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## Lesson Plan

Name of the Faculty : Miss Ekta & Dr. Laxmi  
Class : B.Sc- I  
Semester : First Semester  
Subject : Organic Chemistry, Inorganic Chemistry,  
Physical Chemistry & Chemistry Practical.  
Paper Code : CH 101, CH 102, CH 103 & CH 104

Lectures	Topic (including assignment and test)
August 2023	<p><b>Organic Chemistry:</b> Structure and Bonding: Localized and delocalized chemical bond, van der Waals interactions, resonance, hyperconjugation, inductive effect, Electromeric effect. 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 enantiomers, inversion, retention and racemization.</p> <p><b>Inorganic Chemistry:</b> 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.</p> <p><b>Physical Chemistry:</b> Gaseous States: Maxwell's distribution of velocities and energies, Calculation of root mean square velocity, average velocity and most probable velocity. Collision diameter, collision number, collision frequency and mean free path. Deviation of Real gases from ideal behavior. Derivation of Vander Waal's Equation of State, its application. Explanation of behavior of real gases using Vander Waal's equation.</p> <p><b>Chemistry Practical:</b> Redox titrations: Determination of Fe<sup>2+</sup>, C<sub>2</sub>O<sub>4</sub><sup>2-</sup> (using KMnO<sub>4</sub>, K<sub>2</sub>Cr<sub>2</sub>O<sub>7</sub>), Iodometric titrations: Determination of Cu<sup>2+</sup> using standard hypo.</p>
September 2023	<p><b>Organic Chemistry:</b> Stereochemistry of Organic Compounds: Relative and absolute configuration, sequence rules, R &amp; S systems of nomenclature. Geometric isomerism determination of configuration of geometric isomers. E &amp; Z, 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.</p> <p><b>Inorganic Chemistry:</b> 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 &amp; p block).</p> <p><b>Physical Chemistry:</b> 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 a &amp; b. Critical compressibility factor. The Law of corresponding states. Liquefaction of gases.</p>

	<p><b>Chemistry Practical:</b>Complexometric titrations: Determination of <math>Mg^{2+}</math>, <math>Zn^{2+}</math> by EDTA.To determine the specific reaction rate of the hydrolysis of methyl acetate/ethyl acetate catalyzed by hydrogen ions at room temperature.</p>
October 2023	<p><b>Organic Chemistry:</b> 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. Assigning formal charges on intermediates and other ionic species.</p> <p><b>Inorganic Chemistry:</b> 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. Valence shell electron pair repulsion (VSEPR) theory to <math>NH_3</math>, <math>H_3O^+</math>, <math>SF_4</math>, <math>ClF_3</math>, <math>ICl_2^-</math> and <math>H_2O</math>. MO theory of heteronuclear diatomic molecules, bond strength and bond energy, percentage ionic character from dipole moment and electronegativity difference.</p> <p><b>Physical Chemistry:</b> Liquid States: Structure of liquids. Properties of liquids, surface tension, viscosity vapour pressure and optical rotations and their determination.</p> <p><b>Chemistry Practical:</b>To prepare arsenious sulphide sol and compare the precipitating power of mono-, bi - and trivalent anions.To determine the surface tension of a given liquid by drop number method.</p>
November & December 2023	<p><b>Organic Chemistry:</b> Alkanes and Cycloalkanes: IUPAC nomenclature of branched and unbranched alkanes, the alkyl group, classification of carbon atoms in alkanes. Isomerism in alkanes, sources, methods of formation 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 strain less rings.</p> <p><b>Inorganic Chemistry:</b> Ionic Solids: Ionic structures radius ratio effect and coordination number, limitation of radius ratio rule, lattice defects, semiconductors, lattice energy and Born-Haber cycle, solvation energy and its relation with solubility of ionic solids, polarizing power and polarisability of ions, Fajan's rule.</p> <p><b>Physical Chemistry:</b> 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 crystals. Definition of unit cell &amp; space lattice. Bravais lattices, crystal system. X-ray diffraction by crystals. Derivation of Bragg equation. Determination of crystal structure of NaCl, KCl. Liquid crystals: Difference between solids, liquids and liquid crystals, types of liquid crystals. Applications of liquid crystals.</p> <p><b>Chemistry Practical:</b> To determine the viscosity of a given liquid. To determine the specific refractivity of a given liquid</p>

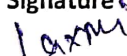
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Dr. Laxmi *Laxmi*

