University of Calcutta under Graduate Curriculum under Choice Based Credit System (CBCS)
Lesson Plan with Syllabus for Chemistry (G) Semester-III
Total Marks-100 (Credits: Theory-04, Practical-02)
(Theory: 50; Practical: 30; Internal Assessment: 10; Attendance: 10)
[Marks obtained in this course will be taken to calculate SGPA & CGPA]

Tentative may subject to change: Theory Class					
Months	**Week**	**Unit**	**Topic**	**No. of Lectures**	**Teacher**
September (2021)	3rd	1	***Chemical Bonding and Molecular Structure*** *Ionic Bonding:* • General characteristics of ionic bonding • Energy considerations in ionic bonding, • lattice energy and solvation energy and their importance in the context of stability and solubility of ionic compounds	1	PKD
		4	***Coordination Chemistry*** • Werner's coordination theory • Valence Bond Theory (VBT): Inner and outer orbital complexes of Cr, Fe, Co, Ni, and Cu (coordination numbers 4 and 6)	1	SM
		6	***Aromatic Hydrocarbons*** • *Benzene: Preparation*: from phenol, by decarboxylation, from acetylene	1	TKL
	4th	1	***Chemical Bonding and Molecular Structure*** • Statement of Born-Landé equation for calculation of lattice energy	1	PKD
		4	***Coordination Chemistry*** • Structural and stereoisomerism in complexes with coordination numbers 4 and 6	1	SM
		6	***Aromatic Hydrocarbons*** • *Reactions*: electrophilic substitution reaction (a general mechanism) • nitration (with mechanism)	1	TKL
	5th	1	***Chemical Bonding and Molecular Structure*** • Born-Haber cycle and its applications • polarizing power and polarizability	1	PKD
		4	***Coordination Chemistry*** • Drawbacks of VBT • IUPAC system of nomenclature	1	SM
		6	***Aromatic Hydrocarbons*** • *Reactions*: halogenations (chlorination and bromination)	1	TKL
October	1st	1	***Chemical Bonding and Molecular Structure*** • Fajan's rules • ionic character in covalent compounds • bond moment, dipole moment, and percentage ionic character	1	PKD
		5	***ELECTROCHEMISTRY*** **1) Ionic Equilibria:** • Strong, moderate, and weak electrolytes • degree of ionization, factors affecting the degree of ionization • ionization constant and ionic product of water	1	SM

		6	***Aromatic Hydrocarbons*** • *Reactions*: Friedel-Crafts reaction (alkylation and acylation) (up to 4 carbons on benzene)	1	TKL
	2nd	1	***Chemical Bonding and Molecular Structure*** *Covalent bonding:* • VB Approach: Shapes of some inorganic molecules and ions based on VSEPR	1	PKD
		5	***ELECTROCHEMISTRY*** **1) Ionic Equilibria:** • Ionization of weak acids and bases • pH scale • common ion effect	1	SM
		7	***Organometallic Compounds*** • Introduction • *Grignard reagents*: *Preparations* (from alkyl and aryl halide)	1	TKL
			11/10 – 30/10 Puja Vacation		

Months	**Week**	**Unit**	**Topic**	**No. of Lectures**	**Teacher**
November	1st	1	***Chemical Bonding and Molecular Structure*** *Covalent bonding:* • Hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal, and octahedral arrangements	1	PKD
		5	***ELECTROCHEMISTRY*** **1) Ionic Equilibria:** • Salt hydrolysis-calculation of hydrolysis constant • degree of hydrolysis and pH for different salts	1	SM
		7	***Organometallic Compounds*** • *Grignard reagents*: *Preparations* (from alkyl and aryl halide)	1	TKL
	2nd	1	***Chemical Bonding and Molecular Structure*** *Covalent bonding:* • Concept of resonance and resonating structures in various inorganic and organic compounds	1	PKD
		5	***ELECTROCHEMISTRY*** **1) Ionic Equilibria:** • Buffer solutions • Solubility and solubility product of sparingly soluble salts – applications of solubility product principle	1	SM
		7	***Organometallic Compounds*** • Reformatsky reaction	1	TKL
November	3rd	1	***Chemical Bonding and Molecular Structure*** *MO approach:* Rules for the LCAO method, bonding, and antibonding MOs and their characteristics for *s-s*, *s-p*, and *p-p* combinations of atomic orbitals, a nonbonding combination of orbitals	1	PKD
		5	***ELECTROCHEMISTRY*** **2) Conductance:**	1	SM

