

18
CHEMISTRY (HONOURS)

Paper I /

Time - 3 hours

Full Marks - 75

Ten questions to be set. Five questions to be answered selecting two from group A (Physical Chemistry) and three from group B (Inorganic Chemistry). Short answer type questions are recommended. There may be several parts in a question.

Group A

PHYSICAL CHEMISTRY

The syllabus consists of following units :-

Marks - 25

UNIT - I

10 Hrs

GASEOUS STATE

Kinetic molecular theory of gases, Kinetic gas equation, Deduction of gas laws, Equipartition of energy, vander Waal's equation of state, Critical constants and vander Waal's constants, Boyles temperature, Principle of corresponding states, R.M.S. velocity, Average and most probable speeds, Collision number, Mean free path and collision diameter.

UNIT - II

6 Hrs

LIQUID STATE

Molar Volume, Vapour Pressure

Trouton's rule, Surface Tension

Viscosity and their measurements, Parachore, Rheachore and chemical constitution.

Kopp's law, Liquid crystals, Nematic, Cholestric and sonectic liquid crystals, Inter molecular forces.

UNIT - III

8 Hrs

SOLID STATE

Types of solids, Space lattices, Unit cell, Law of rational indices, Miller Indices, Radius ratio, Co-ordination number, Octahedral and tetrahedral voids.

X-ray diffraction

Bragg's equation, Structure of NaCl, CsCl, Zinc blende, Wurtzite Fluorite and antiferite structures.

UNIT - IV

ELECTROCHEMISTRY

Conduction, Electrolytic Conduction
 Specific, Equivalent and molar conductances
 Cell constant, Effect of dilution on conduction, Ionic mobility,
 Kohlrausch's law.
 Transport number and its determination
 Conductometric-titration and applications.

Group B

INORGANIC CHEMISTRY

The syllabus consists of following units :-

Marks - 50

UNIT - I

5 Hrs

PERIODIC PROPERTIES

Atomic and Ionic radii, Covalent and vander Waal's radii, EA, EN and their trends in P.T. and application in explaining and predicting the chemical behaviours.

UNIT - II

20 Hrs

CHEMICAL BONDING

a) **Covalent bond** - V.B. Theory and its limitations, Directional Characteristics of covalent bond. Hybridisation and shape of Inorganic Molecules and Ions, VSEPR Theory with special reference to bond length, Bond angle vs electronegativity, M.O. Theory, Homonuclear and Heteronuclear diatomic molecules(CO and NO), Bond strength, Bond energy, Dipole moment, Percentage Ionic Character in HX Molecules, Geometry of polyatomic molecules.

b) **Ionic Solids** :- Lattice Energy

Born Haber cycle, Solvation energy, Solubility of Ionic Solids, polarising power and polarisation of ions, Fajan's rule.

Weak Interactions, H-bonding

UNIT - III

6 Hrs

s-BLOCK ELEMENTS

Comparative Study :- Diagonal relationship, Hydrides, Solvation and complexing tendencies. An introduction to alkyl and aryl organometallics.

Extractions of Li and Be.

UNIT - IV**P-BLOCK ELEMENTS**

Comparative Study
 Diagonal relationship
 Elements of group 13 to 17.
 Elementary Idea of Hydrides.
 Oxides and Halides.
 Hydrides of Boron, Diborane and higher Boranes.
 Borazines, Fullerenes, Silicates, Tetra
 Sulphur tetranitride, Properties of halogens.
 Interhalogens and polyhalides, Extraction of B and Sn.

UNIT - VI

6 Hrs

CHEMISTRY NOBLE GASES

Isolation and separation of Inert gases, Chemical properties of noble gases.
 Chemistry of Xenon, Structure and bonding in Xe-compounds, Clathrate compounds.

CHEMISTRY (HONOURS)**Paper II****Time - 3 hours****Full Marks - 75**

Ten questions to be set. Five questions to be answered selecting two from group A (Physical Chemistry) and three from group B (Organic Chemistry). Short answer type questions are recommended. There may be several parts in a question.

