RAJASTHAN PUBLIC SERVICE COMMISSION, AJMER

SYLLABUS FOR SCREENING TEST FOR THE POST OF ASSISTANT TESTING OFFICER (GEOLOGY) 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: Physical Geology, Structural Geology and Tectonics -

Earth as a part of the Solar system. Origin, evolution, composition and internal structure of the Earth. Chemical composition of continental and oceanic crust. Theory of Continental Drift. Concept of Seafloor spreading and Plate Tectonics theory. Concept of Isostasy. Structure, geological characteristics and distribution of Island Arcs, Mid Oceanic Ridges, Rift Valleys and Oceanic Trenches. Morpho-tectonic subdivisions of India and origin of the Himalayan Mountain Belt. Earthquakes: origin, classification, magnitude and intensity. Global distribution of earthquakes, seismic zones of India. Volcanoes: types, distribution and products. Submarine volcanism. Seismicity and volcanism in relation to Plate Tectonics. Rock deformation: concept and analyses of stress and strain. Strain makers in naturally deformed rocks. Folds: Morphology and classification. Mechanism of folding and buckling. Faults: Morphology and classification, mechanism and causes of faulting. Joints, Cleavages and Lineations: genesis and significance. Unconformity: types and geological significance.

Unit -II: Remote sensing and Geoinformatics -

Principles of Remote Sensing. Elementary idea of the electromagnetic spectrum. Aerial photographs and their applications. Satellite image: characteristics and image analyses. Identification of ground objects based on tone, texture and pattern. Remote sensing in terrain analysis, evaluation of groundwater potential, rock type identification and interpretation of topographic, geomorphologic and tectonic features. Application of remote sensing techniques in slope failure and rock failure analyses, and selection of civil engineering construction sites. Concept of GIS and GPS, and their application in geological investigations. Indian space programme: types of Indian satellites and their orbital parameters.

Unit -III: Mineralogy and Geochemistry-

Crystals: Symmetry elements and classification. Concept of space lattice. Optical properties (orthoscopic and conoscopic) of minerals. Silicate minerals: Structure and classification. Concept of Isomorphism and Polymorphism, chemical, physical and optical properties, and mode of occurrence of Feldspar, Amphibole, Pyroxene, Mica, and Olivine mineral groups. Geochemical classification of elements. Abundance of elements in the Earth. Major oxides, Trace and Rare Earth Elements: their significance in petrogenetic interpretation and tectonic discrimination. Stable isotopes and their geological significance. Radioactive dating based on U-Pb, Rb-Sr, Ar-Ar decay schemes and the concept of ^{14}C dating.

Unit -IV: Petrology-

Magma: origin, evolution, crystallization and emplacement. Phase Rule and its application in binary (Albite-Anorthite, Diopside-Anorthite, Albite-Orthoclase, Forsterite-Silica and Leucite-Silica) and Ternary (Diopside-Albite-Anorthite) magmatic systems. Igneous rocks: occurrence, texture and classification (mineralogical and chemical). Mode of occurrence, classification and petrogenesis of mafic-ultramafic, acidic and alkaline rocks. Metamorphism: Types, factors, grades, zones and facies. Metamorphic rocks: Texture, structure and classification.

Metamorphic reactions and pressure-temperature conditions of metamorphism. Anatexis and origin of migmatites. Petrogenesis of hornfels and cataclastites, schist, gneiss,

amphibolite, granulite and eclogite. Clastic and non-clastic sedimentary rocks: Classification, nomenclature, texture, structure, diagenesis and lithification. Petrology and genesis of sandstone - greywacke, mudstone, limestone – dolostone. Sedimentary environments and facies (continental: alluvial-fluvial, lacustrine, desert-aeolian, glacial, and marine). Paleocurrent, paleoenvironmental, and basin analysis. Sedimentary basins: evolution, tectonics and sedimentation.

Unit -V: Stratigraphy -

Geological time-scale and Indian stratigraphic units. International code of stratigraphic nomenclature. Principles and methods of stratigraphic correlation. Elementary idea of Geochronology, Chronostratigraphy, Lithostratigraphy, Biostratigraphy, Magnetostratigraphy and Sequence stratigraphy. Distribution, classification, lithology, structure and economic importance of Dharwar, Bastar, Singhbhum, Aravalli – Bundelkhand and Shillong cratons. Proterozoic basins of India: Aravalli, Delhi, Dharwar, Vindhyan and Cuddapah supergroups; Sausar – Sakoli Belt, and Neoproterozoic magmatism. Phanerozoic stratigraphy of India with special reference to Palaeozoic rocks of Kashmir, Mesozoic rocks of Spiti, Kachchh, western Rajasthan, central and southern India. Gondwana Supergroup and its significance. Tertiary rocks of western India and Himalayan region including Siwalik Supergroup. Deccan Volcanic Province: evolution, extent, stratigraphy and age. Quaternary Geology of India: origin and evolution of Indo-Gangetic plains and Thar Desert.