Lesson Plan

Name of the Faculty : Dr. Laxmi  
 Class : B.Sc- I  
 Semester : Second Semester  
 Subject : Organic Chemistry, Inorganic Chemistry,  
 Physical Chemistry & Chemistry Practical.  
 Paper Code : CH 101, CH 102, CH 103 & CH 104

Lectures	Topic (including assignment and test)
January 2024	<p><b>Organic Chemistry:</b> Alkenes: Nomenclature 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 <math>KMnO_4</math>.</p> <p><b>Inorganic Chemistry:</b> Hydrogen Bonding &amp; Vander Waals Forces: Hydrogen Bonding-Definition, Types, effects of hydrogen bonding on properties of substances, application Brief discussion of various types of Vander Waals Forces. Metallic Bond and Semiconductors: Metallic Bond- Brief introduction to metallic bond, band theory of metallic bond. Semiconductors- Introduction, types and applications.</p> <p><b>Physical Chemistry:</b> Kinetics: 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.</p> <p><b>Chemistry Practical:</b> Qualitative Analysis of the any one of the following Inorganic cations and anions by paper chromatography (<math>Pb^{2+}</math>, <math>Cu^{2+}</math>, <math>Ca^{2+}</math>, <math>Ni^{2+}</math>, <math>Cl^-</math>, <math>Br^-</math>, <math>I^-</math> and <math>PO_4^{3-}</math> and <math>NO_3^-</math>).</p>
February 2024	<p><b>Organic Chemistry:</b> Arenes and Aromaticity: Nomenclature of benzene derivatives: 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. mechanism of nitration, halogenation, sulphonation, and Friedel-Crafts reaction. Energy profile diagrams. Activating, deactivating substituents and orientation.</p> <p><b>Inorganic Chemistry:</b> S-Block Elements: Comparative study of the elements including, diagonal relationships, salient features of hydrides (methods of preparation excluded), solvation and complexation tendencies including their function in systems. Chemistry of Noble Gases: Chemical properties, chemistry of xenon, structure and bonding of fluorides, oxides &amp; oxyfluorides of xenon.</p> <p><b>Physical Chemistry:</b> 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.</p> <p><b>Chemistry Practical:</b> Preparation and purification of Iodoform from ethanol, <i>m</i>-Dinitrobenzene from nitrobenzene.</p>

<p>March 2024</p>	<p><b>Organic Chemistry: Dienes and Alkynes:</b> Nomenclature and classification of dienes: isolated, conjugated and cumulated dienes. Structure of butadiene. Chemical reactions 1,2 and 1,4 additions (Electrophilic &amp; 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.</p> <p><b>Inorganic Chemistry :</b> p-Block Elements: Emphasis on comparative study of properties of p-block elements (including diagonal relationship and excluding methods of preparation). Boron family: Diborane – properties and structure (as an example of electron – deficient compound and multicentre bonding), Borazine – chemical properties and structure Trihalides of Boron – Trends in Lewis acid character structure of aluminium (III) chloride. Carbon Family: Catenation, <math>p\pi - d\pi</math> bonding (an idea), carbides, fluorocarbons, silicates structural aspects), silicon – general methods of preparations, properties and uses.</p> <p><b>Physical Chemistry: Electrochemistry:</b> Electrolytic conduction, factors affecting electrolytic conduction, 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, Transport number, definition and determination by Hittorf's methods.</p> <p><b>Chemistry Practical:</b> Preparation and purification of p-Bromoacetanilide from acetanilide, Dibenzalacetone from acetone and benzaldehyde &amp; Aspirin from salicylic acid.</p>
<p>April 2024</p>	<p><b>Organic Chemistry:</b> 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, <math>S_N2</math> and <math>S_N1</math> reactions with energy profile diagrams. Methods of formation and reactions of aryl halides, addition-elimination, elimination-addition mechanisms of nucleophilic aromatic substitution reactions. Relative reactivities of alkyl halides vs allyl, vinyl and aryl halides.</p> <p><b>Inorganic Chemistry:</b> Nitrogen Family: Oxides – structures of oxides of N, P. oxyacids – structure and relative acid strengths of oxyacids of Nitrogen and phosphorus. Structure of white, yellow and red phosphorus. Oxygen Family: Oxyacids of Sulphur – structures and acidic strength <math>H_2O_2</math> – structure, properties and uses. Halogen Family: Basic properties of halogen, interhalogen types properties, hydro and oxyacids of Chlorine – structure and comparison of acid strength.</p> <p><b>Physical Chemistry:</b> Electrochemistry-II: Kohlrausch's Law, calculation of molar ionic conductance and effect of viscosity temperature &amp; pressure on it. 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 <math>K_a</math> of acids determination of solubility product of sparingly soluble salts, conductometric titrations. Definition of pH and <math>pK_a</math>, Buffer solution, Buffer action, Henderson-Hasselbalch equation, Buffer mechanism of buffer action.</p> <p><b>Chemistry Practical:</b> To study the process of sublimation of camphor and phthalic acid.</p>

