LessonPlan

Name of Assistant/Associate Professor: Dr. Geeta

Class:B.Sc (1stSem)

ChemistryLessonPlan:Week (FromJUL2023toDEC 2023)

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| **Month** | **Week** | **Topic Name** |
| **Jul** | **5th** | **Atomic Structure**  Idea of de Broglie matter waves, Heisenberg uncertainty principle, atomic orbitals, , quantum numbers, radial and angular wave functions and probability distribution curves, shapes of s, p, d orbitals. |
| **Aug** | **1s**t | **Periodic Properties**  General principles of periodic table: Aufbau and Pauli exclusion principles, Hund's multiplicity rule. Electronic configurations of the elements, effective nuclear charge, Slater’s rules. Atomic and ionic radii, ionization energy, electron affinity and electronegativity –definition, methods of determination or evaluation, trends in periodic table (in s &p block elements). |
| **2nd & 3rd** | **Covalent Bond**  Valence bond theory and its limitations, directional characteristics of covalent bond, various types of hybridization and shapes of simple inorganic molecules and ions ( BeF2, BF3, CH4, PF5, SF6,IF7 SO42 -, ClO4- )Valence shell electron pair repulsion (VSEPR)5 theory to NH3, H3O+, SF4, CIF3, ICI2- and H2O. MO theoryofheteronuclear (CO and NO) diatomic.molecules, , bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference. |
| **4th** | **Ionic Solids**  Ionic structures (NaCl,CsCl, ZnS(Zinc Blende), CaF2) radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy (methamtical 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. |
| **5th** | **Gaseous States**  Maxwell’s distribution of velocities and energies (derivation excluded) Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, co llision number, col lision frequency and mean free path. |
| **Sep** | **1st** | **Gaseous States**  Deviation of Real gases from ideal behaviour. Derivation of Vander Waal’s Equation of State, its application in the calculation of Boyle’s temperature (compression factor) Explanation of behaviour of real gases using Vander Waal’s equation. |
|  | **2nd** | **Critical Phenomenon:**  Critical temperature, Critical pressure, critical volume and their determination. PV isotherms of real gases, continuity of states, the isotherms of Vander Waal’s equation, relationship between critical constants and Vander Waal”s constants. Critical compressibility fac tor. The Law of corresponding states. Lequifaction of gases. |
|  | **3rd** | **Liquid States**  Structure of liquids. Properties of liquids – surface tension, viscosity vapour pressure and optical rotations and their determination. |
|  | **4th& 5th** | **Solid State**  Classification of solids, Laws of crystallography – (i) Law of constancy of interfacial angles (ii) Law of rationality of indices (iii) Law of symmetry. Symmetry elements of c rystals. Definition of unit cell & space lattice. Bravais lattices, crystal system. Xray diffraction by crystals. Derivation of Bragg equation. Determination o f crystal structure o fNaCl, KCl. Liquid crystals: Difference between solids, liquids and liquid crystals,types of liquid crystals. Applications of liquid crystals. |
| **Oct** | **1st** | **Structure and Bonding**  Localized and delocalized chemical bond, van der Waals in teractions, resonance: conditions, resonance effect and its applications, hyperconjugation, inductive effect, Electromeric effect & their comparison. |
| **2nd** | **Stereochemistry of Organic Compounds-I**  Concept of isomerism. Types of isomerism. Optical isomerism, elements of symmetry, molecular chirality, enantiomers, stereogeniccentre, optical activity, properties of enantiomers, chiral and achiral molecules with two stereogeniccentres, diastereomers, threo and erythrodiastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. |
| **3rd** | **Stereochemistry of Organic Compounds-II**  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. |
|  | **4th& 5th** | **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. Energy considerations. Reactive intermediates carbocations, carbanions, free radicals, carbenes ,arynes and nitrenes (formation, structure & stability). Assigning formal charges on intermediates and other ionic species |
| **Nov** | **1st&2nd** | **Alkanes and Cycloalkanes**  IUPAC nomenclature of branched and unbranchedalkanes , the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation (with special reference to Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids), physical properties. 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. |
| **3rd&4th** | **Revision, Assignment, Test** |

Lesson Plan

Name of Assistant/Associate Professor: Dr. Geeta

Class: B.Sc. (2ndSem)

Chemistry Lesson Plan: Week (From January 2024 to April 2024)

