

GOVT. COLLEGE (AUTONOMOUS), RAJAHMUNDRY

DEPARTMENT OF CHEMISTRY

SYLLABUS FOR B.Sc. FIRST YEAR SEMESTER I

FROM 2018 -19 ONWARDS

INORGANIC & ORGANIC CHEMISTRY

Course Code: CHE101

INORGANIC CHEMISTRY

UNIT- I: P-block elements-I

15

hrs

General characteristics of elements of groups 13, 14, 15, with special reference to metallic,

acidic nature, oxidation states, I.P, E.A., E.N.

Group-13: Synthesis and structure of diborane and higher boranes (B_4H_{10} and B_5H_9),

Boron-Nitrogen compounds ($B_3N_3H_6$ and BN), carboranes

Group-14: C_{60} and its compounds-Intercalation compounds of graphite,

Preparation and application of Carbides, Silicones and silicates

Group-15: Preparation and reactions of 1. Hydrazine, 2. Hydroxylamine,

Phosphazenes.

Unit-II: P-block elements-II

6

hrs

General characteristics of elements of groups 16, 17, with special reference to metallic,

acidic nature, oxidation states, I.P, E.A., E.N

Group - 16: Classification of oxides based on (i) Chemical behaviour and (ii) Oxygen

content- Structures of oxo acids of sulfur.

Group-17: Classification, preparation and structures of inter halogen compounds-

definition and examples of pseudo halogens.

Additional input: Hydrazoic acid; Polyhalides and their structures.

Organ metallic Chemistry

5

hrs

Definition and classification of Organo metallic compounds-nomenclature,

preparation, properties and applications of alkyls of I, 2 and 13 group elements (Li, Mg, Al) With special reference to Grignard reagent (RMgX) and Gilman reagent (R₂CuLi).

Additional input : Organo cadmium compounds, Special properties of Li.

General Principles of Inorganic qualitative analysis **4 hrs**

Anion analysis: Theory of sodium carbonate extract, classification and reactions of anions- CO₃²⁻, Cl⁻, Br⁻, SO₄²⁻, PO₄³⁻, BO₃³⁻. CH₃COO⁻, NO³⁻. Cation Analysis: Principles involved - Solubility product, common ion effect, general discussion for the separation group reagents, testing of cations.

ORGANIC CHEMISTRY

Unit –III: Structural Theory in Organic Chemistry **10hrs**

Types of bond fission and organic reagents (Electrophilic, Nucleophilic, and free radical reagents including neutral molecules like H₂O, NH₃ & AlCl₃). Free radicals, carbonium ions, carbanions. Carbenes, allenes, and nitrenes.

Bond polarization: Inductive effect. Application of inductive effect (a) Basicity of amines (b) Acidity of carboxylic acids (c) Stability of carbonium ions. Resonance or Mesomeric effect, application to (a) acidity of phenol, and (b) acidity of carboxylic acids. Hyper conjugation and its application to stability of carbonium ions.

Types of Organic reactions: (mechanism not required)

Addition - Electrophilic, Nucleophilic and free radical. **Substitution** - Electrophilic, Nucleophilic and free radical.

Elimination- Examples.

Additional input: S_N¹, S_N² mechanisms

Unit - IV: Unsaturated Hydrocarbons and Alicyclic Hydrocarbons Acyclic Hydrocarbons **10 hrs**

Alkenes - Preparation of alkenes (a) by dehydration of alcohols (b) by dehydro halogenation of alkyl halides (c) by dehalogenation of 1,2 dihalides (brief mechanism), Saytzev's rule. Properties: 1) Addition of hydrogen - heat of hydrogenation and stability of alkenes. 2) Addition of halogen and its mechanism, 3) Addition of HX, Markonikov's rule, 4) addition of H₂O. 5) HOX, 6)

H₂SO₄ with mechanism and 7) addition of HBr in the presence of peroxide (anti - Markonikov's addition). 8) Oxidation -9) hydroxylation by KMnO₄ ,10) OsO₄, 11)per acids (via epoxidation)12) hydroboration

Alkadienes - Types of dienes, reactions of conjugated dienes - 1,2 and 1,4 addition of HBr to 1,3 - butadiene and Diel's - Alder reaction.

Additional input: Ozonolysis, Polymerisation, polymers in daily life

Alkynes - Preparation by 1) dehydrohalogenation of dihalides,2) dehalogenation of tetrahalides; Properties; Acidity of acetylenic hydrogen (formation of Metal acetylides). Preparation of higher acetylenes, Metal ammonia reductions Physical properties. Chemical reactivity - Electrophilic addition of 1) X₂, 2) HX, 3) H₂O (Tautomerism), 4) Oxidation with KMnO₄, 5) OsO₄, 6) reduction and 7) Polymerization reactions of acetylene.

Additional input: Ozonolysis

Alicyclic Hydrocarbons (Cyclo Alkanes) 4 hrs

Nomenclature, Preparation by 1) Freund's methods,2) heating dicarboxylic metal salts. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes.

Stability of cyclo alkanes -1) Baeyer's strain theory, 2) Sachse and Mohr predictions and Conformational structures of cyclohexane.

Additional input: Conformers of cyclo pentane

UNIT -V: Benzene And Its Reactivity

6 hrs

Concept of Aromaticity - Aromaticity (definition), Huckel's rule- application to

Benzenoid (Benzene, Naphthalene) and Non - Benzenoid compounds (cyclo propenyl cation, cyclopentadienyl anion and tropylium cation). Antiaromaticity-examples.

Reactions- General mechanism of Electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation.

Polynuclear Hydrocarbons – naphthalene reactivity towards electrophilic substitution. Nitration and sulfonation as examples.

Orientation of aromatic substitution - Definition of ortho, para and meta directing

groups. Ring activating and deactivating groups with examples (Electronic

interpretation of
various groups like NO_2 and Phenolic).

Orientation of (i). Amino, methoxy and methyl groups (ii) . Carboxy, nitro, nitrile, carbonyl and Sulfonic acid groups. (iii). Halogens (Explanation by taking minimum of one example from each type).

Additional input:Hammett and Illingworth's rules.
