

Syllabus for the post of Scientific Officer, Class-I (on Contract basis) in HPSPCB under the Department of Environment, Science & Technology

Screening test (either online or offline) shall be of two hours' duration consisting of 100 objective type Multiple Choice Questions covering the syllabus in the ratio of 80:10:10:-

Molecular theory of heterodiatomic molecules, Band theory of bonding in metals, Hydrogen bonding.

Solid state chemistry: Radius ratio rule, Space lattice (only cubes), Type of unit cell, Bragg's Law, Calculation of density of unit cell. One and Two Dimensional solids, Graphite as two dimensional solid and its conducting properties. Fullerene and its applications.

Schrodinger equation; interpretation of wave function; hydrogen atom; atomic and molecular orbitals.

Order and molecularity of reactions, First and second order reactions. Energy of activation. Phase Rule, its application to one component system (water). Equilibrium potential, electrochemical cells (galvanic and concentration cells), Electrochemical theory of corrosion and protection of corrosion. First law of thermodynamics and its mathematical statement, heat, energy and work; Heat content or Enthalpy of a system; Thermochemistry: Hess's law of constant heat summation, Heat of reaction, Heat of combustion, Heat of neutralization, Heat of formation, Heat of fusion, Heat of vaporization, Heat of sublimation, Heat of solution and Heat of dilution (only definition and explanation).

Stability of reaction intermediates, e.g. Carbanions, Carbocations and free radicals. Types of organic reactions, and mechanism of nucleophilic substitution reactions. Common organic reactions and their mechanism,

Stability of cycloalkanes, resonance concept, inductive and mesomeric effects, directive effects, activating and deactivating group, hydrogen bonding, reagents in organic synthesis, of selected organic name reactions and their mechanisms, nucleophilic substitution reaction, electrophilic and free radical addition reactions, electrophilic aromatic substitutions, nucleophilic addition; principles of nucleophilic addition to carbonyl groups. Reduction and oxidation.

E-Z and R, S Nomenclature. Optical isomerism of organic compounds containing one chiral center. Examples of Optically active compounds without chirality. Conformations of n-butane.

Concept of aromaticity, properties of conjugated systems.

Carbohydrate structure and biological functions, Monosaccharides disaccharides and polysaccharides.

Glycoproteins Amino Acids and Proteins: Their structure and function, Types of amino acids, Fats and Lipids: Their structure and biological functions, Types of lipids, triacylglycerol, Waxes, Phospholipids, Sphingolipids, Lipoproteins

Nucleic acid and Nucleotides: DNA, Structure of chromosomes and genes, Replication and transcription of DNA, RNA.

Classification and biological importance of fatty acids and lipids, stereochemical notation in lipids, chemical synthesis of phospholipids and glycolipids, properties of lipid aggregates, micelles, bilayers, liposomes and biological membranes.

Basic principles of spectroscopic methods. The use of UV, Visible, IR, ¹HNMR, for the

determination of structure of simple organic compounds.

General introduction to antibiotics, Mechanism of action of lactam antibiotics, non-lactam antibiotics and quinilones; antiviral and anti-AIDS drugs.

Homogenous and heterogeneous catalysis, enzyme catalysis, mechanism of heterogeneous catalysis. Emulsions, emulsifiers, theory of emulsification, properties and stability of emulsions.

Sun and climate, Oceans and atmosphere Earth, astronomical catastrophies, atmospheric chemistry and global climate, atmosphere as life supporting system, evolution of biosphere and major biomes with reference to India, influence of geomagnetic field on biosphere, the climate system and general circulations of the atmosphere, air pollution meteorology, hydrology of water systems and ground water, meteology, geo-chemistry of water etc. Environmental pollution and health, Environmental Impact Assessment, Issues and problems in environmental assessment. EIA monitoring and auditing. Environmental policy matters and law.

Introduction to microbial biodiversity: distribution, abundance, ecological niche, Classification, Morphology and Chemistry of Viruses; Growth and cell division, Solute Transport, Utilization of sugars other than glucose and complex polysaccharides), Metabolism of nitrogen, lipids and hydrocarbons, Immune cell reception response and signalling, Enzyme kinetics, Enzyme Inhibition, Microbial diversity in normal and extreme environments, The nature of Genetic material, replication, Recombinant DNA technology, Plant-pathogen interactions, Rapid diagnostic principles, microbial products and Fermentation economics.

(80 questions of one marks each)=80 marks

10 questions consisting of General knowledge of H.P.

10 marks

10 questions consisting of national/ international affairs.

10 marks
