Explain chemical bonding, including ionic and covalent bonds, intermolecular forces, and predict molecular shapes using VSEPR theory.	K3
CO3	Analyze organic compounds through classification, nomenclature, hybridization, molecular geometry, and reaction intermediates.	K4
CO4	Evaluate gaseous behavior using ideal and real gas laws, Van der Waals equation, and critical phenomena.	K5
CO5	Apply volumetric analysis concepts including concentration calculations, preparation of standard solutions, indicators, and titration techniques.	K6

BTL K1 and K2 – remembering and understanding, K3- Applying, K4 – Analyse, K5- Evaluate and K6- Create

Relationship Matrix – 26CH906

Course Outcomes	Programme Outcomes (POs)						Programme Specific Outcomes (PSOs)						Mean Score of Cos
	PO1	PO2	PO3	PO4	PO5	PO6	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	
CO1	3	2	2	1	1	1	3	2	2	1	1	1	1.6
CO2	2	3	2	1	1	1	2	3	2	2	1	1	1.7
CO3	2	2	3	2	1	1	2	3	3	2	2	1	2
CO4	2	2	3	2	2	1	2	2	3	3	2	2	2.1
CO5	2	2	3	2	2	3	2	2	3	3	3	3	2.5
Total													1.98

Mean Score: 3- High, 2- Medium/Moderate, 1-Low

