

BS23MJ1CH1
B. Sc. Semester –I Chemistry (Major-I)

Unit – I: Atomic Structure

Atomic spectrum of Hydrogen atom, De Broglie equation, Heisenberg's Uncertainty principle and its significance, Schrodinger wave equation, significance of ψ and ψ^2 , Quantum mechanical model of atom (Concept of atomic orbital), Difference between orbit and orbital, Quantum numbers and their significance, Radial and angular wave function for hydrogen atom, Radial function plots, Radial probability distribution plots, Shape of s, p and d atomic orbitals and its physical significance, Boundary surface diagram, Relative energies of orbitals, Aufbau principle and its limitations, Pauli Exclusion principle, Hund's rule of maximum multiplicity.

Unit – II: Chemical Bonding and Molecular Structure

Chemical bond, Types of bond (Ionic, Covalent, Coordinate and Metallic Bond), Conditions and factors governing the formation of ionic Bond, Born-Haber Cycle, Conditions for formation of covalent bond, Co-ordinate covalent Bond, Characteristics of ionic and covalent compounds, Condition for Hydrogen bonding, Types of hydrogen bonding, Metallic bond, Sedgwick Powel theory, VSEPR theory and its application for CH_4 , NH_3 , H_2O , ClF_3 , SF_4 , SF_6 , I_3^- , IF_7 , Hybridization of atomic orbitals, Rules for Hybridization, Types of hybridization and Shape of molecules with sp , sp^2 , sp^3 , sp^3d , sp^3d^2 hybridization. MO Theory, LCAO Theory, BOM, ABMO, NBMO, MO theory for Homo nuclear and Hetro nuclear diatomic molecules and calculate BO (H_2 , N_2 , O_2 , CO , NO)

Unit: III (A) Aromatic Hydrocarbons (only Benzene)

Preparation : from phenol, from Acetylene, from benzoic acid, from benzene sulphonic acid

Reaction : Electrophilic substitution reaction SE^2 with mechanism : Nitration, Sulphonation, Halogenation (Cl,Br), Friedel-craft's reaction (alkylation, acylation)

(B) Alkyl and Aryl Halides:

Alkyl Halides (up to 5 carbons) : Types of Nucleophilic substitution reaction (SN^1 & SN^2)

Preparation : from alkenes and alcohols.

Reaction : Hydrolysis, Nitrile, Nitro, Nitrite, iso-Nitrile.

Aryl Halides (only chloro and Bromo benzene)

Preparation : from phenol, from, Sandmeyer & Gattermann reaction

Reaction : (only chloro benzene) Aromatic substitution reaction (replacement by –OH group) and effect of nitro substituent , Benzyl reaction with mechanism ($\text{NH}_2^- / \text{NH}_3$)

Unit: IV : Stereochemistry:

Introduction, Stereo chemical aspects of organic molecules, Chirality, Optical isomerism, Enantiomers and Diastereomers, threo and erythro diastereomers, meso compounds, resolution of enantiomers, inversion, retention and racemization. Relative and absolute configuration, sequence rules, D - L and R-S system of nomenclature, Geometric isomerism — determination of configuration of geometric isomers, E & Z system of nomenclature, geometric isomerism in oximes and alicyclic compounds, Difference between configuration and conformation, Conformational analysis of Ethane, n-Butane & Cyclohexane, Axial and equatorial bonds, conformation of mono substituted Cyclohexane derivatives (only one example), Newman projection and Sawhorse formula, Fischer and flying wedge formula.

REFERENCE BOOKS

1. '*Concise Inorganic Chemistry*' by J. D. Lee, Wiley India, 5th Ed., 2013.
2. '*Basic Inorganic Chemistry*' by F. A. Cotton, Geoffrey Wilkinson, Carlos A Murillo and Manfred Bochmann, Wiley publication, 6th Ed.
3. '*Inorganic Chemistry*' by Shriver & Atkins, Oxford University Press, 5th Ed., 2013.
4. '*Introductory Quantum Chemistry*' by A. K. Chandra, Tata Mc Graw Hill Publishing Company Limited, New Delhi, 4th Ed., 2017.
5. '*Elements of Quantum Mechanics*' by Michael D. Fayer, Oxford University Press, Indian Ed.
6. '*Satya Prakash's Modern Inorganic Chemistry*' by Dr. R. D. Madan, S Chand, Revised Ed.
7. '*Concise Inorganic Chemistry*' by J. D. Lee, Blackwell Science. 5th Ed. 3. '*Inorganic Chemistry*, by James E. Huheey, Pearson, 4th Ed, 2012.
8. '*Elements of Quantum Mechanics*' by Michael D. Fayer, Oxford University Press, Indian Ed
9. '*Basic Inorganic Chemistry*' by F. A. Cotton, Wiley publication, 6th Ed.
10. '*Quantum chemistry*' by R. K. Prasad, New Age International publishers, 2nd Ed., 1996.

11. 'Organic Chemistry' by G. Marc Loudon, 4/E, 2010, Oxford University Press, Indian Edition.
12. 'Organic Chemistry' by Robert Thornot Morrison, Robert Neilson Boyd, 6/E, 1992, Prentice Hall of India Pvt Ltd, New Delhi.
13. 'Text book of Organic Chemistry' by P. L. Soni and H. M. Chawla, 26/E, 1995, Sultan Chand & Sons Publication, New Delhi.
14. 'Text book of Organic Chemistry' by P. S. Kalsi, 1999, MacMillan of India Pvt. Ltd.
15. 'Organic Chemistry' by Bhupinder Mehta, Manju Mehta, Prentice Hall of India Pvt. Ltd, New Delhi