Government PG College, Ambala Cantt.

Subject: **CHEMISTRY**

Lesson Plan Session **2022-23 (Odd Semester)**

Class: **B.Sc. 1st Semester**

Month	Details		Remarks
Sept 2022	**IC**	**Atomic Structure** Idea of de Broglie matter waves, Heinsenberg's uncertainty principle, atomic orbitals, quantum numbers, radial and angular wave functions, normal and orthogonal wave functions, significance of Ψ and Ψ^2, probability distribution curves, shapes of s, p, d, f orbitals, Aufbau and Pauli exclusion principles, Hund's multiplicity rules, Electronic configuration of elements, effective nuclear charge, Slater's rules.	Studies are followed by Orientation and Recapitulations of previous studies
	PC	**Gaseous States** Kinetic Molecular Theory of Gases , Maxwell's distribution of velocitie s and energies (de rivation excluded) Calculation of root mean squa re velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path (Derivations excluded), Deviation of Real gases from ideal behavior, Derivation of Van der Waal's Equation of State, its application in the calculation of Boyle's temperature (compression factor)	
	OC	**Structure and Bonding** Localized and delocalized chemical bond, Vander Waal's interactions, resonance conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison.	
Oct 2022	**IC**	**Periodic Table and Atomic Properties** Classification of periodic table into s, p, d, f blocks, atomic and ionic radii, ionisation energy, electron affinity and electronegativity definition, methods of determination or evaluation, trend in periodic table (in s and p-block elements), Pauling , Mulliken, Allred Rachow and Mulliken Jaffe's electronegativity scale, Sanderson's electron density ratio.	Assessment Test
	PC	**Critical Phenomenon** Critical tempera ture, critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Van der Waal's equation, relationship between critical constants and Van der Waal's cons tants. Critical compressibility factor. The Law of corresponding states.	
	OC	**Stereochemistry of Organic Compounds** Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogenic centre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogenic centres, diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiome rs, invers ion, retention and racemization. Relative and absolute configuration, sequence rules, R & S systems of nomenclature. Geometric isomerism, determination of configuration of geometric isomers. E & Z system of nomenclature, Conformational isomerism, conformational analysis of ethane and n-butane, conformations of cyclohexane, axial and equatorial bonds. Newman projection and Sawhorse formulae, Difference between configuration and conformation.	
Nov	**IC**	**Covalent Bond**	Assignments

2022		Valence bond theory (Heitler-London and Pauling approach) and its limitation, directional characteristics of covalent bond, various type of hybridisation and shapes of simple inorganic molecules and ions (BeF_2, BF_3, CH_4, PF_5, SF_6, IF_7, SO_4^{-2}, ClO_4^{-1}, NO_3^{-1}) valence shell electron pair repulsion (VSEPR) theory to NH_3, H_3O^+, SF_4, ClF_3, H_2O, $SnCl_2$, ClO_3^{-1} and ICl_2^{-1}.	
	PC	**Liquid States** Structur e of liquids, Properties of liquids – surface tension, refractive index, vi scosity, vapour pre ssure and optical rotation.	
	OC	**Mechanism of Organic Reactions** Curved arrow notation, drawing electron movements with arrows, half-headed and double-headed arrows, homolytic and heterolytic bond breaking. Types of reagents – electrophiles and nucleophiles. Types of organic reactions. Reactive intermediates, carbocations, carbanions, free radicals, carbenes,(formation, structure & stability).	
Nov 2022	**IC**	**Covalent Bond** Molecular orbital theory of homonuclear (N_2, O_2) heteronuclear (CO and NO) diatomic molecules and ions, bond energy, bond angle, bond length and dipole moments, percentage ionic character from dipole moment and electronegativity difference.	Assignments
	PC	**Solid State** Classification of solids, Law of constancy of interfacial angles, law of rational indices, Miller indices, elementary ideas of symmetry and symmetry elements, seven crystal systems and fourteen Bravais lattices;	
	OC	**Alkanes and Cycloalkanes** IUPAC nomenclature of branched and unbranched alkanes, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation: Wur tz reaction, Kolbe reaction, Corey-House reaction and de carboxylation of carboxylic acids, physical properties.	
Dec 2022	**IC**	**Ionic Solids** Ionic structures (NaCl, CsCl, ZnS (Zinc blende), CaF_2) size effects, radius ratio rule and its limitations, Madelung constant, Stoichiometric and Non stoichiometric defects in crystals, Lattice energy (mathematical derivation excluded) and Born-Haber cycle, Solvation energy and its relation with solubility of Ionic solids, Polarizing power and Polarisability of ions, Fajan's rule.	Assessment Test
	PC	**Solid State** X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method.	
	OC	**Alkanes and Cycloalkanes** Mechanism of free radical halogenation of alkanes: reactivity and selectivity. Cycloalkanes, nomenclature, synthesis of cycloalkanes and their derivatives–photochemical (2+2) cycloaddition reactions, dehalogenation of dihalides, pyrolysis of calcium or barium salts of dicarboxylic acids, Baeyer's strain theory and its limitations., theory of strainless rings.	
Dec 2022 Jan 2023	**Semester-End Final Examinations**		