Group A**PHYSICAL CHEMISTRY**

The syllabus consists of following units :-

Marks - 25**UNIT - I**

12 Hrs.

CHEMICAL THERMODYNAMICS

First law of Thermodynamics, Internal energy, Enthalpy, C_p and C_v and relation between them for ideal gas.

Joule-Thomson coefficient for ideal and real gases, Inversion temperature, Calculation of W , dU and dH for expansion of ideal gases under isothermal and adiabatic conditions for reversible and irreversible processes.

Relation between ΔH and ΔU , Variation of ΔH and ΔU with temp. (Kirchhoff's equation).

UNIT - II

8 Hrs

DILUTE SOLUTIONS

Types of solutions, Solution of gases in liquids, Henry's law, Raoult's law, Vapour pressure, Ideal and non Ideal solutions and their characteristics, Vapour pressure and composition of liquid phase, Azeotropic mixture, Principle of steam and Fractional distillations.

UNIT - III

6 Hrs.

COLLOIDAL STATE

Definition, Classification, Preparation and purification of Colloids, Kinetic, Optical and electrical properties of sols, Stability of colloids, protective action, Hardy-Schulze law, Gold number, Emulsions, Micelles, Gels, Thixotrophy.

UNIT - IV

4 Hrs.

PHASE EQUILIBRIA

Gibb's phase rule, Phase, Component and degree of freedom, Phase equilibria of one component systems - water and sulphur, Triple point.

Group B**ORGANIC CHEMISTRY**

The syllabus consists of following units :-

Marks - 50**UNIT - I**

10 Hrs.

STRUCTURE AND BONDING

Atomic orbitals, Hybridisation, Orbital representation of hydrocarbons, Hydrogen Bonding, Inductive, Steric, Electromeric and Hyperconjugation effect and their effects on properties of compounds, Nomenclature of polyfunctional complex organic compounds.

UNIT - II

10 Hrs.

ORGANIC REACTION MECHANISM

Homolytic and hetrolytic bond cleavages, Nucleophiles and electrophiles, Reaction Intermediates Carbocations, Carbanions, Free radicals, Nitrenes, Carbenes and arynes, their generation, Structure and reactivity, General considerations of energy profile diagrams-Transition state.

UNIT - III

STEREO CHEMISTRY

10 Hrs.

Confirmation of Ethane, Propane and n-butane, Newman projection formulae, Confirmation of Cyclohexane and its monosubstituted derivatives, Axial and equatorial bonds.

UNIT - IV

ALCOHOLS AND ORGANO-S-COMPOUNDS

10 Hrs.

Distinction among 1°, 2° and 3° alcohols, preparation and properties of ethylene glycol, Glycerol, Allyl alcohol, Thiols and thioethers.

UNIT - V

10 Hrs.

Organometallic compounds, Introduction, Nomenclature, Grignard reagent-Preparation, Structure and application in organic synthesis

UNIT - VI

10 Hrs.

ORGANIC COMPOUNDS OF NITROGEN

Classification, Structure and reactivity, Preparation and properties of aliphatic amines, Separation and Identification of 1°, 2° and 3° amines Preparation, Properties and estimation of urea.

CHEMISTRY (HONOURS)

PRACTICAL

Time - 6 hours

Full Marks - 50

1. Qualitative Inorganic analysis of mixtures containing four radicals and one Interfering radicals **20 marks**

BASIC RADICALS - Ag^+ , Pb^{+2} , Cu^{+2} , Cd^{+2} , Sb^{+2} , As^{+2} , Sn^{+2} , Fe^{+2} , Fe^{+3} , Al^{+2} , Ni^{+2} , Co^{+2} , Mn^{+2} , Ba^{+2} , Sr^{+2} , Mg^{+2} , NH_4^+

ACID RADICALS - CO_3^{-2} , SO_4^{-2} , NO_3^{-1} , NO_2^{-1} , S^{-2} , SO_3^{-2} , Halide and phosphate.

2. **Qualitative Organic Analysis** **20 marks**

(i) Detection of Elements (X, N, & S)

(ii) Detection of functional groups

ph-OH, -COOH, C=O, Ar-NH_2 , Ar-NO_2 , -CONH₂.

3. Note Book **05 marks**

4. Viva-voce **05 marks**