

# TECHNICIAN (Chemical & Biological Sciences)

## Written Test Pattern and Syllabus (Indicative)

17.12.2025

The written test consists of two parts 1) Part-A and 2) Part-B

The level of test is XII in Chemistry.

### Part-A Test

The objective test will be for **60** marks and duration of the test will be for **01** hour.

The medium of language will be English only. The indicative syllabus for above test is given below.

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1. Class XII Science (Physics, Chemistry, Mathematics)
  2. Numerical Ability
  3. Logical Reasoning
  4. General Knowledge & Current Affairs
  5. Computer Fundamentals
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### Part-B Test

The objective test will be for **40** marks and duration of the test will be for **01** hour.

The medium of language will be English only. The indicative syllabus for above test is given below.

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### Some Basic Concepts of Chemistry

General Introduction: Importance and scope of Chemistry, Nature of matter, laws of chemical combination, Dalton's atomic theory: concept of elements, atoms and molecules, atomic and molecular masses, mole concept and molar mass, percentage composition, empirical and molecular formula, chemical reactions, stoichiometry and calculations based on stoichiometry.

### Structure of Atom

Discovery of Electron, Proton, and Neutron, atomic number, isotopes, and isobars. Thomson's model and its limitations. Rutherford's model and its limitations, Bohr's model and its limitations, concept of shells and subshells, dual nature of matter and light, de Broglie's relationship, Heisenberg uncertainty principle, concept of orbitals, quantum numbers, shapes of s, p and d orbitals, rules for filling electrons in orbitals - Aufbau principle, Pauli's exclusion principle and Hund's rule, electronic configuration of atoms, stability of half-filled and completely filled orbitals.

### Chemical Kinetics

Rate of a reaction (Average and instantaneous), factors affecting rate of reaction: concentration, temperature, catalyst; order and molecularity of a reaction, rate law and specific rate constant, integrated rate equations and half-life (only for zero and first order reactions), concept of collision theory (elementary idea, no mathematical treatment), activation energy, Arrhenius equation.

### Chemical Bonding and Molecular Structure

Valence electrons, ionic bond, covalent bond, bond parameters, Lewis structure, polar character of covalent bond, covalent character of ionic bond, valence bond theory, resonance, geometry of covalent molecules, VSEPR theory,

concept of hybridization, involving s, p and d orbitals and shapes of some simple molecules, molecular orbital theory of homonuclear diatomic molecules (qualitative idea only), Hydrogen bond.

### **d and f Block Elements**

General introduction, electronic configuration, occurrence and characteristics of transition metals, general trends in properties of the first row transition metals – metallic character, ionization enthalpy, oxidation states, ionic radii, colour, catalytic property, magnetic properties, interstitial compounds, alloy formation, preparation and properties of  $K_2Cr_2O_7$  and  $KMnO_4$ .

Lanthanides - Electronic configuration, oxidation states, chemical reactivity, and lanthanide contraction and its consequences.

Actinides - Electronic configuration, oxidation states, and comparison with lanthanides.

### **Coordination Compounds**

Coordination compounds - Introduction, ligands, coordination number, colour, magnetic properties and shapes, IUPAC nomenclature of mononuclear coordination compounds. Bonding, Werner's theory, VBT, and CFT; structure and stereoisomerism, importance of coordination compounds (in qualitative analysis, extraction of metals, and biological systems).

### **Organic Chemistry – Some Basic Principles and Techniques**

General introduction, methods of purification, qualitative and quantitative analysis, classification, and IUPAC nomenclature of organic compounds. Electronic displacements in a covalent bond: inductive effect, electrometric effect, resonance, and hyperconjugation. Homolytic and heterolytic fission of a covalent bond: free radicals, carbocations, carbanions, electrophiles and nucleophiles, types of organic reactions.

### **Aldehydes, Ketones, and Carboxylic Acids**

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophilic addition, reactivity of alpha hydrogen in aldehydes, uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

### **Alcohols, Phenols, and Ethers**

Alcohols: Nomenclature, methods of preparation, physical and chemical properties (of primary alcohols only), identification of primary, secondary, and tertiary alcohols, mechanism of dehydration, uses with special reference to methanol and ethanol.

Phenols: Nomenclature, methods of preparation, physical and chemical properties, acidic nature of phenol, electrophilic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

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