HINDUSTAN PETROLEUM CORPORATION LIMITED

Regd. Office: 17, Jamshedji Tata Road, Mumbai - 400020.
CIN NO: L23201MH1952GOI008858

SYLLABUS

JUNIOR EXECUTIVE- QUALITY CONTROL

Inorganic Chemistry

Atomic structure, quantum numbers, electronic configurations, periodic table trends, ionization energy, electron affinity, electronegativity, ionic and covalent bonding, VSEPR theory, hybridization, molecular orbital theory, lattice energy, solubility of ionic compounds, s-block elements, p-block elements, d-block elements, f-block elements, transition metal chemistry, oxidation states, color and magnetic properties, lanthanides and actinides, coordination compounds, Werner's theory, types of isomerism in complexes, ligand types, crystal field theory, crystal field splitting energy, spectrochemical series, bioinorganic chemistry, metal ions in biological systems, metalloproteins, hemoglobin, myoglobin, nitrogen fixation, organometallic compounds, metal-carbon bonds, catalysis (Wilkinson's, Ziegler-Natta), HSAB principle, metallurgical processes, environmental pollution by metals, green chemistry, and nuclear chemistry.

Organic Chemistry

Classification of organic compounds, IUPAC nomenclature, types of isomerism, resonance and inductive effects, hyperconjugation, reactive intermediates (carbocations, carbanions, free radicals), alkanes, alkenes, alkynes, cycloalkanes, aromaticity, benzene and its derivatives, electrophilic substitution reactions, alcohols, phenols, ethers, aldehydes, ketones, carboxylic acids, acid derivatives, amines, diazonium salts, nitration, sulphonation, halogenation, Friedel-Crafts reactions, stereochemistry, chirality, optical activity, enantiomers and diastereomers, conformational analysis, carbohydrates (glucose, fructose), amino acids, proteins, nucleic acids, lipids, vitamins, alkaloids, terpenes, steroids, heterocyclic compounds (furan, pyrrole, pyridine), organic reagents ($LiAlH_4$, $NaBH_4$, PCC), organic photochemistry, pericyclic reactions, and modern synthetic methods.

Physical Chemistry

States of matter, ideal and real gases, van der Waals equation, critical phenomena, surface tension, viscosity, laws of thermodynamics, enthalpy, entropy, Gibbs free energy, spontaneous and non-spontaneous processes, chemical equilibrium, Le Chatelier's principle, ionic equilibria, pH, buffer solutions, solubility product, chemical kinetics, rate laws, order and molecularity of reactions, Arrhenius equation, collision theory, phase rule, phase diagrams, colligative properties, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, conductivity of electrolytes, Kohlrausch's law, electrochemical cells, Nernst equation, EMF, corrosion, adsorption, Freundlich and Langmuir isotherms, colloids, emulsions, quantum chemistry basics, wave-particle duality, Schrödinger equation, atomic orbitals, molecular orbitals, UV-Vis spectroscopy, IR spectroscopy, NMR spectroscopy, ESR spectroscopy, and statistical thermodynamics.

Others

Qualitative analysis of inorganic salts, detection of acidic and basic radicals, preparation of inorganic compounds, detection of organic functional groups, synthesis of organic compounds (e.g., aspirin, benzoic acid), purification by crystallization and distillation, melting point and boiling point determination, volumetric analysis (acid-base, redox, complexometric titrations), kinetics experiments, determination of rate constants, conductometric and

potentiometric titrations, determination of partition coefficient, measurement of surface tension and viscosity, UV-Vis spectrophotometry, IR spectroscopy, paper chromatography, thin-layer chromatography (TLC), column chromatography, and final year research project or dissertation work.

NOTE: The syllabus/topics mentioned are indicative in nature. Candidates are expected to possess significant knowledge/proficiency pertaining to the relevant subjects and their qualifying degree.