

Lesson Plan

Session 2023-24 (Even Semester)

Name of the Assistant Professor: *Natasha Kaushal, Nitin Kumar Verma, Mandeep Singh*

Class: *B.Sc. I (2nd Sem)*

Subject: *Chemistry*

Sr. No.	Month	Topic
1	<i>February January</i>	<p>Covalent Bond Valence bond theory approach, shapes of simple inorganic molecules and ions based on valence shell electron pair repulsion (VSEPR) theory and hybridization with suitable examples of linear, trigonal planar, square planar, tetrahedral, trigonal bipyramidal and octahedral arrangements. Molecular orbital theory of homonuclear (N₂, O₂) and heteronuclear (CO and NO) diatomic molecules, dipole moment and percentage ionic character in covalent bond.</p> <p>Chemical Kinetics Concept of reaction rates, rate equation, factors influencing the rate of reaction, Order and molecularity of a reaction, integrated rate expression for zero, first. Half-life period of a reaction, Arrhenius equation.</p> <p>Alkanes and Cycloalkanes Nomenclature, classification of carbon atoms in alkanes and its structure. Isomerism in alkanes, sources. Methods of formation: Wurtz reaction, Kolbe reaction, Corey-House reaction and decarboxylation of carboxylic acids</p>
2	<i>March February</i>	<p>Ionic Solids Ionic structures (NaCl, CsCl, ZnS (Zinc blende), CaF₂) size effects, radius ratio rule and its limitations, Concept of Lattice energy, Born-Haber cycle, Solvation energy and its relationship with solubility of ionic solids, Polarizing power and Polarisability of ions, Fajan's rule.</p> <p>Distribution Law Nernst distribution law – its thermodynamic derivation, Nernst distribution law after association and dissociation of solute in one of the phases, of distribution law: (i) Determination of degree of hydrolysis and hydrolysis constant of aniline hydrochloride</p> <p>Alkanes and Cycloalkanes Physical properties. Mechanism of free radical halogenation of alkanes: reactivity and selectivity. Nomenclature of Cycloalkanes, Baeyer's strain theory and its limitations, theory of strainless rings.</p>
3	<i>April March</i>	<p>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.</p> <p>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</p> <p>Alkenes Nomenclature of alkenes and its structure. Methods of formation: dehydration of alcohols, dehydrohalogenation of alkyl halide, Hofmann elimination and their mechanism. The Saytzeff rule and relative stabilities of alkenes. Chemical reactions: electrophilic and free radical additions, addition of halogens, halogen acids, hydroboration-oxidation, oxymercuration-reduction, ozonolysis and hydration, Markownikoff's rule of addition.</p>
4	April & May	Quick Revision and discussion

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Session 2023-24 (Even Semester)

Name of the Assistant Professor: *Natasha Kaushal, Nitin Kumar Verma, Mandeep Singh*

Class: *B.Sc. I SEC (2nd Sem)*

Subject: *SEC*

Sr. No.	Month	Topic
1	February	Chromatography: Definition, general introduction on principles of chromatography. Column chromatography, paper chromatography, TLC & ion-exchange chromatography.
2	March	Analysis of soil: Composition of soil, Concept of pH and pH measurement, Complexometric titrations, Chelation, Chelating agents, use of indicators.
3	April	Analysis of water: Definition of pure water, sources responsible for contaminating water, water sampling methods, water purification methods. Analysis of food products: Nutritional value of foods, idea about food processing and food preservations and adulteration
4	May	Quick Revision and discussion

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Session 2023-24 (Even Semester)

Name of the Assistant Professor: *Natasha Kaushal, Nitin Kumar Verma, Mandeep Singh*

Class: *B.Sc. I MDC (2nd Sem)*

Subject: *MDC*

Sr. No.	Month	Topic
1	<i>February January</i>	Renowned Indian Scientists Brief Biography of Renowned Indian Scientists (Hargobind Khurana, Dr. P.C. Ray, Sir C.V. Raman, Dr. A.P.J. Abdul Kalam, C. N. R. Rao, Dr. Vikram Sara Bhai, Dr. Homi Jahangir Bhabha, Dr. J.C. Bose, Dr. S. N. Bose)
2	<i>March February</i>	Metal and Non - Metals Periodic table, classification of elements, physical and chemical aspects of metals and non - metals, Ore and Minerals of Iron, Copper, Aluminium, alloys Physical Properties of Matter Classification of matter, properties, uses, ideal gas equation, real gas equation, some important compounds (baking soda, washing soda, plaster of Paris, gypsum, glass)
3	<i>April March</i>	Soil and fertilizers Green revolution, soil: types of soil and their components for fertility, grow condition, pH, irrigation, biofertilizers, chemical fertilizers and their uses, acid rain.
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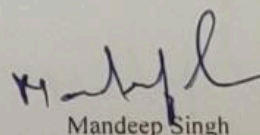
Session 2023-2024 (Even Semester)