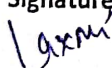
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 Dr. Laxmi

Lesson Plan

Name of the Faculty : Miss Ekta & Dr. Laxmi  
 Class : B.Sc- II  
 Semester : Third Semester  
 Subject : Organic Chemistry, Inorganic Chemistry,  
 Physical Chemistry & Chemistry Practical.  
 Paper Code : CH 301, CH 302, CH 303 & CH 304

Lectures	Topic (including assignment and test)
August 2023	<p><b>Organic Chemistry:</b> 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, chemical reactions of vicinal glycols, oxidative cleavage and pinacol-pinacolone rearrangement.          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</p> <p><b>Inorganic Chemistry:</b> Chemistry of Elements of 1st transition series: Definition of transition elements, position in the periodic table, General characteristics &amp; properties of 1st transition elements. Structures &amp; properties of some compounds of transition elements - TiO<sub>2</sub>, VOCl<sub>2</sub>, FeCl<sub>3</sub>, CuCl<sub>2</sub> and Ni(CO)<sub>4</sub>.</p> <p><b>Physical Chemistry:</b> Thermodynamics: 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 gas and real gas: and inversion temperature.</p> <p><b>Chemistry Practical:</b> Gravimetric Analysis: Quantitative estimations of, Cu<sup>2+</sup> as copper thiocyanate and Ni<sup>2+</sup> as Ni - dimethylglyoxime.</p>
September 2023	<p><b>Organic Chemistry:</b> 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 Mechanisms of Fries rearrangement, Claisen rearrangement, Reimer-Tiemann reaction, Kolbe's reaction and Schotten and Baumann reactions.</p> <p><b>Inorganic Chemistry :</b> Chemistry of Elements of II<sup>nd</sup> &amp; III<sup>rd</sup> transition series: General characteristics and properties of the II<sup>nd</sup> and III<sup>rd</sup> transition elements          Comparison of properties of 3d elements with 4d &amp; 5d elements with reference only to ionic radii, oxidation state, magnetic and Spectral properties and stereochemistry</p> <p><b>Physical Chemistry:</b> Thermodynamics: Calculation of w.q. dU &amp; dH for the expansion of ideal gases under isothermal and adiabatic conditions for reversible process, Temperature dependence of enthalpy, Kirchhoff's equation. Bond energies and applications of bond energies.</p> <p><b>Chemistry Practical:</b> Systematic identification of the following simple mono and</p>

	bifunctional organic compounds: Naphthalene, anthracene, acenaphthene, benzyl chloride, <i>p</i> -dichlorobenzene, <i>m</i> -dinitrobenzene, <i>p</i> -nitrotoluene, resorcinol, hydroquinone, $\alpha$ -naphthol, $\beta$ -naphthol, benzophenone, ethyl methyl ketone, benzaldehyde.
October 2023	<p><b>Organic Chemistry:</b> UV 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 <math>\alpha</math>-unsaturated ketones. Applications of UV Spectroscopy.</p> <p><b>Inorganic Chemistry :</b> Coordination Compounds: Werner's coordination theory, effective atomic number concept, chelates, nomenclature &amp; isomerism in coordination compounds, valence bond theory of transition metal complexes</p> <p><b>Physical Chemistry:</b> 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-Chatelier's principle and its applications Clapeyron equation and Clausius – Clapeyron equation its applications.</p> <p><b>Chemistry Practical:</b> Systematic identification of the following simple mono and bifunctional organic compounds: vanillin, oxalic acid, succinic acid, benzoic acid, salicylic acid, aspirin, phthalic acid, cinnamic acid, benzamide, urea, acetanilide, benzanilide, aniline hydrochloride, <i>p</i>-toluidine, phenyl salicylate, glucose,</p>
November & December 2023	<p><b>Organic Chemistry:</b> Carboxylic Acids &amp; Acid Derivatives: Nomenclature, 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 stability of acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis</p> <p><b>Inorganic Chemistry:</b> Non-aqueous Solvents: Physical properties of a solvent, types of solvents and their general characteristics, reactions in non-aqueous solvents with reference to liquid NH<sub>3</sub> and liquid SO<sub>2</sub>.</p> <p><b>Physical Chemistry:</b> Distribution 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.</p> <p><b>Chemistry Practical:</b> Systematic identification of the following simple mono and bifunctional organic compounds: fructose, sucrose, <i>o</i>-, <i>m</i>-, <i>p</i> nitroanilines, thiourea.</p>

