CHEMISTRY
PAPER-I

1. Atomic Structure and chemical bonding:- Quantum theory. Heisenberg's uncertainty principle Schrödinger wave equation (time independent), Interpretation of the wave function, particle in a one-dimensional box, quantum members, hydrogen atom wave functions. Shapes of s.p. and d. orbitals. Lonic bond: Lattice energy. Born Haber Cycle. Fajan's rule dipole moment, characteristics, of ionic compounds, electronegativity differences. Covalent bond and its general characteristics, valence bond approach. Concept of resonance and resonance energy. Electronics configuration of H_2+ H_2, N_2,O_2, F_2, NO,CO and HF molecules in terms of molecular orbital approach. Sigma and pi bonds. Bond order, bonds strength and bond length.

2. Thermodynamic:- Work heat and energy First law of thermodynamics. Enthalpy, heat capacity, Relationship between Cp and Cv. Laws of thermochemistry, Kirchoffs equation. Spontaneous and non spontaneous changes, Second Law of thermodynamics. Entropy changes in gases for reversible and irreversible processes. Third Law of thermodynamics. Free energy variations of free energy of a gas with temperature, pressure and volume. Gibbs-Helmholtz equation. Chemical potential. Thermodynamic criteria for equilibrium. Free energy change in chemical reaction and equilibrium constant. Effect of temperature and pressure on chemicalequilibrium. Calculation of equilibrium constants form thermodynamic measurements.

3. Solid State:- Forms of solids, law of constancy of interfacial angles. Crystal systems and crystal classes (crystallographic Groups). Designation of crystal faces, lattice structure and unit cell. Laws of rational indices Brag's law, X-ray diffraction by crystals. Defects in crystals, Elementary study of liquid crystal.

4. Chemical Kinetic:- Order and molecularity of a reaction. Rate equations (differential and integrated forms) of Zero, first and second order reaction. Half like of a reaction Effect of temperature, pressure and catalysts reaction rates. Collision theory of reaction rates of bimolecular reactions. Absolute reaction rate theory. Kinetics of polymerization and I photochemical reactions.

5. Electrochemistry-Limitations of Arrhenius theory of dissociation. Debye-Huckel theory of strong electrolytes and its quantitative treatment. Electrolytic conductance theory and theory of activity co-efficients Derivation of limiting laws for various equilibria and transport properties of electrolyte solutions.

6. Concentration cells, liquid junction potential, application of c.m.f. measurements of fuel cells.

7. Photochemistry:- Absorption of light Lambert Beer's law. Laws of photochemistry. Quantum efficiency. Reasons for high and low quantum yields Photo-electric cells.

8. General Chemistry of 'b' block elements;

   (a) Electronic configuration, Introduction to theories of bonding in transition metal complexes, Crystal field theory and its modification; applications of the theories in the explanation of magnetism and electronic spectra of meta complexes.

   (b) Metal Carbonyls; Cyclopentadienyl. Olefin and acetylene complexes.

   (c) Compounds with metal-metals bonds and metal atom clusters.

9. General Chemistry of 'F' block elements: Lanthanides and actinides; Separation, Oxidation states, magnetic and spectral properties.

10. Reactions in non aqueous, solvent,liquid, ammonia and sulphur dioxide).

PAPER –II

1. Reaction Mechanisms, General methods (both Kinetic and non Kinetic) of study of mechanisms of organic reactions illustrated by examples.

Formation and stability of reactive intermediates (carbocations, Carbanions, free radicals, carbench, nitrenes and benzynes.)

SN_1 and SN_2 mechanisms –$H.E_2$ and E_1 cB eliminations-cis and trans addition to carbon to carbon double bonds mechanisms of addition to carbon-Oxygen double bonds-Micheal addition- addition to conjugated carbon- carbon double bonds aromatic electrophilic and nuelephilic substitution-allylic and benzylic substitutions.

2. Pericyclic reactions; Classification and examples an elementary study a Woodward-Hoffman roles of pericyelic reactions.

3. Chemistry of the following name reactions: aldol condensation, Claisen condensation, Dieckmann reaction, perkin reaction. Reime –Ticmann reaction. Cannizzaro reaction.

4. Polymeric Systems:

(a) Physical Chemistry of polymers, End group analysis, Sedimentation, Light Scattering and Viscosity of Polymers

(b) Polythylene, Polystyrene, Polyvinyl Chloride, Ziegler Natta Catalysis, Nylon, Terylene.

(c) Inorganic Polymeric Systems : Phosphonitric halide compounds, Silicones; Borazines. Friedel- Craft reaction. Reformatsky reaction pinocolpinacolone. Wagner-Meerweinand Backmann rearragements and their mechanism uses of the following reagents in organic synthesis O_5O_6 HIO_3 NBs, dibocrane, Na liquid ammonia Na-Bh_4 $LIAlH_4$.

5. Photochemical reactions of organic and inorganic compounds: types of reactions and examples and synthetic uses-Methods used instructure determination: Principles and applications of uv-visible IR, IH NMH and mass spectra for structure determination of simple organic and inorganic molecules.

6. Molecular Structural determinations: Principles and Applications to simple organic and inorganic Molecules.

(i) Rotational spectra of diatomic molecules (Infrared and Raman) isotopic substitution and rotational constants.

(ii) Vibrational Spectra of diatomic, Linear symmetric, Linear asymmetric and bent traitomic molecules (infrared and Raman).

(iii) Specifivity of the functional groups (Infrared and Ruman).

(iv) Electronic Spectra-singlet and triplet states, conjugated double bonds, B-unsaturated carbonyl compounds.

(v) Nuclear Magnetic resonance: Chemical shift, spin –spin coupling.

(vi) Electron Spin Resonance: Study of inorganic complexes and free radicals.