

CORE COURSE III - GENERAL CHEMISTRY - II

Unit 1: Chemical Bonding

Ionic bond – Lattice Energy – Born – Haber Cycle – Pauling and Muliken's Scales of electro negativity – Polarizing power and Polarisability – partial ionic character from electro negativity – Transitions from ionic to covalent character and vice versa – Fajan's rule.

VESPR Theory – Shapes of simple inorganic molecules (BeCl_2 , SiCl_4 , PCl_5 , SF_6 , IF_7 , NH_3 , XeF_6 , BF_3 , H_2O) - VB Theory – Principles of hybridization – BeCl_2 – MO Theory – Bonding and antibonding orbitals – Application of MO Theory to H_2 , He_2 , N_2 , O_2 , HF and CO – Comparison of VB and MO Theories.

Unit 2: CHEMISTRY OF s-BLOCK ELEMENTS

Position of Hydrogen in the Periodic Table, atomic hydrogen, nascent hydrogen, occluded hydrogen, uses of hydrogen. General characteristics of s-block elements – General characteristics of Group IA – diagonal relationship between Li and Mg – Extraction of Lithium – Physical and Chemical properties of Lithium – Uses – Extraction of Sodium – Physical and Chemical properties – Uses – Preparation of NaOH (Laboratory and Industrial methods) – Properties – Uses – Preparation of Na_2CO_3 (Laboratory and Industrial methods) – Properties – Uses – Extraction of Potassium – Properties – Uses – Chemistry of KOH , KBr and K_1 .

General characteristics of Elements of Group 11A – diagonal relationship between Be and Al – Extraction of Beryllium – Physical and Chemical properties of Be – Uses Extraction of Mg – Physical and Chemical properties – Uses – Chemistry of some compounds of Mg: MgCO_3 , MgSO_4 , MgCl_2 , $\text{Mg}(\text{NH}_4)\text{PO}_4 \cdot 6\text{H}_2\text{O}$ – Extraction of Ca – Physical and Chemical properties – Uses – Cement manufacture – Types – Chemistry of setting of cement.

Unit 3: CHEMISTRY OF ALKENES, ALKYNES AND DIENES

Nomenclature – Geometrical Isomerism – Petroleum source of alkenes and aromatics – General methods of preparation of alkenes – Chemical properties – Uses – Elimination mechanisms (E_1 , E_2 , E_1cB) – Electrophilic, Free radical additions – Ziegler – Natta Catalytic polymerization of ethylene – polymers of alkene derivatives.

Nomenclature General methods of preparation of alkynes – Physical properties – Chemical properties – Uses – Types of alkadienes – General methods of preparation of Dienes – Physical properties – Chemical properties – Uses – Mechanisms of electrophilic and Free radical addition reactions – Polymers – Rubber as a natural polymer – Types of polymerization reactions – Mechanisms of Ionic and Free radical polymerization reactions – Chemistry of Vulcanization of rubber – Chemistry of manufacture of Film sheets, Rayon and Polycyclic fibres – Uses of Polymers.

Unit 4: CHEMISTRY OF BENZENE AND OTHER BENZENOID COMPOUNDS

General methods of preparation of benzene – Chemical properties – Uses – Electrophilic substitution mechanism – Orientation and reactivity in substituted benzenes. Types of Polynuclear Aromatic compounds – Nomenclature – Naphthalene from coal tar and petroleum – Laboratory preparation Structure of Naphthalene – Aromatic character – Physical properties – Chemical properties – Uses – Mechanism of Aromatic electrophilic substitution – Theory of orientation and reactivity – Anthracene, Phenanthrene from tar and petroleum – Laboratory preparation- Molecular Orbital structures – Aromatic Characters – Physical Properties - Chemical properties – Uses – Preparation of biphenyls – Physical and Chemical properties – Uses.

Unit 5: GASEOUS STATE

Maxwell's distribution of Molecular velocities (Derivation not required). Types of Molecular velocities – Mean, Most probable and root mean square velocities. Graphical representation and its significance – Collision diameter, Mean free path and collision number – Transport properties – Thermal conductivity, Viscosity and Diffusion – Law of equipartition of energies – Degree of freedom. Molecular basis of Heat capacity – Real gases – vander. Waals equation of states – derivation – significance of critical constants – Virial equations of state – Law of corresponding states – Compressibility factor.

Books for Reference:

- 1 Puri B.R., Sharma L.R., Kalia K.K., Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Lee J.D., Concise Inorganic Chemistry, UK, Black well science (2006).
- 3 Puri B.R., Sharma L.R., Pathania M.S., Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
- 4 Glasstone S., Lewis D., Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.
- 5 Morrison R.T. and Boyd R.N., Organic Chemistry (6th edition), New York, Allyn & Bacon Ltd., (1976).
- 6 Bahi B.S. and Arun Bahl, Advanced Organic Chemistry, (12th edition), New Delhi, Sultan Chand & Co., (1997).