SYLLABUS

LECTURER (SCHOOL EDUCATION)
PAPER – II
CHEMISTRY

Part – I Senior Secondary Level

1. Atomic Structure : Fundamental Particles, Modern concept of atomic structure, Quantum numbers, Aufbau principle, Pauli's exclusion principle, Hund's Rules. Electronic configuration of elements, Classification of elements and periodicity in properties, s, p, d and f Block elements.

2. p- Block Elements: General introduction, electronic configuration, Occurrence, Oxidation states, Trends in physical and chemical properties.

3. Transition Elements: Transition elements, electronic configuration, Oxidation states, Absorption spectra including charge transfer spectra and magnetic properties, Co-ordination compounds (Werner's theory). Nomenclature (IUPAC), Isomerism. Lanthanides and Actinides: Electronic configuration, Oxidation states, Chemical reactivity, Lanthanide contraction and its consequences.

4. Solid State & Surface Chemistry : Classification of solids, Calculation of density of unit cell, packing in solid, Point defects, Band theory of metals, Physical and chemical adsorption, Colloids and emulsions.

5. Solutions : Types of solutions, Solubility and concentrations, Ideal and non-ideal solutions, Colligative properties and calculations of molar mass, Abnormal molecular mass, Vant Hoff factor.

6. Thermodynamics : Laws of thermodynamics, Zeroth and first law and their applications, Concept of work and heat, Gibb's energy.

7. Alkanes, Alkenes, Alkynes and Halo-alkanes : Methods of preparations and chemical reactions of alkanes, alkenes, alkynes and haloalkanes.

8. Alcohols, Aldehydes, Ketones, Carboxylic Acids and their derivatives : Classification, nomenclature, methods of preparation, Chemical reactions of an alcohols aldehydes, ketones, carboxylic acids and their derivatives.

9. Aromaticity and Arenes : Aromaticity, Benzene, Alkyl-arenes, Structure of benzene, Electrophilic substitution reactions, orientation of functional groups.

10. Bio-molecules : Elementary treatment of carbohydrates, proteins, enzymes, vitamins & nucleic acids.

Part – II Graduation Level

1. Chemical Bonding : Theories of chemical bonding, VB and MO theories of Diatomic molecules, VSEPR theory, Hydrogen bonding, Quantum mechanics, Schrodinger's wave equation for one electron system.

2. Co-ordination Complexes : Details of Crystal field theory for weak and strong field complexes. Comparison of VB and CFT theories. Factors affecting 10 Dq. Thermodynamic aspects of Crystal fields, John-Teller effect.

3. Co-ordination Chemistry of Lanthanides and Actinides : Co-ordination behaviour of Lanthanides and Actinide complexes. Magnetic and spectroscopic properties.

4. Chemical Dynamics : Rate of reaction, factors affecting rate of reactions. Zero, first and second order reactions. Collision and Transition state theories and their comparison.

5. Electrochemistry : Electrochemical and Galvanic cells, Theory of strong electrolytes. Debye and Huckel theory of activity coefficient, Nernst equation, Ionic equilibria. Fuel cells, Corrosion.

6. Enthalpy and Entropy : Enthalpy and its changes at constant pressure and temperature. Entropy as a function of temperature and volume. Hess's Law of constant heat summation, Gibbs and Helmholtz functions.

7. Conformations and Configuration : Conformation of alkanes (ethane, butane). R/S nomenclature, Configuration of alkenes (E/Z) nomenclature. Conformations of cyclo-hexane.

8. Reactions Intermediates : Free radicals, carbocations, carbanions, cabenes, benzyne, nitrene. Name Reactions: Nucleophilic Addition reactions and mechanism of Aldol, Cannizzaro, Perkin, Stobbe, Benzoin, Reformatsky, Knoevenagel, Baeyer– Villiger, Wittig and Mannich reactions.

9. Halo, Nitro, Amino-Arenes and Diazonium Salts: Preparations, Chemical properties of Halo, Nitro, Amino-Arenes and diazonium salts, elimination and addition mechanism and synthetic applications of diazonium salts.

10.Polymers and Drugs : Polymers, Types of polymerization, Natural and synthetic polymers. Drugs (antacids, anti-histamines, analgesics, antipyretics, antibiotics and antifertility).

Part – III Post Graduation Level

1. Molecular Orbital Theory: M.O. Theory of polyatomic molecules (AX2, AX3 and AX4).

2. Organometallic Compounds : Organometallic compounds of Li, Mg, Sn and Fe. Structure, bounding and applications.

3. Kinetics and Catalysis : Kinetics of photo-chemical reactions, Acid-Base and Enzyme catalysis.

4. Electrochemistry : Measurement of E.M.F., Kohlrausch's Law and its applications, Membrane equilibria.

5. Thermodynamics : Third Law of Thermodynamics and Joule-Thompson's experiment.

6. Substitutions and Elimination Reactions : SN1 , SN2 , SNi , E1 and E2 reactions of haloalkanes, Preparation and Chemical reactions of phenols, ethers and epoxides.

7. Pericyclic Reactions : Electrocyclic, Cyclo-addition and Sigmatropic rearrangement, Photo-organic chemistry of alkenes.

8. Environmental Pollution : Ozone depletion, Green house effect, Global warming.

9. Spectroscopy : Elementary idea of IR, UV and NMR techniques.

Part – IV (Pedagogy, Teaching Learning Material, Use of Computers and Information Technology in Teaching Learning)

I. Pedagogy and Teaching Learning Material (Instructional Strategies for Adolescent Learner)

- Communication skills and its use.
- Teaching models- advance organizer, concept attainment, information processing, inquiry training.
- Preparation and use of teaching-learning material during teaching.
- Cooperative learning.

II. Use of Computers and Information Technology in Teaching Learning

- Concept of ICT, hardware and software.
- System approach.
- Computer assisted learning, computer aided instruction