Government PG College, Ambala Cantt.

Subject: **CHEMISTRY**

Lesson Plan Session **2022-23 (Even Semester)**

Class: **B.Sc. 2nd Semester**

Month	Details		Remarks
Feb 2023	IC	**Hydrogen Bonding and Van der Waals forces** Hydrogen Bonding – Definition, types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Van der Waals forces. **Metallic Bond and semiconductors** Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators). Semiconductors – Introduction, types and applications.	Studies are followed by Recapitulations of previous studies
	PC	**Kinetics** Rate of reaction, rate equation and its types, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated r ate expression for zero order, first order, second and third order reactions.	
	OC	**Alkenes** Nomenc lature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halide. The Saytzeff rule, Hofmann elimination, physical proper ties and relative stabilities of alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff's rule, hydroboration–oxidation, oxymercurationreduction, ozonolysis, hydration, hydroxylation and oxidat ion with $KMnO_4$.	
Mar 2023	IC	**s-Block elements** Comparative study of the elements including diagonal relationship, Anomalous behaviour of Lithium and Beryllium compared to other elements in the same group, salient features of hydrides, oxides, halides, hydroxides (methods of preparation excluded), behaviour of solution in liquid NH_3. **Chemistry of Noble Gases** General physical properties, low chemical reactivity, chemistry of xenon, structure and bonding in fluorides, oxides and oxyfluorides of xenon.	Assessment Test
	PC	**Kinetics** Half life period of a reaction. Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular collision. Transition state theory of bimolecular reactions.	
	OC	**Arenes and Aromaticity** Nomenclature of benzene derivatives: Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aroma tic ions, annulenes up to 10 carbon atoms, aromatic, anti-aromatic and non-aromatic compounds. Aromatic electrophilic substitution, general pattern of the mechanism, mechans im of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating, deactivating substituents and orientation.	
Apr 2023	IC	**p-Block elements:** Electronic configuration, atomic and ionic size, metallic character, melting point, ionization energy, electron affinity, electronegativity, inert pair effect and diagonal relationship. **Boron family (13th group):** Diborane: Preparation, properties and structure (as an example of	Assignments

