ACADEMIC YEAR : 2021-22
SEMESTER   : I
TOTAL HOURS   : L - 45 hours +T-15 = 60Hrs

Course Code	21CYB101J	Course Name	Chemistry		Course Category	BS	Basic Sciences	L	T	P	C
								3	1	2	5

Module	Lecture	SLO	Topic	Detailed Lesson Plan
1	S-1	SLO-1	Coordination complexes	Introduction, Coordination numbers and geometries
		SLO-2	Coordination complexes	Coordination numbers and geometries with examples
	S-2	SLO-1	Crystal field theory-Introduction	Crystal field theory – Introduction, Salient features of crystal field theory
		SLO-2	Crystal field theory-Introduction	Octahedral complex- splitting of d –orbitals- CFSE
	S-3	SLO-1	Crystal field theory-Explanation	Spectrochemical series
		SLO-2	Crystal field theory-Explanation	high spin and low spin complex - CFSE
	S-4	SLO-1 SLO-2	Tutorial-Calculation of CFSE for few Octahedral complexes	
	S-7	SLO-1	Energy level diagrams for transition metal ions	Tetrahedral complex - splitting of d –orbitals- CFSE
		SLO-2	Energy level diagrams for transition metal ions	High spin complex - CFSE
	S-8	SLO-1	Optical properties of transition metal complexes	Introduction and importance
		SLO-2	Optical properties of transition metal complexes	Calculation of energy and wavelength of absorption
	S-9	SLO-1	Magnetic properties of transition metal complexes	Magnetism – introduction, calculation of magnetic moment for octahedral complex
		SLO-2	Magnetic properties of transition metal complexes	Magnetism – introduction, calculation of magnetic moment for tetrahedral complex
	S-10	SLO-1 SLO-2	Tutorial-Calculation of CFSE for few Tetrahedral and Octahedral complexes	
	S-13	SLO-1	Isomerism in transition metal compounds-Introduction	1. Stereoisomerism. a) Geometrical isomerism b) Optical isomerism with an example each
		SLO-2	Isomerism in transition metal compounds-Types	2. Structural Isomerism.a) Coordination isomerism, b) Ionization isomerism, c) Hydrate isomerism d) Linkage isomerism with an example each
	S-14	SLO-1	Effective nuclear charge, penetration of orbitals	Periodic table, Effective nuclear charge, penetration of orbitals (Slater's rule-formula

				only)
		SLO-2	variations of s, p, d and f orbital energies of atoms in the periodic table	Variations in the periods and groups
	S-15	SLO-1	Electronic configurations, atomic and ionic sizes	Electronic configurations, atomic and ionic sizes across the periods and groups
		SLO-2	ionization energies, electron affinity and electronegativity.	Definition and trends across the periods and groups
	S-16	SLO-1	Tutorial- Discussion on Modern periodic Table	
		SLO-2	Tutorial- Problems on calculation of Z_{eff}	
2	S-1	SLO-1	Hard soft acids and bases	HSAB – Types
		SLO-2	Hard soft acids and bases	Examples
	S-2	SLO-1	Thermodynamic functions: energy	Internal energy, Helmholtz free energy, Enthalpy, (Definition, expression & explanation)
		SLO-2	Entropy and free energy	Gibbs's free energy, Entropy (Definition, expression & explanation)
	S-3	SLO-1	Estimation of entropy	Estimation of entropy and free energy(Gibb's – Helmholtz equation of free energy and its application)
		SLO-2	Estimation of free energies.	(Gibb's – Helmholtz equation of free energy and its application)-Continuation of the above
	S-4	SLO-1	Tutorial- Discussions on Basic terms (System, Surroundings, Homogeneous, Heterogeneous, open, closed etc.,), Laws of Thermodynamics	
		SLO-2		
	S-7	SLO-1	Free energy and EMF Cell potentials	Electrochemical cells / galavanic cells, cell representation, cell potential, relationship between cell potential and free energy (no derivation)
		SLO-2	The Nernst equation and applications	Nernst equation – Derivation
	S-8	SLO-1	Nernst equation applications- Acid base, oxidation-reduction , Solubility equilibria	acid-base, redox and (Brief account and expression only)- continued below
		SLO-2	Nernst equation applications- Acid base, oxidation-reduction , Solubility equilibria	solubility product (Brief account and expression only)
	S-9	SLO-1	Corrosion	Definition, Types- Dry and Wet [Hydrogen evolution and Oxygen absorption types only],
		SLO-2	Corrosion	Mechanism for Dry and wet - continuation of the above
	S-10	SLO-1	Tutorial- Electrode potential expression for various electrodes	
		SLO-2		
	S-13	SLO-1	Corrosion – Free energy perspectives	Free energy of a corrosion reaction – thermodynamics discussion
		SLO-2	Corrosion – Free energy perspectives	Free energy of a corrosion reaction – thermodynamics discussion
	S-14	SLO-1	Pourbaix diagram	Pourbaix diagram – introduction
		SLO-2	Pourbaix diagram	Pourbaix diagram – salient features

