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**Syllabus for Recruitment Examination of**  
**Post Graduate Teacher (Chemistry)**

**PAPER-I**

**Unit 1:- Co-ordination compounds and Organo- Metallics**

Introduction, definition of co-ordination compounds, co-ordination Number, Werner's co-ordination theory, ligands and their types, IUPAC- nomenclature of co-ordination compounds, Isomerism, bonding in co-ordination compounds: valence bond theory and crystal field theory, Colour and magnetic properties in co-ordination compounds, biological importance of co-ordination compounds. Organo-Metallics : Types and nomenclature. Metal carbonyls, its preparation, properties and uses. Grignard reagents.

**Unit 2 :-Concept of organic chemistry**

Hybridisation of carbon in organic compounds, sigma and pi-bonds, shapes of simple organic molecules, structural and geometrical isomerism, optical isomerism of compounds containing up to two asymmetric centres (EZ concept excluded) IUPAC- nomenclature of simple organic compounds with different functional groups, conformations in Ethane and Butane (Newman and Projections), chain and Boat forms of cyclohexane, Resonance and hyperconjugation, keto- enol tautomerism determination of empirical and molecular formula of simple compound (only combustion method) hydrogen bonds- definition and their effect on physical properties of alcohol and carboxylic acids, inductive and resonance effect on acidity and basicity of organic acids and bases polarity and inductive effect in alkyl halides, reactive intermediate produced during homolytic and heterolytic bond cleavage: formation, structure and stability of carbocations, carbanions and free radicals

**Unit 3:-Hydrocarbons**

Nature and classification of hydrocarbons (aliphatic and aromatic), IUPAC nomenclature. Alkanes: Preparation, physical properties and chemical reactions including free radical mechanism halogenation, combustion and pyrolysis, isomerism in alkanes. Alkenes and Alkynes: Structure of double bonds (in alkenes) and triple bonds (in alkynes), geometrical isomerism in alkenes, Preparation, properties and reactions of alkenes and alkynes, addition of hydrogen, halogens, water, hydrogen halides (Markovnikov's rule and peroxide effect). Mechanism of electrophilic addition, acidic nature of alkenes and alkynes, reaction of alkenes with potassium permanganate, ozonolysis of alkenes and alkynes, Alkadienes, its classification, preparation of conjugate dienes. Benzene: Resonance, aromaticity, Chemical properties, Electrophilic substitution of Benzene (Halogenation, Nitration,

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Sulphonation, Friedel–craft alkylation and acylation), effect of ortho, meta, para directing group in monosubstituted benzene, Benzene; Carcinogenic nature and toxicity.

#### Unit 4:- Haloalkanes and Haloarenes

Introduction, classification of Halogen derivatives of hydrocarbons as aliphatic halogen compounds, nature of carbon atoms, classification on the basis of type of hybridization of carbon bonded to the halogen atom, Nomenclature of haloalkanes and haloarenes, isomerism in haloalkanes and haloarenes, methods of preparation, properties(physical and chemical) of haloalkanes and haloarenes, test to distinguish alkylhalides and arylhalides, mechanism and definition of  $SN^2$  and  $SN^1$  reaction. Reactivity of alkyl halides towards  $SN^2$  reaction and  $SN^1$  reaction, some basic concept about optical activity and optical isomerism, stereo-chemical aspects of nucleophilic substitution reaction of  $SN^2$  and  $SN^1$ , uses and environment effect of dichloromethane, trichloromethane, tetrachloromethane, iodoform, freons DDT.

#### Unit 5:- Alcohols, Phenols and Ethers

**Alcohols:** Nomenclature, nature of C-O bond, physical and chemical properties, mechanism of substitution reaction, mechanism of dehydration, uses. Some important compound(methanol and ethanol), Identification of primary, secondary and tertiary alcohol. Phenols: its nomenclature, method of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reaction, uses of phenols, Kolbe's and Reimer – Tieman reactions.

**Ether :-** Its nomenclature, methods of preparation, physical and chemical properties, uses.

#### Unit 6:-Aldehydes, Ketones and Carboxylic Acids

**Aldehydes and Ketones :-** Their nomenclature, isomerism, methods of their preparation (common as well as individual preparation) physical properties and chemical properties Aldol condensation, Cannizzaro reaction, Rosemund's reduction, Clemmensen reduction Perkin reaction. Relative reactivity of Aldehydes and Ketones, uses of formaldehyde, acetaldehyde, acetone and benzaldehydes, distinction between aldehydes and ketones Gatterman- Koch reaction, Etard reaction, Stephen reaction, Wolff-Kishner reduction, acidity of alpha hydrogen's of aldehydes and ketones, (aldol condensation).

**Carboxylic Acids :-** Its nomenclature, structure of carboxyl group, methods of preparation physical and chemical properties and uses of Carboxylic acids. Acidity and effect of substituent's on acid strength of carboxylic acids. Derivatives of carboxylic acid (Anhydride, acid chloride, amide and ester): preparation, properties and uses