		electron deficient compound and multicenter bonding), Borazine chemical properties and structure, relative strength of Trihalide of Boron as lewis acids, structure of aluminium(III) chloride.	
	PC	**Electrochemistry** Electrolytic conduction, factors aff e cting ele ctrolytic conduct ion, specific conductance, molar conductance, equivalent conductance and relation among them, their variation with concentration. Arrhenius theory of ionization, Ostwald's Dilution Law. Debye-Huckel – Onsager's equation for strong electrolytes (elementary treatment only),	
	OC	**Dienes and Alkynes** Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structur e of butadiene. Chemical reactions, 1,2 and 1,4 additions (Electrophilic & free radical mechanism), Diels-Alder reaction, Nomenclature, structure and bonding in alkynes. Methods of formation. Chemical reactions of alkynes, acidity of alkynes. Mechanism of e lectrophilic and nucleophilic addition reactions, hydroboration-oxidation of alkynes.	
Apr 2023 May 2023	**IC**	**Carbon family and Nitrogen family (14th and 15th group):** Catenation, Carbides, fluoro carbons, silicates (structural aspects). Oxides: Structure of oxides of nitrogen and phosphorus, Oxyacids : Structure and relative acid strength of oxy acids of nitrogen and phosphorus, structure of white and Red phosphorus. **Oxygen family (16th group):** Oxy acids of sulphur – structure and acidic strength, Hydrogen Peroxide – properties and uses.	Assignments
	PC	**Electrochemistry** Application of Kohlrausch's Law in calculation of conductance of weak electrolytes at infinite dilution. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Concepts of pH and pKa	
	OC	**Alkyl and Aryl Halides** Nomenc lature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides, SN_2 and SN_1 reactions with energy profile diagrams. Methods of formation and reactions of aryl halides,	
May 2023	**IC**	**Halogen family (17th group):** Interhalogen compounds (their properties and structures), Hydra and oxy acids of chlorine – structure and comparison of acid strength, cationic nature of Iodine.	Assessment Test
	PC	**Electrochemistry** Buffer solution, Buffer action, Henderson – Hazel equation, Buffer mechanism of buffer action.	
	OC	**Alkyl and Aryl Halides** The addition-elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivitie s of alkyl halides *vs* allyl, vinyl and aryl halides.	
May 2023 Jun 2023	**Semester-End Final Examinations**		

Government PG College, Ambala Cantt.

Subject: **CHEMISTRY**

Lesson Plan Session **2022-23 (Odd Semester)**

Class: **B.Sc. 3rd Semester**

Month	Details		Remarks
Sept 2022	**IC**	**Chemistry of d-Block elements** Definition of transition elements, position in the periodic table, General characteristic properties of d-Block elements, Comparison of properties of 3d elements with 4d and 5d elements with reference only to ionic radii, oxidation state, magnetic and spectral properties and stereo chemistry.	Studies are followed by Recapitulations of previous studies
	PC	**Thermodynamics** Definition of thermodynamic terms : system, surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Thermodynamic equilibrium, Concept of heat and work.	
	OC	**Alcohols** Monohydric alcohols, nomenclature, methods of formation by reduction of aldehydes, ketones, carboxylic acids and esters. Hydrogen bonding. Acidic nature. Reactions of alcohols. Dihydric alcohols — nomencla tur e, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [$Pb(OAc)_4$ and HIO_4] and pinacol-pinacolone rearrangement.	
Oct 2022	**IC**	**Chemistry of d-Block elements** Stability of various oxidation states and e.m.f (Latimer and Frost diagrams), Structure and properties of some compounds of transition elements- TiO_2, $VOCl_2$, $FeCl_3$, $CuCl_2$ and $Ni(CO)_4$.	Assessment Test
	PC	**Thermodynamics** First law of thermodynamics: statement, concepts of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pres sure and their relationship. Joule–Thomson coefficient for ideal gas and real ga s and inversion temperature. Calculation of w,q, dU & dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process.	
	OC	**Phenols** Nomenclature, structure and bonding. Preparation of phenols, physical properties and acidic character. Comparative acidic strengths of alcohols and phenols, resonance stabilization of phenoxide ion. Reactions of phenols — electrophilic aromatic substitution, Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.	
Nov 2022	**IC**	**Coordination Compounds** Werner's theory of coordination compounds, effective atomic number, chelates, nomenclature of coordination compounds, Isomerism in coordination compounds, valence bond theory of transition metal complexes.	Assignments
	PC	**Chemical Equilibrium** Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant. Clausius–Clapeyron equation and its applications.	
	OC	**Ultraviolet (UV) absorption spectroscopy** Absorption laws (Beer-Lambert law), molar absorptivity, presentation and analysis of UV spectra, types of electronic transitions, effect of	