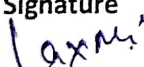
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 Dr. Laxmi

Lesson Plan

Name of the Faculty : Dr. Laxmi  
 Class : B.Sc-II  
 Semester : Fourth Semester  
 Subject : Organic Chemistry, Inorganic Chemistry,  
 Physical Chemistry & Chemistry Practical.  
 Paper Code : CH 401, CH 402, CH 403 & CH 404

Lectures	Topic (including assignment and test)
January 2024	<p><b>Organic Chemistry: IR absorption spectroscopy:</b> 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.</p> <p><b>Inorganic Chemistry: Lanthanides:</b> Electronic structure, oxidation states and ionic radii and lanthanide contraction, complex formation, occurrence and isolation, lanthanide compounds.</p> <p><b>Physical Chemistry: Thermodynamics:</b> Second law of thermodynamics, need for the law, different statements of the law, Carnot's cycles and its efficiency, Carnot's theorem, Thermodynamics scale of temperature. Concept of entropy – entropy as a state function, entropy as a function of V &amp; T, entropy as a function of P &amp; T, entropy change in physical change, entropy as criteria of spontaneity and equilibrium. Entropy change in ideal gases and mixing of gases.</p> <p><b>Chemistry Practical: Gravimetric Analysis:</b> To verify Beer - Lambert law for <math>KMnO_4 / K_2Cr_2O_7</math>, determine the concentration of the given <math>KMnO_4 / K_2Cr_2O_7</math> solution, Preparation of Cuprous chloride.</p>
February 2024	<p><b>Organic Chemistry: Amines:</b> 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 arylamines, reactions of amines with nitrous acid.</p> <p><b>Inorganic Chemistry: Actinides:</b> 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.</p> <p><b>Physical Chemistry: Thermodynamics:</b> 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 &amp; Gas criteria for thermodynamic equilibrium and spontaneity, their advantage over entropy change. Variation of G and A with P, V and T.</p> <p><b>Chemistry Practical:</b> Preparation of Prussian blue from iron fillings, tetraammine cupric sulphate, chrome alum, potassium trioxalatochromate(III).</p>

	<p><b>Organic Chemistry:</b> Diazonium Salts: Mechanism of diazotisation, structure of benzene diazonium chloride, Replacement of diazo group by H, OH, F, Cl, Br, I, NO<sub>2</sub> and CN groups, reduction of diazonium salt to hydrazines, 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.</p> <p><b>Inorganic Chemistry: Theory of Qualitative and Quantitative Inorganic Analysis:</b> 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 of basic radicals.</p> <p><b>Physical Chemistry: Electrochemistry:</b> Electrolytic and Galvanic cells – reversible &amp; Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction. 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 electrodes potential, sign conventions, electrochemical series and its applications.</p> <p><b>Chemistry Practical:</b> To determine the CST of phenol – water system, To determine the solubility of benzoic acid at various temperatures and to determine the <math>\Delta H</math> of the dissolution process, To determine the enthalpy of neutralisation of a WA/WB vs. SB/SA and determine the enthalpy of ionisation of the WA/WB.</p>
<p>April 2024</p>	<p><b>Organic Chemistry:</b> 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, PCC, PDC, 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, LiAlH<sub>4</sub> and NaBH<sub>4</sub> reductions.</p> <p><b>Inorganic Chemistry:</b> Chemistry of analysis of various groups of basic radicals, Theory of precipitation, coprecipitation, Post- precipitation, purification of precipitates.</p> <p><b>Physical Chemistry: Electrochemistry:</b> Concentration cells with and without transference, LJP, application of EMF measurement, potentiometric titration, Determination of pH using Hydrogen electrode, Quinhydrone electrode and glass electrode by potentiometric methods.</p> <p><b>Chemistry Practical:</b> To determine the enthalpy of solution of solid calcium chloride, To study the distribution of iodine between water and CCl<sub>4</sub>.</p>