Unit -VI: Paleontology-

Origin of life, organic evolution and mass extinction events, Marine and terrestrial ecosystems. Morphology, classification, palaeoecology and evolutionary trends of Echinoids, Lamellibranchs, Cephalopods, Gastropods, Brachiopods and Trilobites. Morphology, classification and palaeoecology of Foraminifers and Ostracods. Application of micropaleontology in oil exploration; Palynology and its application. Vertebrate fossils of Siwalik Supergroup. Evolutionary histories of Man, Elephant and Horse. Gondwana flora and its significance.

Unit -VII: Mineral, Energy Resources and Exploration -

Classification of ore-forming processes. Characteristics of Hydrothermal, Metasomatic replacement and magmatic processes of ore genesis. Economic mineral deposits of sedimentary association with emphasis on iron, manganese and evaporite deposits. Residual and mechanical concentration processes of ore formation. Fluvial, Alluvial, Aeolian and Beach placer deposits. Oxidation and Supergene Sulphide deposits. Economic deposits of Biogenic origin. Geological setting and genesis of metallic (iron, manganese, chromium, lead, zinc, copper and aluminum), industrial (mica, feldspar, quartz, soapstone, clay, gypsum, limestone, calcite, wollastonite and abrasive minerals), rock phosphate and potash deposits of India with special reference to Rajasthan. Coal and lignite: origin and classification, geological setting, geographical distribution and characteristics of Indian deposits. Hydrocarbons: origin and nature, primary and secondary migration of oil and gas. Characteristics of reservoir rocks and traps (structural, stratigraphic and combination). Geological characteristics of Cambay, Barmer – Jaisalmer, Bombay High, Assam and Krishna – Godavari, petroleum basins U and Th deposits of India: mode of occurrence, geological setting and genesis. Geological,

geochemical and geophysical exploration methods for ferrous, nonferrous metals and petroleum and coal deposits.

Unit -VIII: Hydrogeology and Environmental Geology-

Ground water: occurrence and distribution. Water Table and its significance. Aquifer types and properties: Porosity, permeability, specific yield, specific retention, hydraulic conductivity, transmissivity, storage coefficient. Geological formations as aquifers. Steady, unsteady and radial flow conditions of water. Darcy's law and its application. Water Table contour maps. Pumping test and its significance. Physical and chemical properties of water; drinking water quality standards and suitability of water for industrial and agricultural usage. Groundwater pollution (natural and anthropogenic), problems of nitrate, arsenic and fluoride in water and remedial measures. Impact of industrialization and urbanization on surface and ground water quality. Salt water intrusion in coastal aquifers and its prevention. Surface and subsurface geological and geophysical methods of groundwater exploration. Groundwater provinces of India with special reference to Rajasthan. Water resource evaluation and management. Water logging: causes and remedies. Concept of Environmental Geology. Elementary idea about climate change through Earth's history. Ozone layer and its depletion, Carbon di-oxide in the atmosphere and sea water. Records of palaeotemperatures in ice cores. Global warming and role of greenhouse gases. Eco-friendly mining and concept of sustainable development. Environmental impact of mining, EIA (Environmental Impact Assessment) and EMP (Environmental Management Plan).

Unit -IX: Engineering Geology-

Rocks, soils and aggregates as construction material. Rock aggregate and rock mass properties. Mechanical properties of rocks: Crushing, transverse, shear and tensile strength. Modulus properties of rocks – quasi-elastic, semi-elastic and non-elastic; porosity, permeability, absorption value, density, durability, abrasive resistance and frost and fire resistance. Engineering properties of rocks and soils related to dams, reservoirs, tunnels, bridges, roads, runways and pavement. Post construction geological problems, landslides and earthworks for various civil engineering structures. Geological investigations for dams and reservoir sites. Dam foundation investigations, dam failure and remedies. Classification of ground for tunnelling purposes; types of tunnel support. Geotechnical considerations for tunnel construction and alignment. Mass movements with special emphasis on landslides. Hill slope instability and remedial measures.

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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.)