		conjugation. Concept of chromophore and auxochrome. Bathochromic, hypsochromic, hyperchromic and hypochromic shifts. UV spectra of conjugated enes and enones,Woodward- Fieser rules, calculation of lambda max of simple conjugated dienes and ·,· -unsaturated ketones. Applicat ions of UV Spectroscopy in s tructure elucidation of simple organic compounds.	
Dec 2022	**IC**	**Non-aqueous solvents** Physical properties of solvents, types of solvents and their general characteristics, reactions in non aqueous solvents with reference to liquid NH_3 and liquid SO_2	Assignments
	PC	**Distribution Law** Nernst distribution law – its thermodynamic derivation, Applications of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride (ii) Determination of equilibrium constant of potassium tri–iodide complex and (iii) Process of extraction. More stress on numerical problems.	
	OC	**Carboxylic Acids & Acid Derivative s** Nomenclature of Carboxylic acids, structure and bonding, physical properties, acidity of carboxylic acids, effects of substituents on acid strength. Preparation of carboxylic acids. Reactions of carboxylic acids. Hell-Volhard-Zelinsky reaction. Reduction of carboxylic acids. Mechanism of decarboxylation. Relative stability of a cylderivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic).	
Dec 2022	**IC**	Revision/ Recapitulations of Studies	Assessment Test
	PC	Revision/ Recapitulations of Studies	
	OC	**Epoxides** Synthesis of epoxides. Acid and ba se-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides.	
Dec 2022 Jan 2023	**Semester-End Final Examinations**		

Government PG College, Ambala Cantt. **Subject: CHEMISTRY**

Lesson Plan Session **2022-23 (Even Semester)** **Class: B.Sc. 4th Semester**

Month	Details		Remarks
Feb 2023	**IC**	**Chemistry of f-Block elements** Lanthanides: Electronic structure, oxidation states, magnetic properties, complex formation, colour, ionic radii and lanthanide contraction, occurrence, separation of lanthanides, Lanthanide compounds.	Studies are followed by Recapitulations of previous studies
	PC	**Thermodynamics** Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycle s and its efficiency, Carnot's theorm, Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V & T, entropy as a funct ion of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium.	
	OC	**Infrared (IR) absorption spectroscopy** Molecular vibrations, Hooke 's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds.	
Mar 2023	**IC**	**Chemistry of f-Block elements** Actinides: General characteristics of actinides, chemistry of separation of Np, Pu and Am from uranium, Transuranic elements, comparison of properties of Lanthanides and actinides with transition elements.	Assessment Test
	PC	**Thermodynamics** Third law of thermodynamic s: Nerns t heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, G as criteria for thermodynamic equilibrium and spontaneity, its advantage over entropy change. Variation of G with P, V and T.	
	OC	**Amines** Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabriel - phthalimide reaction, Hofmann bromamide reaction. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.	
Apr 2023	**IC**	**Theory of Qualitative and Quantitative Analysis** Chemistry of analysis of various groups of basic and acidic radicals, chemistry of identification of acid radicals in typical combination,	Assignments
	PC	**Electrochemistry** Electrolytic and Galvanic cells – reversible & irreversible cells, conventional representation of electrochemical cells. Calculation of thermodynamic quantities of cell reaction (▲G, ▲H & K).	
	OC	**Diazonium Salts** Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO_2 and CN groups, reduction of diazonium salts to hyrazines, couplingreaction and its synthetic application.	

April 2023 May 2023	**IC**	**Theory of Qualitative and Quantitative Analysis** chemistry of interference of acid radicals including their removal in the analysis of basic radicals, common ion effect, solubility product,	Assignments
	PC	**Electrochemistry** Types of reversible electrodes – metal- metal ion, gas electrode, metal – insoluble salt- anion and redox electrodes. Electrode reactions, Nernst equations, derivation of cell EMF and single electrode potential. Standard Hydrogen electrode, reference electrodes, standard electrode potential, sign conventions, Concentration cells with and without transference, liquid junction potential and its measurement.	
	OC	**Aldehydes and Ketones** Nomenclature and structure of the carbonyl group. Synthesis of aldehydes and ketones with particular reference to the synthesis of aldehydes from acid chlorides, advantage of oxidation of alcohols with chromium trioxide (Sarett reagent) pyridinium chlorochromate (PCC) and pyridinium dichromate. Physical properties, Comparison of reactivities of aldehydes and ketones. Mechanism of nucleophilic additions to carbonyl group with particular emphasis on benzoin, aldol, Perkin and Knoevenagel condensations. Condensation with ammonia and its derivatives. Wittig reaction.	
May 2023	**IC**	**Theory of Qualitative and Quantitative Analysis** theory of precipitation, co-precipitation, post precipitation, purification of precipitates.	Assessment Test
	PC	**Electrochemistry** Applications of EMF measurement in solubility product and potentiometric titrations using glass electrode. More stress on numerical problems.	
	OC	**Aldehydes and Ketones** Mannich reaction.Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, $LiAlH_4$ and $NaBH_4$ reductions.	
May 2023 Jun 2023	**Semester-End Final Examinations**		

