

First year of Five Years integrated M. Sc. (Physics / Chemistry / Mathematics)**M.Sc. - I, Semester – I****L T P C****MC 101 : Chemistry – I****3 1 2 5**

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- **ATOMIC STRUCTURE AND CHEMICAL BONDING** (13 Hours)
Heisenberg's Uncertainty principle, postulates of quantum mechanics, Schrödinger wave equation: Derivation, significance of ψ^2 , Schrödinger wave equation for H - atom and particle in 1-D box, angular and radial wave function, atomic orbitals and shape of s and p orbitals, Valence bond theory, Hybridization, Resonance, VSEPR, Molecular orbital theory, molecular orbitals, bonding and energy level diagram for homonuclear and heteronuclear diatomic molecules, ionic solids, Born-Haber cycle, covalent bonds, coordinate bond, hydrogen bond, dipole moment, geometry and shape of simple molecules, Molecular structure and different kind of intermolecular forces and interactions like hydrogen bonding, hydrophobicity, π – π interaction, π –cation interaction, and properties such as melting and boiling points, dipole moment, acidity and basicity.

 - **PERIODIC TABLE AND ATOMIC PROPERTIES** (03 Hours)
Electronic configuration, periodicity in properties: ionization potential, electron affinity, ionic radii and electronegativity
 - **CHEMICAL KINETICS** (04 Hours)
Rate of reaction, order of reaction, enzyme catalyzed reaction, fast reactions, homogeneous and heterogeneous catalysis, general characteristics of catalytic reactions.

 - **THERMODYNAMICS** (07 Hours)
First law of thermodynamics, entropy, second and third laws of thermodynamics, Gibbs free energy, Helmholtz energy, chemical equilibria, Clausius Clapeyron equation
 - **ELECTROCHEMISTRY** (08 Hours)
Single electrode potential, Hydrogen electrode, Galvanic cell, EMF series, Nernst equation, Reversible electrodes, metal-metal ion electrodes, Calomel electrode, Oxidation-Reduction electrodes, Potentiometric titration, Application of electrochemistry in Corrosion control by cathodic protection, batteries, and related devices.

 - **CHEMISTRY OF WATER** (07 Hours)
Structure of water, properties, types of water (raw water, cooling water, boiler water), role of water in life sciences, Water-treatment- primary treatment and secondary treatment, types of water treatment for use in industries.

(Total Contact Time (Theory): 42 Hours)

BOOKS RECOMMENDED:

1. **Atkins P. W. and Paula D.**, *Atkin's Physical Chemistry*, Oxford University Press/Gopsons Paper Ltd, Noida, 8th Edn., 2006.
2. **Alberty R. A. and Silbey R. J.**, *Physical Chemistry*, 1st Edn., John Wiley & Sons (Asia), Singapore, 1995.
3. **Levine I. R.**, *Quantum Chemistry*, Prentice Hall India (Ltd), 1995.
4. **Lee J. D.**, *Concise Inorganic Chemistry*, 4th Edn., ELBS, 1991.
5. **Cotton F. A., Wilkinson G., Gans P. G.**, *Basic Inorganic Chemistry*, 2nd Edn., John Wiley & Sons, 1987.