

SEMESTER I

ALLIED CHEMISTRY I

UNIT I : ATOMIC STRUCTURE AND PERIODIC PROPERTIES

Atomic structure: Bohr's theory – electronic configurations of elements – classification of elements – Periodic classification – s,p,d,f block elements and elementary idea about their group study.

Periodicity in properties: Atomic radii – ionic radii – ionization potential, electron affinity and electronegativity.

UNIT II : CHEMICAL BONDING

MO theory - bonding, anti - bonding and non - bonding orbitals - Bond order

MO configurations of H_2 , He_2 , N_2 , O_2 and F_2 – Diamagnetism and Para magnetism

VSEPR theory - Shapes of H_2O , NH_3 , CH_4 , SF_6 , BrF_3 , IF_5 and IF_7 molecules.

Concept of hydrogen bonding – inter and intra molecular hydrogen bonding.

UNIT III : COVALENT BOND AND STEREOISOMERISM

Hybridization and geometry of CH_4 , C_2H_4 , C_2H_2 and C_6H_6 molecules - Inductive effect, mesomeric effect and steric effect - Influence of these effects on acidic and basic characters in organic compounds.

Elements of symmetry-symmetry and asymmetry - Chirality, racemisation, resolution. Isomerism in lactic acid and tartaric acid – R/S nomenclature - Geometrical isomerism of maleic and fumaric acids - E/Z nomenclature - Properties of geometrical isomers - Elementary ideas of conformation - Cyclohexane – chair and boat form. Configurations – D, L

UNIT IV : ENERGETICS AND COLLOIDS

ENERGETICS

Types of systems - reversible, irreversible, isothermal, adiabatic and spontaneous processes - Statement of I law - enthalpy change - endothermic and exothermic processes – Joule - Thompson effect - inversion temperature - Need for II law - Statements of II law – Entropy and its significance - Entropy changes in physical transformations – free energy changes and its importance - Conditions for spontaneity in terms of S and G - Relationship between G, H, T and S.

COLLOIDS

Types of colloids – Preparation – Tyndall effect – Brownian motion – Electrophoresis and Electro Osmosis

UNIT V : CHEMICAL KINETICS AND PHOTOCHEMISTRY

CHEMICAL KINETICS

Order and molecularity – I , II and zero order reactions – examples – Effect of temperature on reaction rates – Catalysis by enzymes – rate of enzyme catalyzed reactions – effect of pH and temperature on enzyme catalyzed reactions.

PHOTOCHEMISTRY

Grothus - Draper's law and Stark - Einstein's law of photochemical equivalence - quantum yield - fluorescence, phosphorescence, chemiluminescence's and Photosensitization - definitions with examples

SEMESTER II

ALLIED CHEMISTRY II

UNIT I: CO-ORDINATION CHEMISTRY AND INDUSTRIAL CHEMISTRY

CO-ORDINATION CHEMISTRY

Nomenclature - Werner and Pauling theories – chelation - chemistry of EDTA - Haemoglobin and chlorophyll-Isomerism in co-ordination compounds (elementary) including stereo isomerism.

INDUSTRIAL CHEMISTRY

Fuel gases - natural gas, water gas, producer gas, oil gas (composition and uses only) - Problems with the present fuels and Scope for Hydrogen as a potential fuel - cost effective fuels. Silicones - Synthesis, properties and uses of Silicones Fertilizers - Preparation and uses of urea, Ammonium Sulphate, Super Phosphate, triple Super phosphate and NPK fertilizer.

UNIT II : TYPES OF REACTIONS, REAGENTS AND INTERMEDIATES

Substitution, addition, elimination, rearrangement, condensation, Polymerization. Concept of electrophiles and nucleophiles. Intermediates – Carbocation, carbanion, carbenes and nitrenes - their stabilities.

Free radicals in biological systems – Antioxidants – Free radical inhibitors.

UNIT III : AROMATIC COMPOUNDS

Aromaticity - Huckel's rule - mechanisms of Nitration, Halogenation, Alkylation, Acylation and Sulphonation of Benzene. Influence of substituents – o,p directing groups.

Naphthalene - Haworth's synthesis, isolation and properties.

UNIT IV: ELECTROCHEMISTRY

Ionic equilibria - strong and weak electrolytes - common ion effect – pH – buffers - buffer action in biological system.

EMF and its origin - standard electrode reference potentials - electrodes (NHE & Calomel) - formation of standard cells - Nernst equation Cell reactions and calculation of EMF - lead storage cell - Corrosion and its prevention - H_2-O_2 fuel cells

UNIT V : ANALYTICAL TECHNIQUES

CHROMATOGRAPHY

Principles and applications of column chromatography, thin layer chromatography and Paper chromatography – gas chromatography and HPLC – principle and applications.

PHYSICAL METHODS IN CHEMISTRY

Electromagnetic radiation – Interaction with matter - Absorption spectroscopy – Principle and applications of UV – Visible and Atomic Absorption Spectroscopy

ALLIED CHEMISTRY – PRACTICAL

1. BASIC LABORATORY TECHNIQUES

- Calibration of thermometer, pipette, burette and chemical balance.
- Distillation, crystallisation, melting point and boiling point determination.
- Preparation of standard solutions

2. VOLUMETRIC ANALYSIS:

1. Estimation of Sulphuric Acid – Standard Oxalic Acid- Link NaOH.
2. Estimation of NaOH standard Na_2CO_3 , Link H_2SO_4 .
3. Estimation of Ferrous sulphate- ferrous ammonium sulphate- Link KmnO_4 .
4. Estimation of KmnO_4 - standard H_2SO_4 - Link Oxalic Acid.
5. Determination of permanent and temporary hardness of water.
6. Determination of BOD and COD of water samples (not to be given for exam).

3. ORGANIC QUALITATIVE ANALYSIS:

Students must report

- Aliphatic/Aromatic
- Saturated/Unsaturated
- Special elements – N, S, X, P
- Presence of functional groups.

(Functional groups- Phenol, primary amine, amide, diamide, carboxylic acid, ester, aldehyde and methyl ketone)

BOOKS RECOMMENDED

1. Allied Chemistry
Dr.S.Sundaram and R.Gopalan
Sultan Chand Co., New Delhi
2. Allied Chemistry
Veerayan R
Saroja Publishing House, Tanjore
3. Allied Chemistry Practicals
S.Sundaram, R.Krishnan & P.S.Raghavan
S.Viswanathan Publishers, Chennai