

DEPARTMENT OF CHEMISTRY

Honours	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Part 1 (Sem 1) Core T1, Core P1	July	10	8	Valence Bond Theory, Electronic displacements	Separation based upon solubility
	August	17	16	MO theory, Physical properties of molecules, Reaction Mechanism	Purification of the separated components
	September	11	10	Reactive intermediates, Stereochemistry- Bonding geometries of carbon compounds	Determination of melting point of the separated components
	October	6	10	Concept of chirality and symmetry	Determination of boiling point of common organic liquid compounds
	November	8	8	Relative and absolute configuration	Identification of a Pure Organic Compound- Solid
	December	8	8	Optical activity of chiral compounds	Identification of a Pure Organic Compound-Liquid
Part 1 (Sem 1) Core T2, Core P2	July	11	8	Kinetic Theory of gases, Maxwell distribution of speed and energy	Determination of pH of unknown solution (buffer), by color matching method
	August	16	18	Real gas and virial equation, Zeroth and 1st law of Thermodynamics	Determination of heat of neutralization of a strong acid by a strong base
	September	10	8	Thermochemistry, Second Law of Thermodynamics	Study of kinetics of acid-catalyzed hydrolysis of methyl acetate
	October	7	8	Thermodynamic relations, Rate law, order and molecularity	Study of kinetics of decomposition of H ₂ O ₂
	November	9	10	Role of temperature and theories of reaction rate	Determination of heat of solution of oxalic acid from solubility measurement
	December	7	8	Homogeneous catalysis	Revision
Part 1 (Sem 2) Core T3, Core P3	January	11	10	Extra nuclear Structure of atom	Estimation of carbonate and hydroxide present together in Mixture, Estimation of carbonate and bicarbonate present together in a mixture.
	February	14	14	Quantum numbers	Estimation of free alkali present in

				and their significance, Ground state Term symbols of atoms and ions for atomic number upto 30	different soaps/detergents, Estimation of Fe(II) using standardized KMnO ₄ solution
	March	13	12	Chemical periodicity	Estimation of oxalic acid and sodium oxalate in a given mixture
	April	10	10	Acid-Base reactions	Estimation of Fe(II) and Fe(III) in a given mixture using K ₂ Cr ₂ O ₇ solution, Estimation of Fe(III) and Cu(II) in a mixture using K ₂ Cr ₂ O ₇ .
	May	7	8	Redox Reactions	Estimation of Fe(III) and Mn(II) in a mixture using standardized KMnO ₄ solution
	June	5	6	Precipitation reactions	Estimation of Fe(III) and Cr(III) in a mixture using K ₂ Cr ₂ O ₇
Core T4, Core P4	January	10	12	Chirality arising out of stereoaxis, Concept of prostereoisomerism	Organic Preparations noting the yield of the crude product, purification and determination of melting point- Nitration of aromatic compounds, Condensation reactions
	February	15	12	Conformational nomenclature, Reaction thermodynamics, Concept of organic acids and bases	Hydrolysis of amides/imides/esters. Acetylation of phenols/aromatic amines
	March	9	10	Tautomerism, Reaction kinetics	Benzoylation of phenols/aromatic amines, Side chain oxidation of aromatic compounds
	April	11	10	Free-radical substitution reaction	Diazo coupling reactions of aromatic amines, Bromination of anilides using green approach, Redox reaction including solid-phase method
	May	8	10	Nucleophilic substitution reactions	Green 'multi-component-coupling' reaction
	June	7	6	Elimination reactions	Selective reduction of m-dinitrobenzene to m-nitroaniline