Government PG College, Ambala Cantt.

Subject: **CHEMISTRY**

Lesson Plan Session **2022-23 (Odd Semester)**

Class: **B.Sc. 5th Semester**

Month	Details		Remarks
Sept 2022	**IC**	**Metal- Ligand Bonding in Transition Metal complexes** Limitations of valence bond theory, an elementary idea of crystal field theory, crystal field splitting in octahedral, tetrahedral and square planer complexes, factors affecting the crystal field parameters.	Studies are followed by Recapitulations of previous studies
	PC	**Quantum Mechanics-I** Black-body radiation, Plank's radiation law, photoelectric effect, postulates of quantum mechanics, quantum mechanical operators, commutation relations, Hamiltonian operator, Hermitian operator, average value of square of Hermitian as a positive quantity, Role of operators in quantum mechanics, To show quantum mechanically that position and momentum cannot be predicated simultaneously, Determination of wave function & energy of a particle in one dimensional box.	
	OC	**NMR Spectroscopy** Principle of nuclear magnetic resonance, the PMR spectrum, number of signals, peak areas, equivalent and nonequivalent protons positions of signals and chemical shift,shielding and deshielding of protons, proton counting, splitting of signal s and coupling constants, magnetic equivalence of protons. Discussion of PMR spectra of the molecule s: ethyl bromide, n-propyl bromide, isopropyl bromide, 1,1-dibromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone..Simple problems on PMR spectroscopy for structure determination of organic compounds.	
Oct 2022	**IC**	**Thermodynamics and Kinetic Aspects of metal complexes** A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, Irving William Series, substitution reactions of square planer complexes of Pt[II], Trans effect.	Assessment Test
	PC	**Physical Proper ties and Molecular Structure** Optical activity, polarization – (Clausius – Mossotti equation derivation excluded). Orientation of dipoles in an electric field, dipole moment, induced dipole moment, measurement of dipole moment - temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its de termination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetism.	
	OC	**Carbohydrates** Classification and nomenclature of Monosaccharides, mechanism of osazone format ion, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose into mannose. Formation of glycos ides, Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation.	
Nov 2022	**IC**	**Magnetic properties of Transition metal complexes** Types of magnetic materials, magnetic susceptibility, method of determining magnetic susceptibility, spin only formula, L-S coupling, correlation of μs and μeff values, orbital contribution to magnetic moments, application of magnetic moment data for 3d metal complexes.	Assignments

	PC	**Spectroscopy** Introduction: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Born-oppenheimer approximation, Degrees of freedom. **Rotational Spectrum** Selection rules, Energy levels of rigid rotator (semi-classical principles), rotational spectra of diatomic molecules , spectral intensity distribution using population distribution (Maxwell-Boltzmann distribution), determination of bond length and isotopic effect .	
	OC	**Carbohydrates** Structures of ribose and deoxyribose. An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination.	
Dec 2022	**IC**	**Electronic spectra of Transition metal complexes** Selection rules for d-d transition, spectroscopic ground states, spectrochemical series, orgel energy level diagram for d1 and d9 states, discussion of electronic spectrum of [Ti(H2O)6]+3 complex ion.	Assignments
	PC	**Vibrational spectrum** Selection rules, Energy levels of simple harmonic oscillator, pure vibrational spectrum of diatomic molecules, determination of force constant and qualitative relation of force constant and bond energy, idea of vibrational frequencies of different functional groups.	
	OC	**Organometallic Compounds** Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions.	
Dec 2022	**IC**	Revision/ Recapitulations of studies	Assessment Test
	PC	**Raman Spectrum** Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.	
	OC	**Organometallic Compounds** Organolithium compounds: formation and chemical reactions.	
Dec 2022 Jan 2023	**Semester-End Final Examinations**		

Government PG College, Ambala Cantt.