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| **Month** | **Week** | **Topic Name** |
| **Jan** | **3rd**    **4th** | **Hydrogen–Bonding&VanderWaal’sForces**  Hydogen Bonding-Defintion,Types effects of hydrogen bonding on properties of substances, various types of vanderwaals forces.  **Metallic Bond and semiconductors**  Metallic Bond- Brie f introduction to metallic bond, band theory of metallic bond Semiconductors- Introduction, types and applications.  **s-block Elements**  Comparative study of the elements including, diagonal relationships, salient features of hydrides,solvation.  **Chemistry of Nobles Gases**  Chemical properties of the noble gases with emphasis on their low chemical reactivity,chemistry of xenon,structure and bonding of fluorides. |
| **Feb** | **1s**t  **2nd**    **3rd**  **4th** | **p- Block Elements**  Emphasis on comparative study of properties of p-block elements.  **Born Family (13thgp)**  Diborane-properties and structure,Borazene, Trihalides of Boron.  **Carbon Family (14th gp)**  Catenation,pi-dpibonding, carbides, fluorocarbons,silicons  **Nitrogen Family (15thgp)**  Oxides,oxyacid,structure of white,yellow and red phosphorous  **Oxygen Family (16thgp)**  Oxyacids of sulphur – structures and acidic strength H2O2 –structure, properties and uses.  **Halogen family**  Basic properties of halogen,interhalogen,types,properties,hydro and oxyacids of chlorine  **.Alkenes**  Nomenclatu re of alkenes, , mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halides,. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. Chemical reactions of alkenes mechanisms involved in hydrogenation, electrophilic and free radical additions, Markownikoff’s rule, hydroboration–oxidation, oxymercuration reduction, ozonolysis, hydration, hydroxylation and oxidation with KMnO4.  **Arenes and Aromaticity**  Nomenclatu re of benzene deriva tives:. Aromatic nucleus and side chain. Aromaticity: the Huckel rule, aromatic ions, annulenes up to 10 carbon atoms, aromatic, anti - aromatic and non – aromatic compounds. Aromatic electrophilic substitution general pattern of the mechanism, mechansim of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating , deactivating substituents and orientation. |
| **Mar** | **1st**    **2nd**    **3rd** | **Dienes and Alkynes**  Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure 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 electrophilic and nucleophilic addition reactions, hydroboration- oxidation of alkynes.  **Alkyl and Aryl Halides**  Nomenclature and classes of alkyl halides, methods of formation, chemical reactions. Mechanisms and stereochemistry of nucleophilic substitution reactions of alkyl halides , SN2 and SN1reactions with energy profile diagrams.Methods of formation and reactions of aryl halides, The addition elimination and the elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.  **Kinetics I**  Rate of reaction, rate equation, factors influencing the rate of a reaction – concentration, temperature, pressure, solvent, light, catalyst. Order of a reaction, integrated rate expression for zero order, first order, second and third order reaction. Half life period of a reaction. Methods of determination of order of reaction**.**  **Kinetics II**  Effect of temperature on the rate of reaction – Arrhenius equation. Theories of reaction rate – Simple collision theory for unimolecular and bimolecular collision. Transition state theory of Bimolecular reactions |
| **Apr** | **1st**  **2nd**    **3rd** | **Electro Chemistry – I**  Electrolytic conduction, factors affecting electrolytic conduction, specific, conductance, molar conductance,equivalent conductance and relation among them, their vartion with concentration.Arrhenius theory of ionization, Ostwald’s Dilution Law. Debye- Huckel – Onsager’s equation for strong electrolytes (elementary treatment only) Transport number, definition and determination by Hittorfs methods, (numerical included)  **Electro Chemistry – II**  Kohlarausch’s Law, calculation of molar ionic conductance and effect of viscosity temperature & pressure on it. Application of Kohlarausch’s Law in calculation of conductance of weak electrolytes at infinite diloution. Applications of conductivity measurements: determination of degree of dissociation, determination of Ka of acids determination of solubility  Revision & Test |

LessonPlan

Name of Assistant/Associate Professor: Dr. Vijender

Class:B.Sc (3rdSem)

ChemistryLessonPlan:Week (FromJUL2023toDEC 2023)

