RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF ASSISTANT TESTING OFFICER (CHEMISTRY) FOR PUBLIC WORKS DEPARTMENT

PART-A

(General Knowledge of Rajasthan)

History, Art, Culture, Literature and Heritage of Rajasthan: - Prehistoric Rajasthan: Harappan and chalcolithic settlements. Cultural achievements of the rulers of Rajasthan from early medieval period to British period. Political Resistance of rajput rulers: Sultanate, Mughal and other regional powers with special reference to Rawal Ratan Singh, Hammir Chauhan, Maharana Kumbha, Rao Maldev and Maharana Pratap. Commencement of Modernity in Rajasthan: Agents of social and political awakening. Peasant, tribal and prajamandal movements. Process of integration: the constructive contribution of rulers of princely states, various phases of integration.

Performing Art of Rajasthan: Folk music, folk instruments and folk dances. Visual Art of Rajasthan: Schools of painting and architecture (temples, forts, palaces, havelis and baories (stepwells). Social life in Rajasthan: religious belief with reference to folk deities, fairs and festivals, customs and traditions, dresses and ornaments. Language and literature of Rajasthan: main dialects and related regions, famous authors of Rajasthani literature and their works.

Geography of Rajasthan: - Physiographic Regions, Rivers and Lakes. Climate, Natural Vegetation, Soil types, Major Minerals and Energy Resources – Renewable and Non-renewable. Population – Growth, distribution and density. Production and Distribution of Major Crops, Major Irrigation Projects, Major Industries. Drought and Famines, Desertification, Environmental Problems.

Economy of Rajasthan: - Characteristics of state economy. Agricultural Sector: characteristics of agricultural sector in Rajasthan. Major Rabi and Kharif crops with special reference to oil seeds and spices. Irrigated area and trends. Health programmes of state government. Mid-Day Meal Programme. Indira Rasoi Yojna. Infrastructure Development: Progress in national highways, state highways and village roads. Power: Progress in power generation. Recent progress in solar power projects. Major items of exports from Rajasthan. Major welfare schemes of state government for economically and socially backward classes, disabled people, old-aged people. Steps taken for women empowerment and child development.

Contemporary Events: - Major contemporary events and issues of Rajasthan. Persons and places in news: international, national and the state. Sports and Games: international, national and the state.

PART-B

UNIT-I: Atomic Structure and Periodicity: Atomic orbitals, quantum numbers, electronic configuration of the elements. Periodicity in different properties of elements. Ionic, covalent and coordinate bonds. Hybridization, VBT, MOT.

UNIT-II: Minerals, ores, general principles of extraction of metals and their purification with special reference to Cu, Pb, Zn, Al and Fe. Solid State: Metals, insulators and semi-conductors, electronic structure of solids. Band theory- Band structure of solids. Crystal defects- Types of defects, Schottky and Frenkel defect.

UNIT-III: Basic Organic Chemistry: Preparations and properties of alkanes, alkenes, alkynes, aromatic hydrocarbons, alcohols, phenols, carboxylic acids, aldehydes, ketones, amines and nitro compounds.

UNIT-IV: Organic Analysis: Physical examination, element detection (N, S, Cl, Br, I, F). Functional group analysis (-OH, -COOH, phenolic, >C=O, -CHO, carbohydrate, hydrocarbon, $-NO_2$, $-CONH_2$, $-NH_2$). Inorganic qualitative analysis of cations and anions with special reference to Pb, Hg, Na, K, Ca, Mg, Zn, Cu, Ba, Sb, Al, Cr and anions NO_2^-, NO_3^-, S^{2-}, SO_4^{2-}, CO_3^{2-}, halides, cyanide. Analysis of gases CH_4, NH_3, CO_2.

UNIT-V: Solutions and Colligative Properties: Types of solutions. Normality, molarity, molality, mole fraction. Raoult's Law (deviation from ideal behavior) Henery's Law. Relative lowering of vapour pressure, elevation of boiling point, depression in freezing point, osmosis and osmotic pressure. Surface chemistry- Adsorption, homogenous and heterogeneous catalysis. Colloids and suspension.

UNIT-VI: Fundamentals of acids, bases and buffers, pH, pK_a and pK_b values. Principles and application of pH- metry, potentiometry, conductometry. Thermal analysis- TGA, DTA, DSC.

UNIT-VII: Analytical Methods: Classification of analytical methods - classical and Instrumental: volumetric, titrimetric and gravimetric techniques. Types and range of determination. Accuracy, precision and errors. Sample preparation. Statistical Analysis: Mean, mode, median. Correlation and regression analysis, variance, standard deviation, correlation coefficient.

UNIT-VIII: Soil: Types of soils, soil profile, analysis of particle size, pH, moisture content, organic carbon, humus and humic acid. Cation exchange capacity, soil acidity, phosphorous analysis. Surface area measurement. Aggregates: formation, types, structure and uses.

UNIT-IX: Basic Principles, instrumentation and applications: UV-visible, IR, AAS, Mass spectrometry, Fluorescence, phosphorescence spectrophotometry, X-ray fluorescence spectroscopy, X-ray diffraction, ICP- MS.

UNIT-X: Chromatography: General principles and types of chromatographic techniques: Paper chromatography. Column chromatography, Thin layer chromatography, Adsorption chromatography, Ion exchange chromatography, HPLC, GLC.

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Pattern of Question Paper:

1. Objective Type Paper
2. Maximum Marks: 150
3. Number of Questions: 150
4. Duration of Paper: 2:30 Hours
5. All Questions carry equal marks
6. Medium of Screening Test: Bilingual in English & Hindi
7. There will be Negative Marking.

(For every wrong answer, one-third of marks prescribed for that particular question will be deducted.)