Subject: **CHEMISTRY**

Lesson Plan Session **2022-23 (Even Semester)**

Class: **B.Sc. 6th Semester**

Month	Details		Remarks
Feb 2023	**IC**	**Acids and Bases** Arrhenius, Bronsted-lowry, Lux-flood, solvent system and Lewis concept of acids and bases, relative strength of acids and bases, levelling solvents, hard and soft acids and bases(HSAB), Applications of HSAB principle.	Studies are followed by Recapitulations of previous studies
	PC	**Introduction to statistical mechanics** Need for statistical thermodynamics, thermodynamic probability, Maxwell Boltzmann distribution statistics, Born oppenheimer approximation, partition function and its physical significance. Factorization of partition function.	
	OC	**Organic Synthesis *via* Enolat es** Acidity of alpha-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.	
Mar 2023	**IC**	**Organometallic chemistry** Definition, classification and nomenclature of organometallic compounds, preparation, properties and bonding of alkyls of Li, Al, Hg and Sn, concept of hapticity of organic ligand, Structure and bonding in metal-ethylenic complexes, Structure of Ferrocene, classification in metal carbonyls, preparation, properties and bonding in mononuclear carbonyls.	Assessment Test
	PC	**Photochemistry** Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Drapper law, Stark-Einstein law (law of photochemical equivalence), Jablonski diagram depiciting various processes occurring in the excited state, qualitative description of fluorescence, phosphorescence, non-radiative processes (internal conversion, intersystem crossing), quantum yield, photosensitized reactions-energy transfer processes (simple examples).	
	OC	**Heterocyclic Compounds** Introduction: Molecular orbital picture and aromatic characteristics of pyrrole, furan, thiophene and pyridine. Methods of synthesis and chemical reactions with particular emphasis on the mechanism of electrophilic substitution. Mechanism of nucleophilic substitution reactions in pyridine derivatives. Comparison of basicity of pyridine, piperidine and pyrrole.	
Apr 2023	**IC**	**Bio inorganic chemistry** Metal ions present in biological system, classification on the basis of action (essential, non essential, trace, toxic), Metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of Na+, K+, Ca+2, Mg+2, Fe+2 ions, Cooperative effect, Bohr effect.	Assignments
	PC	**Solutions, Dilute Solutions and Colligative Properties** Ideal and non-ideal solutions, methods of expressing concentrations of solutions, Dilute solutions, Raoult's law. Colligative properties: (i) relative lowering of vapour pressure (ii) Elevation in boiling point (iii) depression in freezing point (iv) osmotic pressure. Thermodynamic derivation of relation between amount of solute and elevation in boiling point and depression in freezing point. Applications in calculating molar masses of normal, dissociated and associated solutes in solution.	

	OC	**Heterocyclic Compounds** Introduction to condensed five and six- membered heterocycles. Prepration and reactions of indole, quinoline and isoquinoline with special reference to Fisher indole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline.	
April 2023 May 2023	**IC**	**Silicones and Phosphazenes** Nomenclature, classification, prepration and uses of silicones, elastomers, polysiloxane copolymers, poly phosphazenes and bonding in triphosphazene.	Assignments
	PC	**Phase Equillibrium** Statement and meaning of the terms – phase, component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system –Example – water system.	
	OC	**Amino Acids, Peptides& Proteins** Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of alpha-amino acids. Structure and nomenclature of peptide s and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides. Classical peptide synthesis, solid–phase peptide synthesis. Structures of peptides and proteins :Primary & Secondary structure.	
May 2023	**IC**	Revision/ Recapitulations of studies	Assessment Test
	PC	**Phase Equillibrium** Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead.	
	OC	**Synthetic Polymers** Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler –Natta polymerization and vinyl polymers. Condensation or step growth polymeization. Polyesters, polyamides, phenol formaldehyde resins. Natural and synthetic rubbers.	
May 2023 Jun 2023	**Semester-End Final Examinations**		