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| **Month** | **Week** | **Topic Name** |
| **Jul** | **5th** | **Chemistry of Elements of Ist transition series:**  Definition of transition elements, position in the periodic table, General characteristics &properites of Ist transition elements,. Structures & properties of some compounds of transition elements – TiO2, VOCl2 , FeCl3 , CuCl2 and Ni (CO)4. |
| **Aug** | **1s**t | **Chemistry of Elements of IInd&IIIrd transition series**  General characteristics and properties of the IInd and IIIrd trans ition elements Comparison of properties of 3d elements with 4d & 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry. |
| **2nd** | **Coordination Compounds**  Werner's coordination theory, effective atomic number concept, chelates, nomenclature of coordination compounds, isomerism in coordination compounds, valence bond theory of transition metal complexes |
| **3rd** | **Non-aqueous Solvents**  Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH3 and liquid SO2 |
| **4th& 5th** | **Thermodynamics-I**  Definition of thermodynamic terms: system,surrounding etc. Types of systems, intensive and extensive properties. State and path functions and their differentials. Thermodynamic process. Concept of heat and work. Zeroth Law of thermodynamics, First law of thermodynamics: statement, definition of internal energy and enthalpy. Heat capacity, heat capacities at constant volume and pressure and their relationship. Joule’s law – Joule – Thomson coefficient for ideal gass and real gas: and inversion temperature. |
| **Sep** | **1st&2nd** | **Thermodynamics-II**  Calculation of w.q. dU&dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchoffs equation. Bond energies and applications o f bond energies. |
| **3rd** | **Chemical Equilibrium**  Equilibrium constant and free energy, concept of chemical potential, Thermodynamic derivation of law of chemical equilibrium. Temperature dependence of equilibrium constant; Van’t Hoff reaction isochore, Van’t Hoff reaction isotherm. Le-Chatetier’s principle and its applicationsClapeyron equation and Clausius – Clapeyron equation its applications. |
| **4th** | **Dis tributioln Law**  Nernst distribution law – its thermodynamic derivation, Modification of distribution law when solute undergoes dissociation, association and chemical combination. 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 process of extraction. |
|  | **5th** | **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 — nomenclature, methods of formation, chemical reactions of vicinal glycols, oxidative cleavage [Pb(OAc)4 and HIO4 ] and pinacol-pinacolone rearrangement. |
| **Oct** | **1st** | **Epoxides**  Synthesis of epoxides. Acid and base-catalyzed ring opening of epoxides, orientation of epoxide ring opening, reactions of Grignard and organolithium reagents with epoxides |
| **2nd** | **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. |
| **3rd,4th**  **& 5th** | **Ultraviole t (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 max of simple conjugated dienes and , -unsaturated ketones. Applications o f UV Spectroscopy in structure elucidation of simple organic compounds. |
| **Nov** | **1st&2nd** | .**Carboxylic Acids & Acid Derivatives**  Nomenclatu re 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. Structure , nomenclature and preparation of acid chlorides, esters, amides and acid anhydrides. Relative s tabilityo f acyl derivatives. Physical properties, interconvers ion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic). |
| **3rd&4th** | **Revision, Assignment, Test** |

Lesson Plan

Name of Assistant/Associate Professor: Dr. Vijender Singh

Class: B.Sc (4th Sem)

Chemistry Lesson Plan: Week (From JAN 2024 to Apr 2024)

