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Chemistry

Part – I (Senior Secondary Standard)

1 Atomic Structure :

Fundamental Particles, Modern concept of atomic structure, quantum numbers, Aufbau principle, Pauli's exclusion principle, Hund's Rules. Electronic configuration of elements, classification of elements and periodicity in properties, s, p, d and f Block elements.

2 Transition Elements

Transition elements, electronic configuration, absorption spectra including charge transfer spectra and magnetic properties, co-ordination compounds (Werner's theory). Nomenclature (IUPAC) Isomerism, Elementary M.O. approach for metallic bond and bond order. Conductors, insulators, semiconductors and super conductors.

3 Lanthanides and Actinides

Electronic configuration, oxidation states, Lanthanide and Actinide contraction, principles of isolation and application.

4 Chemical Kinetics & Surface Chemistry

Rate of chemical reaction, order of reaction, factors affecting rate of reactions, Physical adsorption and chemisorption, colloids and emulsions.

5 Solutions

Types of solutions, solubility and concentrations, vapour pressure, Ideal and real solutions, properties and calculations of molar mass.

6 Thermodynamics

Laws of thermodynamics, zeroth and first law and their applications, concept of work and heat, Gibb's energy, enthalpy and entropy.

7 Alkanes, Alkenes, Dienes and Halo-alkanes

Classification, nomenclature (R,S), methods of preparations and chemical reactions of alkanes, alkenes, alkadienes and haloalkanes.

8 Aldehydes, Ketones, Carboxylic Acids and their derivatives

Classification, nomenclature, methods of preparation, chemical reactions of aldehydes, ketones, carboxylic acids and their derivatives.

9 Aromaticity and Arenes

Aromaticity, Benzene, Alkyl-arenes, structure of benzene, electrophilic substitution reactions, orientation of functional groups.

10 Bio-molecules

Elementary treatment of carbohydrates, proteins, enzymes, vitamins & nucleic acids.

Part – II (Graduation Standard)

1 **Chemical Bonding**

Theories of chemical bonding, VB and MO theories of Diatomic molecules, VSEPR theory, Quantum mechanics, Schrodinger's wave equation for one electron system.

2 **Co-ordination Complexes**

Details of Crystal field theory for weak and strong field complexes. Comparison of VB and CFT theories. Factors affecting $10 Dq$. Thermodynamic aspects of Crystal fields, John-Teller effect.

3 **Co-ordination chemistry of Lanthanides and Actinides**

Co-ordination behaviour of Lanthanides and Actinide complexes. Magnetic and spectroscopic properties.

4 **Chemical Dynamics :**

Zero, first and second order reactions. Collision and Transition state theories and their comparison.

5 **Electrochemistry**

Electrochemical and Galvanic cells, theory of strong electrolytes. Debye and Huckel theory of activity coefficient, Nernst equation, Ionic equilibria. Fuel cells.

6 **Enthalpy and Entropy**

Enthalpy and its changes at constant pressure and temperature. Entropy as a function of temperature and volume. Hess's Law of constant heat summation, Gibbs and Helmholtz functions.

7 **Conformations and Configuration**

Conformation of alkanes (ethane, butane). Configuration of alkenes (E/Z) nomenclature. Conformations of cyclo-hexane.

8 **Name Reactions**

Nucleophilic Addition reactions and mechanism of Aldol, Cannizzaro, Perkin, Stobbe, Benzoin, Reformatsky, Knoevenagel, Baeyer–Villiger, Wittig and Mannich reactions.

9 **Halo, Nitro, Amino-Arenes and Diazonium Salts**

Preparations, Chemical properties, elimination and addition mechanism and synthetic applications of diazonium salts.

10 **Polymers and Drugs**

Polymers, Types of polymerization, natural and synthetic polymers. Drugs (antacids, anti-histamines, analgesics, antipyretics, antibiotics and antifertility).

Part – III (Post Graduation Standard)

1 **Molecular Orbital Theory**

M.O. Theory of polyatomic molecules (AX_2 , AX_3 and AX_4)

2 **Organometallic Compounds**

Organometallic compounds of Li, Mg, Sn and Fe. Structure, bonding and Applications.

3 **Super Heavy Elements**

Super heavy elements, electronic configuration and their positions in the periodic table.

4 **Kinetics and Catalysis**

Kinetics of photo-chemical reactions, Acid-Base and Enzyme catalysis.

5 **Electrochemistry**

Measurement of E.M.F., Kohlrausch's Law and its applications, Membrane equilibria.

6 **Thermodynamics**

Third Law of Thermodynamics and Joule-Thompson's experiment.

7 **Substitutions and Elimination Reactions**

S_N^1 , S_N^2 , S_N^i , E_1 and E_2 reactions of haloalkanes, Preparation and Chemical reactions of phenols, ethers and epoxides.

8 **α,β - Unsaturated Aldehydes and Ketones**

Reactions of α,β - Unsaturated Aldehydes and Ketones, Michael addition, Favorskii rearrangement.

9 **Pericyclic Reactions**

Electrocyclic, Cyclo-addition and Sigmatropic rearrangement, Photo-organic chemistry of alkenes.

10 **Environmental Pollution and Spectroscopy**

Ozone depletion, Green house effect, Global warming. Elementary idea of IR, UV and NMR techniques.