General	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester 1 DSC 2A, DSC 2A Lab	July	10	8	Atomic Structure: Review of: Bohr's theory and its limitations, dual behaviour of matter and radiation, de Broglie's relation, Physical Effects, Electronic Displacements in organic molecule	Estimation of sodium carbonate and sodium hydrogen carbonate present in a mixture, Detection of extra elements (N, S, Cl, Br, I) in organic compounds
	August	17	16	Heisenberg Uncertainty principle. Hydrogen atom spectra, Rules for filling electrons in various orbitals, Structure, shape and reactivity of organic molecules	Estimation of oxalic acid by titrating it with KMnO_4 , Detection of extra elements (N, S, Cl, Br, I) in organic compounds
	September	11	10	Ionic Bonding and Covalent bonding, Strength of organic acids and bases	Estimation of water of crystallization in Mohr salt by titrating with KMnO_4 , Separation of mixtures of amino acids by Chromatography
	October	6	10	Concept of resonance and resonating structures in various inorganic and organic compounds, Stereochemistry	Estimation of Fe (II) ions by titrating it with $\text{K}_2\text{Cr}_2\text{O}_7$ using internal indicator, Separation of mixtures of amino acids by Chromatography
	November	8	8	Alkanes, Alkenes, Alkynes	Estimation of Cu (II) ions iodometrically using $\text{Na}_2\text{S}_2\text{O}_3$, Separation of mixtures of sugar by Chromatography
	December	8	8	Alkanes, Alkenes, Alkynes	Separation of mixtures of sugar by Chromatography
	Semester 2 DSC 2B, DSC 2B Lab	January	11	12	Kinetic Theory of Gases and Real gases
February		14	12	Surface tension, viscosity	Viscosity measurement
March		13	10	Forms of solids, crystal systems, unit cells	Acid hydrolysis of methyl acetate with hydrochloric acid, Compare the strengths of HCl and H_2SO_4
April		10	10	Chemical Kinetics, Chemical Bonding and Molecular Structure	Qualitative semimicro analysis of mixtures containing three radicals
May		7	10	Comparative study of p-block elements	Qualitative analysis
June		5	6	Comparative study of p-block elements	Qualitative analysis

Honours	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Part II (Sem III) Core T5, Core P5	July	10	8	Fick's law, Viscosity	Study of viscosity of unknown liquid
	August	17	16	Conductance and transport number, Partial properties and Chemical potential, Chemical Equilibrium	Determination of partition coefficient
	September	11	10	Chemical potential and other properties of ideal substances	Determination of K_{eq}
	October	6	10	Beginning of Quantum Mechanics	Conductometric titration of an acid against strong base
	November	8	8	Wave function, Concept of Operators	Study of saponification reaction conductometrically
	December	8	8	Particle in a box, Simple Harmonic Oscillator	Verification of Ostwal's dilution law
Part II (Sem III) Core T6, Core P6	July	11	8	Ionic bond: General characteristics	Estimation of Cu(II)
	August	16	18	Covalent bond, Fazan's rules	Estimation of Vitamin C, Estimation of (i) arsenite and (ii) antimony iodometrically
	September	10	8	Molecular orbital concept of bonding	Estimation of available chlorine in bleaching powder
	October	7	8	Metallic Bond, Semiconductors and insulators, defects in solids	Determination of heat of solution of oxalic acid from solubility measurement
	November	9	10	Weak Chemical Forces, Effects of chemical force, melting and boiling points	Estimation of Cu in brass, Estimation of Cr and Mn in Steel
	December	7	8	Radioactivity	Estimation of Fe in cement
Part II (Sem III) Core T7, Core P7	July	13	9	Chemistry of alkenes and alkynes: Addition to C=C, Addition to C≡C	Detection of special elements (N, S, Cl, Br) by Lassaigne's test
	August	14	16	Aromatic Substitution: Electrophilic aromatic substitution, Nucleophilic aromatic substitution	Solubility and classification
	September	8	11	Carbonyl and Related Compounds: Exploitation of acidity of α -H of C=O	Detection of the functional groups