			• Conductance, cell constant, specific conductance, and molar conductance • Variation of specific and equivalent conductance with dilution for strong and weak electrolytes		
			McQ based Assessment for all 3-section on Unit-1, 4 and 7	1	TKL, SM, PKD
	4th	1	***Chemical Bonding and Molecular Structure*** *MO approach:* • MO treatment of homonuclear diatomic molecules of 1st and 2nd periods (including the idea of *s- p* mixing) and heteronuclear diatomic molecules such as CO, NO, and NO^+ • Comparison of VB and MO approaches	1	PKD
		5	***ELECTROCHEMISTRY*** **2) Conductance:** • Kohlrausch's law of independent migration of ions; Equivalent and molar conductance at infinite dilution, and their determination for strong and weak electrolytes • Ostwald's dilution law	1	SM
		8	***Aryl Halides*** • *Preparation:* (chloro- and bromobenzene): from phenol	1	TKL
November	5th		******* Library work assignment***		PKD, TKL, SM
December	1st	2	***Comparative study of p-block elements*** • Group trends in electronic configuration, modification of pure elements, common oxidation states, inert pair effect	1	PKD
		5	***ELECTROCHEMISTRY*** **2) Conductance:** • Application of conductance measurement (determination of solubility product and ionic product of water) • Conductometric titrations (acid-base) • Transport Number and principles Moving-boundary method	1	SM
		8	***Aryl Halides*** • *Preparation:* Sandmeyer reaction and effect of nitro substituent (activated nucleophilic substitution	1	TKL
	2nd	2	***Comparative study of p-block elements*** their important compounds in respect of the following groups of elements: i) B-Al-Ga-In-Tl ii) C-Si-Ge-Sn-Pb	1	PKD

		5	***ELECTROCHEMISTRY*** **3) Electromotive Force:** • Faraday's laws of electrolysis • rules of oxidation/reduction of ions based on half-cell potentials • applications of electrolysis in metallurgy and industry	1	SM
		8	***Aryl Halides*** • *Preparation:* Sandmeyer reaction and effect of nitro substituent (activated nucleophilic substitution	1	TKL
	3rd	2	***Comparative study of p-block elements*** their important compounds in respect of the following groups of elements: iii) N-P-As-Sb-Bi iv) O-S-Se-Te v) F-Cl-Br-I	1	PKD
		5	***ELECTROCHEMISTRY*** **3) Electromotive Force:** • Chemical cells, reversible and irreversible • cells with examples; Electromotive force of a cell and its measurement • Nernst equation	1	SM
		8	***Class for slow learners***	1	TKL
	4th		*****Guest Lecture***		
	5th		***Christmas Holiday***		
January	1st	3	***Transition Elements (3d series)*** • General group trends with special reference to the electronic configuration • variable valency, colour	1	PKD
		5	***ELECTROCHEMISTRY*** **3) Electromotive Force:** • Standard electrode (reduction) potential • Electrochemical series	1	SM
		8	• ***Class for slow learners***	1	TKL
	2nd	3	***Transition Elements (3d series)*** • magnetic and catalytic properties • ability to form complexes and stability of various oxidation states (Latimer diagrams) for Mn, Fe, and Cu	1	PKD
		5	***ELECTROCHEMISTRY*** **3) Electromotive Force:** • Concentration cells with and without transference • liquid junction potential • pH determination using hydrogen electrode and quinhydrone	1	SM

		8	***Class for advanced learners***	1	TKL
	3rd	3	***Transition Elements (3d series…)*** • Lanthanoids and actinoids: Electronic configurations, oxidation states,	1	PKD
		5	***ELECTROCHEMISTRY*** **3) Electromotive Force:** Qualitative discussion of potentiometric titrations (acid-base, redox, precipitation)	1	SM
		8	***Class for advanced learners***	1	TKL
	4th	3	***Transition Elements (3d series)*** • Lanthanoids and actinoids: Colour, magnetic properties, lanthanide contraction, separation of lanthanides (ion exchange method only)	1	PKD
		5	• ***Class for slow learners***	1	SM
		9	Question answers discussion	1	TKL
February (2022)	1st		• Homework is given to slow learners • Question answers discussion	1	PKD
			▪ Homework assignment ▪ Question answers discussion	1	SM
	2nd	**Internal Assessment**	**McQ based Internal Assessment for all sections**		PKD, SM, TKL

Tentative may subject to change: Practical Class

Months	Weeks	Topic	Teacher
September	3rd	Qualitative semi microanalysis of mixtures containing two radicals. Emphasis should be given to the understanding of the chemistry of different reactions ▪ Laboratory work discussion	SM
	4th to 5th	▪ Cation Radicals: Na^+, K^+, Ca^{2+}, Sr^{2+}, Ba^{2+}	
October	1st	▪ Cation Radicals: Al^{3+}, Cr^{3+}, Mn^{2+}/Mn^{4+}, Fe^{3+}, Co^{2+}/Co^{3+}	
	2nd	Cation Radicals: Ni^{2+}, Cu^{2+}, Zn^{2+}, Pb^{2+}, Sn^{2+}/Sn^{4+}, NH_4^+	

November	1st to 2nd	▪ Cation Radicals: All the cation radicals repeating the experiment	
	3rd	• Anion Radicals: F^-, Cl^-, Br^-, BrO_3^-	
	4th	▪ Anion Radicals: I^-, SCN^-, S^{2-}, IO_3^-, $SO4^{2-}$	
December	1st	▪ Anion Radicals: NO_3^-, NO_2^-, PO_4^{3-}, AsO_4^{3-}	
	2nd	• Anion Radicals: BO_3^{3-}, CrO_4^{2-}, $Cr_2O_7^{2-}$	
	3rd to 4th	• Anion Radicals: All the anion radicals repeating the experiment	
January	1st to 4th	Cation and anion radicals repeating experiments	