Lesson Plan

Session 2023-2024 (Odd Semester)

Name of the Assistant Professor: ***Mandeep Singh***

Class: ***B.Sc. II (3rd Sem)*** Subject: ***Inorganic Chemistry***

Sr. No.	Month	Topic
1	August, 2023	**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. **REVISION**
2	September,2023	**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 $Ni(CO)_4$. **REVISION**
2	October,2023	**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. **REVISION**
3	November,2023	**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. **REVISION**

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Lesson Plan

Session 2023-2024 (Odd Semester)

Name of the Assistant Professor: ***Mandeep Singh***

Class: ***B.Sc. III (5th Sem)*** Subject: ***Inorganic Chemistry***

Sr. No.	Month	Topic
1	August, 2023	**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. **REVISION**
2	September,2023	**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. **REVISION**
3	October,2023	**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. **REVISION**
4	November,2023	**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. **REVISION**

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Lesson Plan

Session 2023-2024 (Odd Semester)

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

Class: ***B.Sc. I (Ist Sem)*** Name of Course: Chemistry I

Sr. No.	Month	Topic
1	August, 2023	**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 Ψ2 , 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. **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.
2	September, 2023	**Gaseous State** Kinetic theory of gases, Maxwell's distribution of velocities and energies (derivation excluded) Calculation of root mean square 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 behaviour, Derivation of Van der Waal' s Equation of State, its application in the calculation of Boyle' s temperature (compression factor) **Critical Phenomenon** Concept of Critical temperature, critical pressure, critical volume, relationship between critical constants and Van der Waal' s constants (Derivation excluded).
3	October, 2023	**Structure and Bonding** Localized and delocalized chemical bond, Van der Waals interactions. Concept of resonance and its applications, hyperconjugation, inductive effect, Electromeric effect and their comparison. **Mechanism of Organic Reactions** Curved arrow notation, homolytic and heterolytic bond fission. Types of reagents: electrophiles and nucleophiles. Types of organic reactions: Substitution, Addition, Condensation, Elimination, Rearrangement, Isomerization and Pericyclic reactions. Reactive intermediates: Carbocations, carbanions, free radicals, carbenes (structure & stability).
4	November, 2023	**Liquid State** Structure of liquids, Properties of liquids – surface tension, refractive index, viscosity, vapour pressure and optical rotation. **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; X-ray diffraction, Bragg's law, a simple account of Laue method, rotating crystal method and powder pattern method.

Natasha Mandeep Singh Nitin Kumar Verma

Natasha

Principal

Lesson Plan

Session 2023-24 (Odd Semester)

Name of the Assistant Professor: *Nitin Kumar Verma*

Class: ***B.Sc. III (Vth Sem)***

Subject: ***Organic Chemistry***

Sr. No.	Month	Topic
1	July & August 2023	**Carbohydrates** Classification and nomenclature of Monosaccharides, mechanism of osazone formation, interconversion of glucose and fructose, chain lengthening and chain shortening of aldoses. Configuration of monosaccharides. Erythro and threo diastereomers. **Test**
2	September 2023	Conversion of glucose into mannose. Formation of glycosides, Determination of ring size of glucose and fructose. Open chain and cyclic structure of D(+)-glucose & D(-) fructose. Mechanism of mutarotation. Structures of ribose and deoxyribose. An introduction to di saccharides (maltose, sucrose and lactose) and polysaccharides (starch and cellulose) without involving structure determination. **Assignment**
3	October 2023	**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 signals and coupling constants, magnetic equivalence of protons. **Assignment**
4	November 2023	Discussion of PMR spectra of the molecules: 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. **Organometallic Compounds** Organomagnesium compounds: the Grignard reagents-formation, structure and chemical reactions. Organozinc compounds: formation and chemical reactions. Organolithium compounds: formation and chemical reactions. Quick Revision and discussion

Nitin Kumar Verma

Chemistry Department

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Lesson Plan

Session 2023-24 (Odd Semester)

Name of the Assistant Professor: *Nitin Kumar Verma*

Class: ***B.Sc. II (III^{d} Sem)***

Subject: ***Organic Chemistry***

Sr. No.	Month	Topic
1	July & August 2023	**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 HIO_4] and pinacol-pinacolone rearrangement. **Assignment**
2	September 2023	**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. **Test**
3	October 2023	**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. **Ultraviolet (UV) absorption spectroscopy** Absorpt ion 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 λ_{max} of simple conjugated dienes and α,β -unsaturated ketones. Applications of UV Spectroscopy in structure elucidation of simple organic compounds. **Assignment**
4	November 2023	**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 acyl derivatives. Physical properties, interconversion of acid derivatives by nucleophilic acyl substitution. Mechanisms of esterification and hydrolysis (acidic and basic). Quick Revision and discussion

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