Course Code	Course Name	Credits
26CH004	GENERAL CHEMISTRY-III	04

Course Objectives

- In this course, students gain knowledge of the chemistry of s- and p-block elements, noble gases, and coordination compounds, including their properties and structures.
- They develop understanding of crystal field theory and coordination chemistry concepts to explain bonding, magnetism, and colour of complexes.
- Students acquire skills to analyze carbonyl compounds and apply chemical kinetics principles to study reaction mechanisms and rates.

Learning Outcomes

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

- Understand the properties and compounds of s- and p-block elements, noble gases, and halogens.
- Apply concepts of coordination chemistry, including nomenclature, isomerism, and ligand behavior.
- Analyze crystal field theory, magnetic properties, and colour of coordination complexes.
- Evaluate the structure, synthesis, and reactions of carbonyl compounds.
- Apply principles of chemical kinetics to interpret reaction rates and mechanisms.

Unit 1 - s and p Block Elements (12 Hrs.)

Electronic configuration; atomic and ionic radii; ionization enthalpy; electron gain enthalpy; electronegativity; oxidation states; variation in acidic and basic properties of oxides and oxyacids; inert pair effect and catenation; preparation, important reactions, structure, and uses of boric acid, borates, boron nitride, diborane, and oxyacids of nitrogen, phosphorus, sulphur, and chlorine; basic properties of halogens, interhalogens, and pseudohalides; chemistry of noble gases—position in the periodic table; separation and isolation of helium, neon, and argon from liquid air; preparation, structure, and properties of XeF_2, XeF_4, XeO_3, and $XeOF_4$.

Unit 2 – Co-ordination Chemistry (12 Hrs.)

Definition of terms used; nomenclature of coordination complexes; classification of ligands; applications of EDTA; isomerism in coordination complexes—ionization, hydrate, linkage, ligand, coordination, and polymerization isomerism; geometrical and optical isomerism in four- and six-coordinate complexes; Crystal Field Theory (CFT)—postulates; d-orbital splitting in octahedral, tetrahedral, and square planar complexes; strong and weak field ligands; spectrochemical series; high-spin and low-spin complexes; CFT and magnetic properties of complexes; Crystal Field Stabilization Energy (CFSE) and its applications; calculation of CFSE for d^1 to d^{10} octahedral and tetrahedral complexes; CFT and colour of complexes; limitations of CFT; comparison between Valence Bond Theory (VBT) and Crystal Field Theory (CFT).

Unit 3 - Nomenclature and structure of the carbonyl group (12 Hrs.)

Synthesis of aldehydes, ketones, and carboxylic acids; physical and chemical properties of aldehydes, ketones, and carboxylic acids; chemical reactivity of the carbonyl group; general mechanisms of nucleophilic addition and addition–elimination reactions; Wolff–Kishner reduction; Clemmensen reduction; Cannizzaro reaction; Benzoin condensation; Aldol condensation; Perkin condensation.

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 - Chemical kinetics (12 Hrs.)

Reaction rate and units of rate; rate laws; order of reaction; molecularity of reactions; pseudo-order reactions; zero-, first-, second-, and third-order reactions; units of rate constants; half-life of reactions; determination of order of reaction; collision theory of reaction rates; effect of temperature on reaction rate; limitations of collision theory; transition state theory; activation energy and catalysis.

Reference Books:

1. Inorganic Chemistry, J.E. Huheey, E.A. Keiter and R.L. Keier, Harper and Row, 4th Edn., 1993.
2. Advanced Inorganic Chemistry, F.A. Cotton and G. Wilkinson, John Wiley & Sons, 5th Edn., 1988.
3. Organic Chemistry: Morrison and Boyd, Prentice Hall of India Pvt. Ltd. New Delhi
4. Organic Chemistry, Arun Bahl & B.S.Bahl, S.Chand & Co. New Delhi
5. Advanced Organic Chemistry: Jagdamba Singh & L.D.S.Yadav, Pragati Prakashan, Meerut
6. Physical chemistry, D.A. McQuarrie and J.D. simon-VIVA students Ed.(2003)
7. Chemical Kinetics, 3rd edition, J. Laidler,Harper & Row, 1987.

Websites and eLearning Sources:

1. https://onlinecourses.nptel.ac.in/noc19_cy19/preview
2. http://www.digimat.in/nptel/courses/video/104101128/L15.html

COs and Bloom's Taxonomy Mapping – 26CH004		
Course Outcomes	**On completing U.G. program the students will be able to**	**BTL**
CO1	Recall and explain the properties, electronic configurations, and important compounds of S- and p-block elements, noble gases, and halogens.	K1, K2
CO2	Explain coordination chemistry, including nomenclature, ligands, isomerism, and applications of complexes, and apply the concepts to real examples.	K3
CO3	Analyze Crystal Field Theory, orbital splitting, magnetic properties, and colour of coordination complexes; compare VBT and CFT.	K4
CO4	Evaluate the synthesis, structure, and reactivity of carbonyl compounds, including aldehydes, ketones, and carboxylic acids, and apply reaction mechanisms.	K5
CO5	Apply principles of chemical kinetics, including rate laws, collision theory, and transition state theory, to solve quantitative problems and analyze reaction behavior.	K6

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

Relationship Matrix – 26CH004													
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