**Smt. A.A.A. Govt. P. G. College, Kalka**

**Department Of Chemistry**

**Name of Assistant Professor: Dr. Indu Lesson Plan (April 2022 to July 2022)**

| **Class & Paper** | **Month** | **Topic** |
| --- | --- | --- |
| **B. Sc. I (Sem-II)**  **(Organic Chemistry)** | **April 2022** | **Alkenes:** Nomenclature of alkenes, mechanisms of dehydration of alcohols and dehydrohalogenation of alkyl halide. The Saytzeff rule, Hofmann elimination, physical properties and relative stabilities of alkenes. |
| **May 2022** | 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:** 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-general pattern of the mechanism, mechanism of nitration, halogenation, sulphonation and Friedel-Crafts reaction. Energy profile diagrams. Activating, deactivating substituents and orientation |
| **June 2022** | **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. |
| **July 2022** | **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 a ryl 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. |
| **B. Sc. I (Sem-II)**  **(Inorganic Chemistry)** | **April 2022** | **Hydrogen Bonding and Van der Waals forces:** Hydrogen Bonding- Definition, types, effects and application, Brief discussion of various types of Van der Waals forces.  **Metallic Bond and semiconductors:** Metallic bond – Qualitative idea of valence bond and Band theories of metallic bond (conductors, semiconductors, insulators).  Semiconductors – Introduction, types and applications |
| **May 2022** | **s-Block elements:**Comparative study of the elements including diagonal relationship, Anomalous behaviour of Lithium and Beryllium, salient features of hydrides, oxides, halides, hydroxides (methods of preparation excluded), behavior of solution in liquid NH3. **Chemistry of Noble Gases:** General physical properties, low chemical reactivity, chemistry of xenon, structure and bonding in fluorides, oxides and oxyfluorides of xenon. |
| **June 2022** | **p-Block elements:** Electronic configuration, atomic and ionic size, metallic character, melting point, ionization energy, electron affinity, electronegativity, inert pair effect and diagonal relationship.  **Boron family ( 13th group):** Diborane: Preparation, properties and structure (as an example of electron deficient compound and multicenter bonding), Borazine chemical properties and structure, relative strength of Trihalide of Boron as lewis acids, structure of aluminium(III) chloride.  **Carbon family and Nitrogen family (14th and 15th group):** Catenation, Carbides, fluoro carbons, silicates (structural aspects), Oxides: Structure of oxides of nitrogen and phosphorus, Oxyacids: Structure and relative acid strength of oxy acids of nitrogen and phosphorus, structure of white and Red phosphorus. |
| **July 2022** | **Oxygen family (16th group):** Oxy acids of sulphur – structure and acidic strength, Hydrogen Peroxide-properties and uses.  **Halogen family (17th group):** Interhalogen compounds (their properties and structures), Hydra and oxyacids of chlorine-structure and comparison of acid strength, cationic nature of Iodine. |
| **B. Sc. II (Sem-IV)**  **(Organic Chemistry)** | **April 2022** | **Infrared (IR) absorption spectroscopy** Molecular vibrations, Hooke's law, selection rules, intensity and position of IR bands, measurement of IR spectrum, fingerprint region, characteristic absorptions of various functional groups and interpretation of IR spectra of simple organic compounds. Applications of IR spectroscopy in structure elucidation of simple organic compounds. |
| **May 2022** | **Amines** Structure and nomenclature of amines, physical properties. Separation of a mixture of primary, secondary and tertiary amines. Structural features affecting basicity of amines. Preparation of alkyl and aryl amines (reduction of nitro compounds, nitriles, reductive amination of aldehydic and ketonic compounds. Gabrielphthalimide reaction, Hofmann bromamide reaction. Electrophilic aromatic substitution in aryl amines, reactions of amines with nitrous acid.  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. |
| **June 2022** | **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. |
| **July 2022** | 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, WolffKishner, LiAlH4 and NaBH4 reductions. |

| **Class & Paper** | **Month** | **Topic** |
| --- | --- | --- |
| **B. Sc. III (Sem-VI)**  **(Organic Chemistry)** | **April 2022** | **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. |
| **May 2022** | **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. Introduction to condensed five and six- membered heterocycles. |
| **June 2022** | 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.  **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. |
| **July 2022** | **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. Natural and synthetic rubbers. |
| **B. Sc. III (Sem-VI)**  **(Inorganic Chemistry)** | **April 2022** | **Acids and Bases**  Arrhenius, Bronsted-lowry, Lux-flood, solvent system and Lewis concept of acids and bases relative strength of acids and bases, |
| **May 2022** | levelling solvents, hard and soft acids and bases(HSAB), Applications of HSAB principle. |
| **June 2022** | **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, |
| **July 2022** | Structure and bonding in metal-ethylenic complexes, Structure of Ferrocene, classification in metal carbonyls, preparation, properties and bonding in mononuclear carbonyls. |