	S-15	SLO-1	Pourbaix diagram for Iron	Introduction – phase diagram construction
		SLO-2	Pourbaix diagram for Iron	E vs pH – Explanation
	S-16	SLO-1	Tutorial- Discussions on Passivity, corrosion and Immunity taking simple examples.	
		SLO-2		
3	S-1	SLO-1	Representations of three dimensional structures	Fischer, Sawhorse and Newmann projections - any one example for each
		SLO-2	Structural isomers and stereoisomers	Structural isomers-Definition, types-chain, position, functional and metamerism with an example for each, Stereoisomers-enantiomers, diastereoisomers – definition with an example for each.
	S-2	SLO-1	Configurations and symmetry and chirality	Configurations-relative and absolute with examples, Symmetry- Elements of symmetry-plane, center of symmetry, alternating axis of symmetry and principal axis or rotational axes of symmetry Chirality- definition with examples
		SLO-2	Enantiomers, diastereomers	Enantiomers- and diastereomers- definition with an example for each.
	S-3	SLO-1	Optical activity, absolute configurations	Optical activity-Introduction with types (racemic, mesomers, dl isomers) Absolute configurations: Determination of absolute configuration-Cahn Ingold Prelog rules.
		SLO-2	Conformational analysis	Conformational analysis- conformations of n-butane
	S-4	SLO-1	Tutorial- Inter conversion of Sawhorse, Newman and Fischer projections with examples	
		SLO-2		
	S-7	SLO-1	Introduction to reactions involving substitution	Brief account on Nucleophilic and Electrophilic substitution reactions with an example for each, explanation on SN1 mechanism only taking an example.
		SLO-2	Addition reaction	Brief account on Nucleophilic and Electrophilic and Free radical reactions with an example for each, explanation on Free radical mechanism only taking an example.
	S-8	SLO-1	Elimination reaction	Brief account on types of elimination reactions- (E1 and E2 only) with an example for each, explanation on E2 mechanism only taking an example.
		SLO-2	Oxidation reaction	Explanation taking $KMnO_4$ and $K_2Cr_2O_7$ as oxidizing agents only.
	S-9	SLO-1	Reduction reaction	Explanation taking $LiAlH_4$ and $NaBH_4$ as reducing agents only.
		SLO-2	Examples	
	S-10	SLO-1	Tutorial- Differences between electrophile and Nucleophile	
		SLO-2	Tutorial- Identifying the type of mechanism taking few reactions(basic) as examples	
	S-13	SLO-1	Cyclization	Dieckmann Condensation
		SLO-2	Ring opening reactions	Addition of $Cl_2/Br_2/HI/H_2SO_4/H_2$ to cyclopropane
	S-14	SLO-1	Drug molecules	Drugs-Introduction
		SLO-2	Drug molecules Explanation	Examples
	S-15	SLO-1	Synthesis of a commonly	Synthesis of Paracetamol and its uses. (No

