Chemistry

Physical Chemistry

1. Basic principles of chemistry:- Importance of chemistry, Nature of Matter, Properties of Matter and their measurement, Uncertainty in measurements, Laws of chemical combinations, Dalton's Atomic Theory, Atomic and Molecular Masses,Mole concept and molar masses Percentage Composition, Stoichiometry and Stoichiometric Calculations

2. Atomic structure:- Sub atomic Particles, Atomic models, Developments Leading to the Bohr's model of atom, Bohr's Model for hydrogen atom, towards Quantum Mechanical model of the Atom, Quantum mechanical model of Atom, Nature of electromagnetic radiation, photoelectric effect limitations of Bohr's model, Dual nature of matter, de-Broglie's relationship, Heisnberg uncertaintiy principle, various quantum numbers (principal, angular momentum and magnetic quantum numbers) and their significance, shapes of s,p and d – orbitals, electron spin quantum number, Rules for filling electrons in orbitals-aufbau principle , Paulli's exclusion principle and Hund's rule, electronic configuration of elements, extra stability of half- filled and completely filled orbitals.

3. States of Matter:-Intermolecular Forces,Thermal Energy, Intermolecular forces vs thermal interactions, The Gascous state, The Gas laws, Ideal gas equation, Kinetic Molecular theory of Gases, Liquification of Gases, Liquid state

4. Chemical Bonding and Molecular Structure:-Kossel – Lewis approach to chemical bond formation, concept of ionic and covalent bonds, Ionic Bonding, Formation of Ionic bonds, factors affecting the formation of Ionic bonds, calculation of lattice enthalpy, Covalent Bonding, Concept of electronegetavitiy, Fajan's rule, dipole moment, Valence Shell Electron Pair Repulsion(VSEPR) theory and shapes of simple molecules, Quantum mechanical approach to covalent bonding , Valence bond theory – its important features, concept of hybridization involving s,p and d orbitals, Resonance, Molecular Orbital Theory ,LCAOs , types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbitals electronic configurations of homonuclear diatomic molecules, concept of bond order, bond length and bond energy , Elementary idea of metallic bonding , Hydrogen bonding and its applications.

5. Basic principles and applications of spectroscopy:- Rotational, vibrational, electronic, Raman, ESR, NMR

6. Thermodynamics:- Fundamental of thermodynamics , System and surroundings, extensive and intensive properties, state functions, types of processes, First law of thermodynamics ,concept of work, heat internal energy and enthalpy , heat capacity, molar heat capacity, Hess's law of constant heat summation , Enthalpies of bond dissociation, combustion ,formation, atomization,sublimation , phase transition, hydration, ionisationand solution. Second law of thermodynamics, Spontaneity of processes, ΔS of the universe and ΔG of the s system as criteria for spontaneity, ΔG° (standard Gibbs energy change) and equilibrium constant.

7. Equilibrium:- Meaning of equilibrium, concept of dynamic equilibrium. Equilibria involving physical processes: Solid - liquid, liquid - gas and solid - gas equilibria, Henry's