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| **Month** | **Week** | **Topic Name** |
| **Jan** | **3rd**  **4th** | **Chemistry of f-Block elements (Lanthanide**)  Lanthanides Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.  **Chemistry of f-Block elements (Actinides)**  General features and chemistry of actinides, chemistry of separation of Np, Pu and Am from U, Comparison of properties of Lanthanides and Actinides and with transition elements  **Theory Of Qualitative and Quantitative Inorganic Analysis-I**  Chemistry of analysis of various acidic radicals, Chemistry of identification of acid radicals in typical combinations, Chemistry of interference of acid radicals including their removal in the analysis is of basic radicals**.** |
| **Feb** | **1st**  **2nd**  **3rd**    **4th** | **Theory Of Qualitative and Quantitative Inorganic Analysis-II**  Chemistry of analysis of various groups of basic radicals, Theory of precipitation, co- precipitation, Post- precipitation, purification of precipitates.    **Thermodynamics-III**  Second law of thermodynamics, need for the law, different statements of the law, Carnot’s cycles 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 function of P & T, entropy change in physica l change, entropy as a criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.    **Thermodynamics-IV**  Third law of thermodynamics: Nernst heat theorem, statement of concept of residual entropy, evaluation of absolute entropy from heat capacity data. Gibbs and Helmholtz functions; Gibbs function (G) and Helmholtz function (A) as thermodynamic quantities, A & G as criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.  **Electrochemistry-III**  Electrolytic and Galvanic cells – reversible & Irreversible cells , conventional representation of electrochemical cells. EMF of cell and its measurement, Wes ton standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction ( G, H & K). 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 |
| **Mar** | **1st**    **2nd**    **3rd** | **Electrochemistry-IV**  Concentration cells with and without transference, liquid junction potential, application of EMF measurement i.e. valency of ions, solubility product activity coefficient, potentiometric titration (acid- base and redox). Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.  **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. Applica tions of IR spectroscopy in structure e lucidation of simple organic compounds.  **.**  **Amines**  Structure and nomenclatu re of amines, phys ical properties. Separation of a mixture of primary, secondary and tertiary amines.Structural featu res affecting basicity of amines. Prepa ration of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid. |
| **Apr** | **1st**    **2nd**    **3rd** | **. Diazonium salts**  Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO2 and CN groups, reduction of diazonium salts to hyrazines, coupling reaction and its synthetic application.  **Nitro compounds**  Preparation of nitro alkanes and nitro arenes and their chemical reactions. Mechanism of electrophilic substitution reactions in nitro arenes and their reductions in acidic, neutral and alkaline medium.  **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. Mannich reaction.Oxidation of aldehydes, Baeyer–Villiger oxidation of ketones, Cannizzaro reaction. MPV, Clemmensen, Wolff-Kishner, LiAlH4 and NaBH4 reductions.  Revision & Test |

Lesson Plan

Name of Assistant/Associate Professor: Dr. Vijender Singh & Dr. Geeta

Class:B.Sc (5th Sem)

ChemistryLessonPlan:Week (FromJUL2023toDEC 2023)

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| **Month** | **Week** | **Topic Name** |
| **Jul** | **5th** | **Metal-ligand Bonding in Transition Metal Complexes**  Limitations of valence bond theory, an elementary idea of cr ystal-f ield theory, crystal field split ting in octahedral, tetrahedral and square planar complexes, factors affecting the crystal-f ield parameters. |
| **Aug** | **1s**t | **Magnetic Properties of Transition Metal Complexe**  Types of magnetic behaviour, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of s and eff values, orbital  contribution to magnetic moments, application of magnetic moment data for 3dmetal complexes.  3 |
| **2nd** | **Electron Spectra of Transition Metal Complexes**  Types of electronic transitions, selection rules for d-d transitions, spectroscopic ground states, spectrochemical series. Orgel-energy level diagram for d1 and d9 states, discussion of the electronic spectrum of [Ti(H2O)6]3+ complex ion. |
| **3rd** | **Physical Properties and Molecular Structure**  Optica l activity, polarization – (clausius – Mossotti equation). Orientation of dipoles in an electric field, dipole moment, included dipole moment, measurement of dipole moment-temperature method and refractivity method, dipole moment and structure of molecules, Magnetic permeability, magnetic susceptibility and its determination. Applica tion of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetics. |
| **4th& 5th** | **Quantum Mechanic s-I**  Black-body radiation, Plank’s radiation law, photoelectric effect, heat capacity of solids, Compton effect,wave function and its significance of Postulates of quantum mechanics , quantum mechanical operator, commutation relations, Hamiltonial 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 partic le in one dimensional box, Pictorial representation and its significance. |
| **Sep** | **1st** | **NMR Spectroscopy-I**  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 signals and coupling constants, magnetic equivalence of protons. |
| **2nd** | **NMR Spectroscopy-II**  Discuss ion of PMR spectra of the molecules: ethyl bromide, npropyl bromide, isopropyl bromide, 1,1-dibromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone..Simple problems on PMR spectroscopy for structure determination of organic compounds |
| **3th** | **Spectroscopy-I**  **Introduction**: Electromagnetic radiation, regions of spectrum, basic features of spectroscopy, statement of Bornoppenheimer approximation, Degrees of freedom.  **Rotational Spectrum**  Diatomic molecules. Energy levels of rigid rotator (semi-classical principles), selection rules, spectral intensity distribution using population distribution  (Maxwell-Boltzmann distribution), determination of bond length, qualitative description of non-rigid rotor, isotope effect. |
|  | **4th** | **Carbohydrates-I**  Classification and nomenclature. Monosaccharides, mechanism of osazone formation, inte rconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. Conversion of glucose in to mannose. Formation of glycos ides, ethers and esters.  Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism ofmutarotation. Structures of ribose and deoxyribose. |
| **Oct** | **1st** | Carbohydrates-II  An introduc tion to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination. |
| **2nd** | **Organometallic Compounds**  Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.. |
| **3rd,4th**  **& 5th** | **Thermodynamic and Kinetic Aspects of Metal Complexe**  A brief outline of thermodynamic stability of metal complexes and factors affec ting the s tab ility, substitution reac tions of square planar complexes of Pt(II). |
| **Nov** | **1st&2nd** | **Spectroscopy-II Vibrational spectrum**  Infrared spectrum: Energy levels of simple harmonic oscillator, selection rules,  pure vibrational spectrum, intensity, determination of force constant and qualitative relation of force constant and bond energies, effects of anharmonic motion and isotopic effect on the spectra., idea of vibrational frequencies of different functional groups.  **Raman Spectrum:**  Concept of polarizibility, pure rotational and pure vibrational Raman spectra of diatomic molecules, selectin rules, Quantum theory of Raman spectra. |
| **3rd&4th** | **Revision, Assignment, Test** |