			used drug molecule	mechanism)
		SLO-2	Examples	Synthesis of Aspirin and its uses. (No mechanism)
	S-16	SLO-1	Tutorial- Discussion on other oxidizing and reducing agents taking some reactions as examples	
		SLO-2	Tutorial- Discussion on Markovnikov's rule , Anti- Markovnikov's rule, Peroxide effect	
4	S-1	SLO-1	Macromolecules	Introduction to concept of macromolecules
		SLO-2	Macromolecules	Salient features of macromolecules
	S-2	SLO-1	Tacticity	Introduction
		SLO-2	Tacticity	Types with examples
	S-3	SLO-1	Polymers – Types	Classification of Polymers
		SLO-2	Polymers – Discussion	Thermoplastics, Thermosets and Elastomers – properties
	S-4	SLO-1	Tutorial – Examples of Thermoplastics, Thermosets and Elastomers	
		SLO-2		
	S-7	SLO-1	Polymerisation	Types of Polymerization
		SLO-2	Polymerisation	Addition and condensation polymerization
	S-8	SLO-1	Addition polymers	Polypropylene, polystyrene, PVC, Teflon _ Synthesis
		SLO-2	Addition polymers	Properties and applications of Polypropylene, polystyrene
	S-9	SLO-1	Addition polymers	Properties and applications of PVC, Teflon
		SLO-2	Condensation polymers	Nylon, PET – Synthesis
	S-10	SLO-1	Tutorial – Other examples of addition and condensation polymers	
		SLO-2		
	S-13	SLO-1	Condensation polymers	Polyurethane, Synthetic rubber – Synthesis
		SLO-2	Condensation polymers	Properties and applications of Nylon, PET, Polyurethane, Synthetic rubber
	S-14	SLO-1	Conducting polymers	Conducting polymers-Introduction (theory)
		SLO-2	Conducting polymers	Conducting polymers-Types
	S-15	SLO-1	Examples of conducting polymers	n and p - doping – theory
		SLO-2	Examples of conducting polymers	polyacetylene and P3HT – synthesis and properties and applications
	S-16	SLO-1	Tutorial – Polymer molecular weight (number, weight average etc. – Calculations)	
		SLO-2		
5	S-1	SLO-1	Mechanical properties of solid	Introduction
		SLO-2	Mechanical properties of solid	stress-strain relationship, plot
	S-2	SLO-1	Mechanical properties of solid	Tensile strength, Hardness, Fatigue – description
		SLO-2	Mechanical properties of solid	Impact strength, Creep – description
	S-3	SLO-1	Composites	Composite materials – introduction
		SLO-2	Composites	Types of composites
	S-4	SLO-1	Tutorial – Calculation of Young's modulus – Various solid materials	
		SLO-2		
	S-7	SLO-1	Fibre Reinforced Composites	Polymer composites - introduction - Types of composites - particle reinforced - fiber

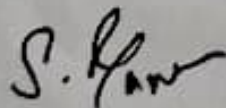|				reinforced - structural composites – examples
		SLO-2	Particle Reinforced Composites	Matrix materials-Reinforcement materials, Kevlar, polyamides
	S-8	SLO-1	Metal Matrix Composites	Synthesis methodology and applications.
		SLO-2	Metal Matrix Composites	Examples – Carbon fibres in Aluminium matrix
	S-9	SLO-1	Ceramic Matrix Composites	Synthesis methodology and applications
		SLO-2	Ceramic Matrix Composites	Example - Carbon/silicon carbide (C/SiC)
	S-10	SLO-1 SLO-2	Tutorials – Other examples of CMC and MMC	
	S-13	SLO-1	surface characterization techniques – XPS – Introduction	XPS-Principle
		SLO-2	surface characterization techniques – XPS – Explanation	Instrumentation-Block diagram and components, Application
	S-14	SLO-1	Diffraction and scattering of solids	X-Ray diffraction and crystal structure- Bragg's law
		SLO-2	Explanation	Miller indices, inter-plane spacing's in lattices- definition with an example for each (only)
	S-15	SLO-1 SLO-2	Tutorial- General applications of XRD and XPS Tutorial- Exercises on Miller indices	
	S-16	SLO-1 SLO-2	Question Bank Discussion	

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