	October	7	6	Elementary ideas of Green Chemistry	Melting point of the given compound
	November	11	9	Nucleophilic addition to α,β -unsaturated carbonyl system, Substitution at sp^2 carbon	Preparation, purification and melting point determination
	December	7	9	Organometallics	Identification of the compound through literature survey
Part II (Sem IV) Core T8, Core P8	January	11	10	Colligative properties, Phase rule	Determination of solubility of sparingly soluble salt
	February	14	14	Binary solutions, Ionic equilibria	Potentiometric titration of Mohr's salt
	March	13	12	Electromotive Force, Dipole moment and polarizability	Determination of K_{sp} for AgCl
	April	10	10	Qualitative treatment of hydrogen atom and hydrogen-like ions	Effect of ionic strength on the rate of Persulphate – Iodide reaction
	May	7	8	LCAO and HF-SCF	Study of phenol-water phase diagram
	June	5	6	Angular momentum	pH-metric titration of acid
Core T9, Core P9	January	10	12	General Principles of Metallurgy	Complexometric titration
	February	15	12	Chemistry of <i>s</i> and <i>p</i> Block Elements	Complexometric titration: Zn(II) in a Zn(II) and Cu(II) mixture
	March	9	10	Noble Gases	Complexometric titration: Ca(II) and Mg(II) in a mixture
	April	11	10	Inorganic Polymers	Complexometric titration: Hardness of water
	May	8	10	Coordination Chemistry	Inorganic preparations
	June	7	6	Coordination Chemistry	Inorganic preparations
Core T10, Core P10	January	12	11	Nitrogen compounds	Estimation of glycine, glucose, sucrose
	February	13	13	Rearrangements	Estimation of vitamin-C
	March	15	14	UV Spectroscopy	Estimation of aromatic amine and phenol
	April	9	9	IR Spectroscopy	Estimation of formaldehyde and acetic acid
	May	6	7	NMR Spectroscopy	Estimation of urea
	June	5	6	The Logic of Organic Synthesis	Estimation of saponification value

General	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester III	July	10	8	Chemical Energetics: Intensive and extensive variables, Standard states, Statement of the second law of thermodynamics	Determination of heat capacity of calorimeter for different volumes
	August	17	16	Chemical Equilibrium, Ionic Equilibria	Determination of enthalpy of ionization of acetic acid, Determination of enthalpy of neutralization, Identification of a pure solid organic compound
	September	11	10	Aromatic Hydrocarbons, Organometallic Compounds	Determination of enthalpy of hydration of copper sulphate, Identification of a pure liquid organic compound
	October	6	10	Aryl Halides	Study of the solubility of benzoic acid in water
	November	8	8	Alcohols, Phenols and Ethers	Measurement of pH of different solutions
	December	8	8	Carbonyl Compounds	Preparation of buffer solutions
Semester IV	January	11	12	Solutions	Distribution Law
	February	14	12	Phase Equilibria, Conductance	Phase equilibria
	March	13	10	Gravimetric analysis, Environmental Chemistry	Determination of dissociation constant of a weak acid
	April	10	10	Volumetric analysis	Conductometric titrations
	May	7	10	Chromatography	Potentiometric titrations
	June	5	6	Electromotive force	Potentiometric titrations

SKILL ENHANCEMENT COURSE (3rd AND 4TH SEM)

	Month	No of lectures		Topic	
		Theory	Practical	Theory	Practical
Semester 3	July	5	5	Introduction to Analytical Chemistry and its interdisciplinary nature	Estimation of Calcium and Magnesium ions as Calcium carbonate by complexometric titration, Determination of pH, acidity and alkalinity of a water sample.
	August	6	6	Analysis of soil, Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents	Identification of adulterants in some common food items like coffee powder, chilli powder, turmeric powder
	September	4	4	Analysis of food products, Nutritional value of foods	Paper chromatographic separation of mixture of metal ion (Fe^{3+} and Al^{3+} , Analysis of deodorants and antiperspirants
	October	4	4	Idea about food processing and food preservations, adulteration	Determination of ion exchange capacity of anion / cation exchange resin
	November	6	6	General introduction on principles of chromatography, paper chromatography, TLC	Spectrophotometric determination of Iron in Vitamin / Dietary Tablets, Spectrophotometric Identification and Determination of Caffeine and Benzoic Acid in Soft Drinks
	December	5	5	Ion-exchange chromatography	Estimation of macro nutrients: Potassium, Calcium, Magnesium in soil samples by flame photometry
Semester 4	January	5	5	<i>Carbohydrates</i> : Biological importance of carbohydrates, Metabolism, Cellular currency of energy (ATP), Glycolysis, Alcoholic and Lactic acid fermentations, Krebs cycle.	Identification and estimation of Carbohydrates – qualitative and quantitative

