

CHEMISTRY (CY) ENTRANCE TEST SYLLABUS

Note: The syllabus for the entrance exam covers key areas of **Organic, Inorganic, and Physical Chemistry** along with **Analytical Chemistry**. Candidates preparing for the exam should focus on these subjects to ensure a comprehensive understanding of fundamental concepts and their applications.

Organic Chemistry

Basic Concepts in Organic Chemistry and Stereochemistry

- Electronic effects (resonance, inductive, hyperconjugation).
- Optical isomerism, conformation of acyclic and cyclic systems.

Organic Reaction Mechanism and Synthetic Applications

- Chemistry of reactive intermediates (carbocations, carbanions, radicals, carbenes, benzyne).
- Various rearrangement reactions and organometallic reagents.

Qualitative Organic Analysis

- Functional group identification using chemical tests.
- UV, IR, and NMR spectroscopy.

Natural Products Chemistry

- Alkaloids, steroids, terpenes, carbohydrates, amino acids, peptides, nucleic acids.

Aromatic and Heterocyclic Chemistry

- Monocyclic, bicyclic, and tricyclic aromatic hydrocarbons.
- Electrophilic and nucleophilic aromatic substitution reactions.

Inorganic Chemistry

Periodic Table

- Aufbau's principle, periodicity, variations of atomic properties.

Extractions of Metals

- General methods, Ellingham diagram applications.

Chemical Bonding and Shapes of Molecules

- Ionic and covalent bonding, hybridization, molecular orbitals, intermolecular forces.

Main Group Elements

- Reactions, structures, and properties of various elements and compounds.

Transition Metals

- Characteristics, complex structures, organometallic compounds, catalysis.

Bioinorganic Chemistry

- Role of metal ions in biological systems, myoglobin, hemoglobin.

Instrumental Methods of Analysis

- Conductometry, potentiometry, spectrophotometry, environmental sample analysis.

Analytical Chemistry

- Principles of qualitative and quantitative analysis.
- Acid-base and complexometric titrations, error analysis, probability theory.

Department of Chemistry

Chaudhary Ranbir Singh University, Jind

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Physical Chemistry

Atomic and Molecular Structure

- Planck's black body radiation, Photoelectric effect, Bohr's theory, de Broglie postulate, Heisenberg's Uncertainty Principle.
- Schrodinger's wave equation, quantum mechanics postulates, normalized and orthogonal wave functions.
- Energy spectrum of hydrogen atom, shapes of s, p, d, and f orbitals; Pauli's Exclusion Principle, Hund's rule.

Gaseous State

- Kinetic molecular model, collision frequency, mean free path.
- Maxwell-Boltzmann distribution, law of equipartition of energy.
- Ideal gases and deviations, van der Waals equation, critical state.

Liquid State

- Physical properties of liquid: vapor pressure, surface tension, viscosity.
- Effects of solutes and temperature on these properties.

Solid State

- Unit cells, Miller indices, crystal systems, Bravais lattices.
- X-ray diffraction, Bragg's Law, lattice energy, defects in crystals.

Chemical Thermodynamics

- Laws of thermodynamics, thermodynamic functions: enthalpy, entropy, Gibbs free energy.
- Partial molar quantities, Gibbs Duhem equation, chemical potential.

Chemical and Phase Equilibria

- Law of mass action, equilibrium constants, Le-Chatelier principle.
- Ionic equilibria, pH, buffer solutions, solubility and solubility product.

Electrochemistry

- Conductivity, Kohlrausch's law, electrochemical series.
- Nernst equation, concentration cells, potentiometric titrations.

Chemical Kinetics

- Order and molecularity, reaction mechanisms, activation energy.
- Temperature dependence of rates, Arrhenius equation.
- Catalysis: solid surfaces, enzyme catalysis.

Adsorption

- Gibbs adsorption equation, adsorption isotherm, surface films.

Spectroscopy

- Beer-Lambert's Law, rotational, vibrational, electronic, and magnetic resonance spectroscopy.