

**OBJECTIVES:** To enable the students to –

- Acquire knowledge about *p*-block elements, some selective component preparations, properties and their structures.
- Gain the knowledge and acquire ability in presenting the various molecular structures in their respective special arrangements. To be able to formulate and discriminate VSEPR theory & MOT theory.
- Learn basics of Organic Chemistry in the topics of Basic concepts of Organic Chemistry and Types of organic reactions.
- Study the structure of Benzene, Orientation which is essential for the understanding of Basics and Mechanisms of Organic Chemistry.

**COURSE:**

**UNIT – I:**

**1. p-block elements**

- 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)
- Group - 14: Preparation and applications of silanes and silicones.
- Group - 15: Preparation and reactions of hydrazine, hydroxylamine.
- Group - 16: Classifications of oxides based on (i) Chemical behaviour and (ii) Oxygen content
- Group-17: Inter halogen compounds and pseudo halogens.

**2. CHEMICAL BONDING**

Valence bond theory, hybridization, Valence bond theory applied to  $ClF_3$ ,  $BrF_5$ ,  $Ni(CO)_4$ ,  $XeF_2$ . Molecular Orbital theory: Linear combination of Atomic orbitals, M.O. diagrams of some homo-nuclear and hetero nuclear diatomic molecules like  $N_2$ ,  $O_2$ ,  $CO$ ,  $NO$  systems; their bond order and magnetic property. Comparison of valence bond and molecular orbital theories.

**UNIT – II:**

- 3. Structural theory in Organic Chemistry:** Types of bond fission and organic reagents. (Electrophilic, Nucleophilic and free radical reagents including neutral molecules  $H_2O$ ,  $NH_3$ ). Reaction Intermediates: Free radicals, Carbonium ions, carbanions, carbenes and nitrenes. Bond polarization: Factors influencing the polarization of covalent bonds, electro negativity - 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,
- 4. Some important aspects of Hydrocarbons:** Types of Organic reactions: Addition - electrophilic, nucleophilic and free radical. Substitution - electrophilic, nucleophilic and free radical. Elimination- Examples. Addition of halogen to ethylene and its mechanism. Addition of HX, Markonikov's rule, addition of  $H_2O$ , HOX,  $H_2SO_4$  with mechanism and addition of HBr in the presence of peroxide (anti - Markonikov's addition). Dienes- Types of dienes, 1,2 and 1,4 addition of HBr to 1,3 -butadiene and Diel's - Alder reaction. Acidity of acetylene, electrophilic addition of  $X_2$ , HX,  $H_2O$  (Tautomerism), Oxidation with  $KMnO_4$ ,  $OsO_4$ , reduction and Polymerization reaction of acetylene.

### UNIT – III:

5. **Alicyclic hydrocarbons (Cycloalkanes):** Nomenclature- Preparation by Freund's method, Wislicenus method. Properties - reactivity of cyclopropane and cyclobutane by comparing with alkanes, Stability of cycloalkanes - Baeyer's strain theory, Sachse and Mohr predictions and Pitzer's strain theory. Conformational structures of cyclobutane, cyclopentane, cyclohexane.
6. **Benzene and its Aromaticity:**
  1. Concept of resonance, resonance energy. Heat of hydrogenation, heat of combustion of benzene, mention of C-C bond lengths and orbital picture of benzene.
  2. Concept of aromaticity – aromaticity (definition), Huckel's rule – application to benzenoid (Benzene, Naphthalene, Anthracene) and Non-Benzenoid compounds (cyclopropenyl cation, cyclopentadienyl anion and tropylium cation).
  3. Reactions – General mechanism of Electrophilic substitution, mechanism of nitration. Friedel Craft's alkylation and acylation. 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<sub>2</sub> and phenolic). Orientation of  
i. Amino, methoxy and methyl groups  
ii. Carboxy, nitro, nitrile, carboxyl and sulfonic acid groups.  
iii. Halogens (Explanation by taking minimum of one example from each type).

### REFERENCES:

1. Inorganic Chemistry by P.L.Soni-Sulthan Chand & Sons-Educational Publishers, New Delhi.
2. Text Book of Inorganic Chemistry by Huhey-E.A.Keiter: R.A.Keiter-IV Harpor Collins College Publishers.
3. Theoretical Inorganic Chemistry by Mc Day & J.Selbin-Reinhold Publishing Corporation, New York-Affiliated East-West Press Pvt. Ltd..., New Delhi.
4. Unified course in Chemistry (Vol.1) – Y.R.SHARMA & Dr. K.RAMA RAO – kalyani publishers Ludhiana Fourth Edition, 2014.
5. Unified course in Chemistry (Vol.1) – Dr. O.P.Agarwal & AVINASH Agarwal – Jai Prakash Nath & Co., Meerut. Sixty Fourth Edition, 2014.
6. Organic Chemistry – Robert T.Morrison & Robert B.Boyd – Published by Prentice Hall or India Pvt. Ltd., New Delhi – 110001.
7. Advanced Organic chemistry – B.S.Bahl & Arun Bahl – S.Chand & Company – Ramnagar, New Delhi – 110055.
8. A Text Book of Organic chemistry by I L Finar Vol I

## Practical - I

**ST.JOSEPH'S COLLEGE FOR WOMEN (AUTONOMOUS), VISAKHAPATNAM**  
**I SEMESTER CHEMISTRY 3 Hrs/Week**  
**CH 1251 (1) QUALITATIVE INORGANIC ANALYSIS – I Max. Marks: 50**  
**w. e .f 2017-2018'AE' batch PRACTICAL SYLLABUS**

**OBJECTIVE :** To enable the students to acquire skills necessary for qualitative analysis of inorganic salts containing one anion and one cation.

Analysis of simple salt containing one anion and cation from the following

**Anions:** Sulphate, chloride, bromide, nitrate, acetate, borate, phosphate, tartrate, oxalate.

**cations:** Lead, copper, cadmium, iron, aluminum, zinc, chromium, manganese, nickel, cobalt, calcium, strontium, barium, potassium, ammonium and Magnesium.

### REFERENCES :

1. Text Book of Macro and semi micro qualitative analysis, A. I. Vogel, Longman England.
2. Semi micro Qualitative Analysis, F. J. Welcher.
3. Inorganic Semi micro Qualitative Analysis V. V. Ramanujan.