Signature  
  
 Dr. Laxmi



Lesson Plan

Name of the Faculty : Miss Ekta & Dr. Laxmi  
 Class : B.Sc- III  
 Semester : Fifth Semester  
 Subject : Organic Chemistry, Inorganic Chemistry,  
 Physical Chemistry & Chemistry Practical.  
 Paper Code : CH 501, CH 502, CH 503 & CH 504

Lectures	Topic (including assignment and test)
August 2023	<p><b>Organic Chemistry:</b> 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.</p> <p><b>Inorganic Chemistry:</b> 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 planar complexes, factors affecting the crystal-field parameters.</p> <p><b>Physical Chemistry:</b> Quantum Mechanics-I: Black-body radiation, Planck'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, 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 &amp; energy of a particle in one dimensional box, Pictorial representation and its significance.</p> <p><b>Chemistry Practical:</b> Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding insolubles): <math>Pb^{2+}</math>, <math>Hg^{2+}</math>, <math>Hg_2^{2+}</math>, <math>Ag^+</math>, <math>Bi^{3+}</math>, <math>Cu^{2+}</math>, <math>Cd^{2+}</math>, <math>As^{3+}</math>, <math>Sb^{3+}</math>, <math>Sn^{2+}</math>, <math>Fe^{3+}</math>, <math>Cr^{3+}</math>, <math>Al^{3+}</math></p>
September 2023	<p><b>Organic Chemistry:</b> NMR Spectroscopy-II: Discuss ion of PMR spectra of the molecules: ethyl bromide, npropyl bromide, isopropyl bromide, 1,1-bromoethane, 1,1,2-tribromoethane, ethanol, acetaldehyde, ethyl acetate, toluene, benzaldehyde and acetophenone. Problems on PMR spectroscopy.</p> <p><b>Inorganic Chemistry :</b> Thermodynamic and Kinetic Aspects of Metal Complexes: A brief outline of thermodynamic stability of metal complexes and factors affecting the stability, substitution reactions of square planar complexes of Pt(II).</p> <p><b>Physical Chemistry:</b> Physical Properties and Molecular Structure: Optical activity, polarization – (Clausius – Mossotti equation). 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 determination. Application of magnetic susceptibility, magnetic properties – paramagnetism, diamagnetism and ferromagnetics.</p> <p><b>Chemistry Practical:</b> Semimicro qualitative analysis of mixture containing not more than four radicals (including interfering, Combinations and excluding</p>

	insolubles): $Co^{2+}$ , $Ni^{2+}$ , $Mn^{2+}$ , $Zn^{2+}$ , $Ba^{2+}$ , $Sr^{2+}$ , $Ca^{2+}$ , $Mg^{2+}$ , $NH_4^+$ , $CO_3^{2-}$ , $S^{2-}$ , $SO_3^{2-}$ , $S_2O_3^{2-}$ , $NO_2^-$ , $CH_3COO^-$ , $Cl^-$ , $Br^-$ , $I^-$ , $NO_3^-$ , $SO_4^{2-}$ , $C_2O_4^{2-}$ , $PO_4^{3-}$ , $BO_3^{3-}$
October 2023	<p><b>Organic Chemistry:</b> Carbohydrates-I: Classification and nomenclature. Monosaccharides, mechanism of osazone formation, interconversion 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 glycosides, ethers and esters. Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose &amp; D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose.</p> <p><b>Inorganic Chemistry :</b> Magnetic Properties of Transition Metal Complexes Types of magnetic behavior, methods of determining magnetic susceptibility, spin-only formula. L-S coupling, correlation of <math>s</math> and <math>eff</math> values, orbital contribution to magnetic moments.</p> <p><b>Physical Chemistry:</b> Spectroscopy: 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.</p> <p><b>Chemistry Practical:</b> Steam distillation: Naphthalene from its suspension in water Separation of <i>o</i>- and <i>p</i>-nitrophenols, Column chromatography: Separation of fluorescein &amp; methylene blue Separation of leaf pigments of spinach leaves.</p>
November & December 2023	<p><b>Organic Chemistry:</b> Carbohydrates-II: An introduction to disaccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination. Organometallic Compounds: Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions.</p> <p><b>Inorganic Chemistry:</b> 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 <math>d1</math> and <math>d9</math> states, discussion of the electronic spectrum of <math>[Ti(H_2O)_6]^{3+}</math> complex ion.</p> <p><b>Physical Chemistry:</b> 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.</p> <p>Raman Spectrum: Concept of polarizability, pure rotational and pure vibrational Raman spectra of diatomic molecules, selection rules, Quantum theory of Raman spectra.</p> <p><b>Chemistry Practical:</b> Thin Layer Chromatography: Determination of <math>R_f</math> values and identification of organic compounds (a) Separation of green leaf pigments (spinach leaves may be used) (b) Separation of a mixture of colored organic compounds using common organic solvents</p>