				Isolation and characterization of polysaccharides.	
February	6	6	<i>Proteins</i> : Classification, biological importance; Primary and secondary and tertiary structures of proteins: α -helix and β -pleated sheets, Isolation, characterization, denaturation of proteins.	Identification and estimation of Lipids – qualitative	
March	4	4	Structure of DNA (Watson-Crick model) and RNA, Genetic Code, Biological roles of DNA and RNA: Replication, Transcription and Translation, Introduction to Gene therapy.	Identification and estimation of cholesterol using Liebermann-Burchard reaction	
April	4	4	<i>Enzymes</i> : Nomenclature, classification, effect of pH, temperature on enzyme activity, enzyme inhibition	Identification and estimation of Proteins – qualitative	
May	6	6	Biochemistry of disease, Composition and functions of blood, blood coagulation. Blood collection and preservation of samples. Anaemia, Regulation	Identification and estimation of protein by the Biuret reaction	
June	5	5	Collection and preservation of samples of urine, Formation of urine. Composition and estimation of constituents of normal and pathological urine.	Determination of the iodine number of oil	

Part-III (HONOURS)

Paper	No. of Lectures	July - September	October - December	January - March	University examinations
Paper-V	204	CEMAT 35-IA: Unit-I: Chemistry of Coordination Compounds=23L CEMAT 35-AA: Unit-I: BioInorganic Chemistry=23L Total=46L	CEMAT 35-IA: Unit-I=12L Unit-II: Chemistry of d and f block elements=23L CEMAT 35-AA: Unit-I=12L Unit-II: Material Chemistry=23L Total=70L	CEMAT 35-IB:Unit-I=19L Organometallic Unit-II=22L Gravimetric analysis CEMAT 35-AB: Unit-I: Bio Inorganic Chemistry=26L Unit-II: BioPhysical Chemistry=21L Total=88L	
Paper-VI	204	CEMAT 36-OA: Unit-I: Pericyclic Reactions=19L CEMAT 36-PA: Unit-I: Statistical Thermodynamics=19L CEMAT 36-PB: Properties of Solid interface and dielectrics =27L Total=65L	CEMAT 36-OA: Unit-I: Polynuclear Hydrocarbon=12L Unit-II: Heteronuclear Compounds =22L CEMAT 36-PA: Unit-I=12L Statistical thermodynamics Unit-II: Molecular Spectroscopy=22L Total=68L	CEMAT 36-OB: Unit-I: Cyclohexane and Carbohydrates=27L Unit-II: Amino acids, Natural Products and alkaloids=22L Unit-I: Unit-II: Phase equilibria and colligative Properties=22L Total=71L	
Paper-VII practical	72 Periods	CEMAP 37-PrA =12 Periods CEMAP 37-PrB =12 periods Total=24 Periods	CEMAP 37-PrA =12 Periods CEMAP 37-PrB =12 periods Total =24 Periods	CEMAP 37-PrA =12 Periods CEMAP 37-PrB =12 periods Total=24 Periods	
Paper-VIII practical	108 Periods	CEMAP 38-PrA =18 Periods CEMAP 38-PrB =16 periods Total=34 Periods	CEMAP 38-PrA =20 Periods CEMAP 38-PrB =18 periods Total=38 Periods	CEMAP 38-PrA =16 Periods CEMAP 38-PrB =20 periods Total =36 Periods	

Part-III (GENERAL)

Paper	No. of Lectures	July - September	October - December		1st April – 15 th May
			January - March		
Paper-IV (CEMGT 34 A, 34 B, 34 C) (Theory)	144	CEMGT 34 A: Unit-I Chemical analysis =24L Unit-II: Volumetric Analysis=24L Total=48L	CEMGT 34 B Unit-I : Industrial Chemistry I=24L CEMGT34B Unit- II: Industrial Chemistry II=24 L Total=48L	CEMGT 34 C Unit-I: Environmental Chemistry=18L Unit-II: Industrial Chemistry III=18L Total=36L	CEMGT 34 C Unit I=6L Unit II=6L Total=12L
CEMGP 34D(Practical)	44	CEMGP 34 D =12 Periods Total=12 Periods	CEMGP 34 D =18 Periods Total=18 Periods	CEMGP 34D=14 Periods Total=14 Periods	