Lesson Plan

Name of Assistant/Associate Professor: Dr. Vijender Singh & Dr. Geeta

Class: B.Sc (6th Sem)

Chemistry Lesson Plan: Week (From JAN 2024 to Apr2024)

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| **Month** | **Week** | **Topic Name** |
| **Jan** | **3rd**  **4th** | **Organometallic Chemistry**  Definition, nomenclature and classification of organometallic compounds. Preparation, properties, and bonding of alkyls of Li, Al, Hg, and Sn a brief account of metal-ethylenic complexes, mononuclear carbonyls and the nature of bonding in metal carbonyls.  **Spectroscopy-III Electronic Spectrum**  Concept of potential energy curves for bonding and antibonding molecular orbitals, qualitative description of selection rules and Franck- Condon principle. Qualitative description of sigma and pie and n molecular orbital (MO) their energy level and respective transitions.  **Acids and Bases, HSAB Concept**  Arrhenius, Bronsted – Lowry, the Lux – Flood, Solvent system and Lewis concepts of acids & bases, relative strength of acids & bases, Concept of Hard and Soft Acids & Bases. Symbiosis, electronegativity and hardness and softness |
| **Feb** | **1st**    **2nd**  **3rd**    **4th** | **Heterocyclic Compounds-I**  Introduction: Molecular orbital p icture 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  **Heterocyclic Compounds-II**  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    **Solutions:**  **Dilute Solutions and Colligative Properties**  Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution,Colligative properties, Raolut’s law, relative lowering of vapour pressure, molelcular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of boiling point and depression of freezing point, Thermodynamic derivation of relation between molecular weight and elevation in boiling point and depression in freezing point. Experimental methods for determining various colligative properties. Abnormal molar mass, degree of dissociation and association of solutes.  **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 and Sulpher systems.  Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilerisation of lead |
| **Mar** | **1st**  **2nd**  **3rd** | **Bioinorganic Chemistry**  Essential and trace elements in biological processes, metalloporphyrins with special reference to haemoglobin and myoglobin. Biological role of alkali and alkaline earth metal ions with special reference to Ca2+. Nitrogen fixation.  **Organic Synthesis *via* Enolates**  Acidity of -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.  **Organosulphur Compounds**  Nomenclature, structural features, Methods of formation and chemical reactions of thiols, thioethers, sulphonic acids, sulphonamides and sulphaguanidine. Synthetic detergents alkyl and aryl sulphonates.  **Sil icones and Phosphazenes**  Silicones and phosphazenes, their preparation, properties,structure and uses |
| **Apr** | **1st**      **2nd**      **3rd** | **Amino Acids, Peptides& Proteins**  Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of -amino acids.Structure and nomenclature of peptides 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.  **Organic Synthesis *via* Enolates**  Acidity of -hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.  **Synthetic Polymers**  Addition or chain-growth polymerization. Free radical vinyl polymerization, ionic vinyl polymerization, Ziegler-Natta polymerization and vinyl polymers.  Condensat ion or step growth polymerization. Polyeste rs ,polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy re sins and polyurethanes.  Natural and synthetic rubbers.  **Revision & Test** |