Name of the Assistant Professor: *Mandeep Singh*

Class: *B.Sc. III (6th Sem)*

Subject: *Inorganic Chemistry*

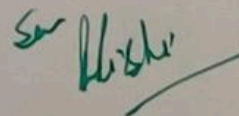
Sr. No.	Month	Topic
1	Jan, 2024	Section- A Acids and Bases Arrhenius, Bronsted-lowry, Lux-flood, solvent system and Lewis concept of acids and bases, relative strength of acids and bases, levelling solvents, hard and soft acids and bases(HSAB), Applications of HSAB principle. REVISION
2	Feb, 2024	Organometallic 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. REVISION
3	March, 2024	Section – B 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. REVISION
4	April and May, 2024	Silicones and Phosphazenes: Nomenclature, classification, preparation and uses of silicones, elastomers, polysiloxane copolymers, poly phosphazenes and bonding in triphosphazene. REVISION



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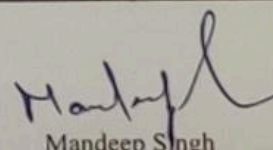
Session 2023-2024 (Even Semester)

Name of the Assistant Professor: *Mandeep Singh*

Subject: *Inorganic Chemistry*

Class: *B.Sc. II (4th Sem)*

Sr. No.	Month	Topic
1	Jan, 2024	Section- A 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. REVISION
2	Feb, 2024	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. REVISION
3	March, 2024	Section- B Quantitative Analysis Chemistry of analysis of various groups of basic and acidic radicals, chemistry of identification of acid radicals in typical combination, chemistry of interference of acid radicals including their removal in the analysis of basic radicals, REVISION
4	April and May, 2024	Quantitative Analysis Common ion effect, solubility product, theory of precipitation, co-precipitation, post precipitation, purification of precipitates. REVISION



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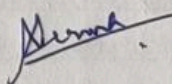
Session 2023-24 (Even Semester)

Name of the Assistant Professor: *Nitin Kumar Verma*

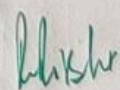
Class: *B.Sc. II (4th Sem)*

Subject: *Organic Chemistry*

Sr. No.	Month	Topic
1	January	<p style="text-align: center;">Infrared (IR) absorption spectroscopy</p> <p>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.</p> <p style="text-align: center;">Amines</p> <p>Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines.</p> <p>Assignment</p>
2	February	<p>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.</p> <p style="text-align: center;">Diazonium Salts</p> <p>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 hydrazines, coupling reaction and its synthetic application.</p> <p>Test</p>
3	March	<p style="text-align: center;">Aldehydes and Ketones</p> <p>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.</p> <p>Assignment</p>
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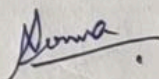
Session 2023-24 (Even Semester)

Name of the Assistant Professor: *Nitin Kumar Verma*

Class: *B.Sc. III (6th Sem)*

Subject: *Organic Chemistry*

Sr. No.	Month	Topic
1	January	<p style="text-align: center;">Organic Synthesis via Enolates</p> <p>Acidity of α-hydrogens, alkylation of diethyl malonate and ethyl acetoacetate. Synthesis of ethyl acetoacetate: the Claisen condensation. Keto-enol tautomerism of ethyl acetoacetate.</p> <p style="text-align: center;">Heterocyclic Compounds</p> <p>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>Assignment</p>
2	February	<p>Introduction to condensed five and six- membered heterocycles. Preparation 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.</p> <p style="text-align: center;">Amino Acids, Peptides & Proteins</p> <p>Classification, of amino acids. Acid-base behavior, isoelectric point and electrophoresis. Preparation of α-amino acids. Structure and nomenclature of peptide s and proteins. Classification of proteins. Peptide structure determination, end group analysis, selective hydrolysis of peptides.</p> <p>Test</p>
3	March	<p>Classical peptide synthesis, solid- phase peptide synthesis. Structures of peptides and proteins: Primary & Secondary structure.</p> <p style="text-align: center;">Synthetic Polymers</p> <p>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. Natural and synthetic rubbers.</p> <p>Assignment</p>
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Lesson Plan Session 2024-25

Name: Ms. Natasha kaushal

Subject: Physical CHEMISTRY

Class: B.Sc. 2nd

Semester: 4

Month/ Working Days	Details
January	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 & T, entropy as a function of P & T, entropy change in physical change, entropy as a criteria of spontaneity and equilibrium
February	Third law of thermodynamics: Nernst 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. Electrolytic and Galvanic cells – reversible & irreversible cells, conventional representation of electrochemical cells. Calculation of thermodynamic quantities of cell reaction (ΔG , ΔH & K).
March	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. Applications of EMF measurement in solubility product and potentiometric titrations using glass electrode. More stress on numerical problems.
April	ASSIGNMENTS AND TESTS

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Lesson Plan Session 2024-25

Name: Ms. Natasha kaushal

Subject: Physical CHEMISTRY

Class: B.Sc. 3rd

Semester: 6

Month/ Working Days	Details
January	Need for statistical thermodynamics, thermodynamic probability, Maxwell Boltzmann distribution statistics, Born oppenheimer approximation, partition function and its physical significance. Factorization of partition function. Photochemistry Interaction of radiation with matter, difference between thermal and photochemical processes. Laws of photochemistry: Grotthus-Draper law, StarkEinstein law (law of photochemical equivalence), Jablonski diagram depicting 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).
Feburary	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 –Example – water system. Phase equilibria of two component systems solid-liquid equilibria, simple eutectic Example Pb-Ag system, desilverisation of lead.
March	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
April	ASSIGNMENTS AND TESTS

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