**Subject Code : RCCSCH1**

## Core Course – I - General Chemistry

### Unit 1: ATOMIC STRUCTURE AND PERIODIC PROPERTIES

Atomic Orbitals, quantum, numbers - Principal, azimuthal, magnetic and spin Quantum numbers and their significance-Principles governing the occupancy of electrons in various quantum levels-Pauli's exclusion principle, Hund's rule, Aufbau Principle, (n+/) rule, stability of half-filled and fully filled orbitals.

Classification as s, p, d & f block elements, variation of atomic volume, atomic and ionic radii ionisation potential, electron affinity and electro negativity along periods and groups – Variation of metallic characters – Factors influencing the periodic properties.

### Unit 2: PRINCIPLES OF WET CHEMICAL ANALYSIS AND ACID – BASE THEORY

**Qualitative Analysis:** Solubility Product – Principle of Elimination of interfering anions, Common Lon Effect – Complexation reactions including spot tests in qualitative analysis – Reactions involved in separation and identifications of cations and anions in the analysis – Semi Micro Techniques .

**Titrimetry:** Definitions of Molarity normality, Molarity and mole fraction – Primary and Secondary standards – Types of titrimetric reactions – acid-base, redox, precipitation and complex metric titrations – Indicators – Effect of change in pH – Neutralization, redox, adsorption and metal ion indicators.

**Acids and Bases:** Arrhenius, Protonic and Lewis Theories of Acids and Bases – usnovich's generalized definition – Relative strengths of Acids and Bases – Dissociation constant of Acids and Bases – Levelling effect of water. Hard and soft acids and bases (HSAB)

**Oxidation and Reduction Reactions:** Oxidation number concept – Balancing redox equations by Oxidation number method and lon-electron method – Equivalent weight of oxidizing and reducing agents.

### Unit 3: COVALENT BONDING AND STRUCTURER

Covalent bonding – Concept of hybridization – Structure of organic molecules based on $sp^3$, $sp^2$ and sp hybridization – Covalent bond properties of organic molecules: bond length, bond angle, bond energy, bond polarity, dipole moment, inductive, mesomeric, electromeric, resonance and hyperconjugative effects – Naming of organic compounds
(up to 10 carbon systems) – Hydrocarbons – Mono functional compounds – Bi-functional compounds – Isomerism – Types of isomerism (structural and stereoisomerisms) with appropriate examples .

**Unit 4: CHEMISTRY OF ALKANES AND CYCLOALKANES**

Petroleum source of alkanes – Methods of preparing alkanes and cycloalkanes - Chemical properties – Mechanism of free radical substitution in alkanes by halogenation – Uses – Conformational study of ethane and n-butane-Relative stability of cycloalkanes from cyclopropane up to cyclooctane – Bayer's Strain theory – Limitations – Cyclohexane and mono – and disubstituted cyclohexanes.

**Unit 5: ATOMIC STRUCTURE AND BASIC QUANTUM MECHANICS**

Dualism of light – Wave nature of radiation classical theory of electromagnetic, radiation and classical expression for energy in term of amplitude. Particle nature of radiation – Black body radiation and Planck's quantum theory, photo electric dualism electric effect and Compton effect of matter – de Broglie hypothesis and Davisson and Germer experiment. Heisenberg's uncertainty principle. Schrödinger wave equation – argument in favour of Schrödinger wave equation. Physical significance of (psi) function. Properties of function – well – behaved function. Quantum numbers and their significance. Wave picture of electron – Concept of atomic orbitals. Shapes of s, p and d orbitals. Nodal planes and nodal points in atomic orbitals g and u character of atomic orbitals.

**Books for Reference:**


1. Puri B.R..,Sharma L.R., Kalia K.K.,Principles of Inorganic Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
2. Lee J.D.,Concise Inorganic Chemistry, UK, Black well science (2006). Puri B.R..,Sharma L.R., Pathania M.S.,Principles of Physical Chemistry, (23rd edition), New Delhi, Shoban Lal Nagin Chand & Co., (1993).
3. Glasstone S., Lewis D.,Elements of Physical Chemistry, London, Mac Millan & Co. Ltd.