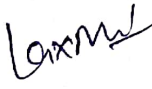
Signature  
Dr Laxmi *Laxmi*

### Lesson Plan

Name of the Faculty : Dr. Laxmi  
 Class : B.Sc- III  
 Semester : Sixth Semester  
 Subject : Organic Chemistry, Inorganic Chemistry,  
 Physical Chemistry & Chemistry Practical.  
 Paper Code : CH 601, CH 602, CH 603 & CH 604

Lectures	Topic (including assignment and test)
January 2024	<p><b>Organic Chemistry:</b> 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</p> <p><b>Inorganic Chemistry:</b> 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.</p> <p><b>Physical Chemistry:</b> 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.</p> <p><b>Chemistry Practical:</b> To determine the strength of the given acid solution (mono and dibasic acid) conductometrically, To determine the solubility and solubility product of a sparingly soluble electrolyte conductometrically, To determine the strength of given acid solution (mono and dibasic acid) potentiometrically.</p>
February 2024	<p><b>Organic Chemistry:</b> Heterocyclic Compounds: Introduction to condensed five and six-membered heterocycles. Preparation and reactions of indole, quinoline and isoquinoline with special reference to Fisherindole synthesis, Skraup synthesis and Bischler-Napieralski synthesis. Mechanism of electrophilic substitution reactions of, quinoline and isoquinoline, 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.</p> <p><b>Inorganic Chemistry:</b> Acids and Bases, HSAB Concept: Arrhenius, Bronsted Lowry, the Lux Flood, Solvent system and Lewis concepts of acids &amp; bases, relative strength of acids &amp; bases, Concept of HSAB. Symbiosis, electronegativity, hardness and softness.</p> <p><b>Physical Chemistry:</b> Dilute Solutions and Colligative Properties: Ideal and non-ideal solutions, methods of expressing concentrations of solutions, activity and activity coefficient. Dilute solution, Colligative properties, Raoult's law, relative lowering of vapour pressure, molecular weight determination, Osmosis law of osmotic pressure and its measurement, determination of molecular weight from osmotic pressure. Elevation of</p>

	<p>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.</p> <p><b>Chemistry Practical:</b> To determine the molecular weight of a non-volatile solute by Rast Method, To standardize the given acid solution (mono, dibasic acid) Potentiometrically.</p>
<p>March 2024</p>	<p><b>Organic Chemistry:</b> Organic Synthesis via Enolates: Acidity of <math>\alpha</math>-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. Condensation or step growth polymerization. Polyesters, polyamides, phenol formaldehyde resins, urea formaldehyde resins, epoxy resins and polyurethanes. Natural and synthetic rubbers.</p> <p><b>Inorganic Chemistry:</b> 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 <math>Ca^{2+}</math>. Nitrogen fixation.</p> <p><b>Physical Chemistry:</b> Electrochemistry: Electrolytic and Galvanic cells – reversible &amp; Irreversible cells, conventional representation of electrochemical cells. EMF of cell and its measurement, Weston standard cell, activity and activity coefficients. Calculation of thermodynamic quantities of cell reaction. 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 electrodes potential, sign conventions, electrochemical series and its applications.</p> <p><b>Chemistry Practical:</b> To prepare o-chlorobenzoic acid from anthranilic acid, To prepare p-bromoaniline from p-bromoacetanilide.</p>
<p>April 2024</p>	<p><b>Organic Chemistry:</b> Amino Acids, Peptides &amp; Proteins: Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of <math>\alpha</math>-amino acids. Structure &amp; nomenclature of peptides, 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 &amp; Secondary structure.</p> <p><b>Inorganic Chemistry:</b> Silicones and phosphazenes, preparation, properties, structure and uses.</p> <p><b>Physical Chemistry:</b> Phase Equilibrium: Statement and meaning of the terms – phase component and degree of freedom, thermodynamic derivation of Gibbs phase rule, phase equilibria of one component system (<math>H_2O</math>, S) Phase equilibria of two component systems solid-liquid equilibria, simple eutectic i.e. Pb-Ag system, desilverisation of lead.</p> <p><b>Chemistry Practical:</b> To prepare m-nitroaniline from m-dinitrobenzene, To prepare S-Benzyl-iso-thiouonium chloride from thiourea.</p>

Signature   
Dr. Laxmi