

**FURTHER DETAILS REGARDING MAIN TOPICS OF
PROGRAMME NO. 04/2013 (Item No. 3)**

GEOLOGICAL ASSISTANT

GROUND WATER DEPARTMENT

(CATEGORY NO. 46/2011)

1. Geotectonics, Geomorphology and Remote Sensing

Earth and the solar system, Planetary evolution of the earth and its internal structure. Heterogeneity of the earth's crust. Major tectonic features of the Oceanic and Continental crust. Continental drift - geological and geophysical evidence, mechanics, objections, present status. Gravity and magnetic anomalies at Mid-ocean ridges, deep sea trenches, continental shield areas and mountain chains. Palaeomagnetism. Seafloor spreading and Plate Tectonics. Island arcs, Oceanic islands and volcanic arcs. Isostasy, orogeny and epeirogeny. Seismic belts of the earth. Seismicity and plate movements. Geodynamics of the Indian plate.

Weathering and soils, Mass wasting, Influence of climate on processes, Concept of erosion cycles. Geomorphology of fluvial tracts, arid zones, coastal regions, 'Karst' landscapes and glaciated ranges. Drainage basin analysis. Applications of geomorphology in mineral prospecting, civil engineering, hydrology, and environmental studies. Topographical maps.

Concepts and principles of aerial photography and photogrammetry, satellite remote sensing-data products and their interpretation. Digital image processing. Remote sensing in landform and land use mapping, structural mapping, hydrogeological studies and mineral exploration. Global and Indian Space Missions. Geographic Information System (GIS) - principles and applications.

2. Structural Geology , Stratigraphy and Paleontology

Measurement of strain in deformed rocks. Behaviour of minerals and rocks under deformation conditions. Structural analysis of folds, cleavages, lineations, joints and faults. Superposed deformation. Mechanism of folding and faulting. Time-relationship between crystallization and deformation. Unconformities and basement-cover relations. Structural behaviour of igneous rocks, diapirs and salt domes.

Nomenclature and the modern stratigraphic code. Radioisotopes and measuring geological time. Geological time-scale. Stratigraphic procedures of correlation of unfossiliferous rocks. Precambrian stratigraphy of India. Stratigraphy of the Palaeozoic, Mesozoic and Cenozoic formations of India. Gondwana system and Gondwanaland. Rise of the Himalaya and evolution of Siwalik basin. Quaternary Stratigraphy.

Fossil record and geological time-scale. Morphology and time-ranges of fossil groups. Evolutionary changes in molluscs and mammals in geological time. Principles of evolution. Use of species and genera of foraminifera and echinodermata in biostratigraphic correlation. Siwalik vertebrate fauna and Gondwana flora, evidence of life in Precambrian times, different microfossil groups and their distribution in India.

3. Mineralogy and Economic mineral deposit

Physical, chemical and crystallographic characteristics of common rock forming silicate mineral groups. Structural classification of silicates. Common minerals of igneous and metamorphic rocks. Minerals of the carbonate, phosphate, sulphide and halide groups.

Optical properties of common rock forming silicate minerals, uniaxial and biaxial minerals. Extinction angles, pleochroism, birefringence of minerals and their relation with mineral composition. Twinned crystals. Dispersion.

Controls of Mineral Localisation, Metallogenic epoch and provinces, Classification of mineral deposit, Precious metals, nonferrous metals iron and ferro-alloy metals, Mineral fuels, ceramic minerals, structural and building materials, metallurgical and refractory materials, fertilizer minerals, abrasive minerals, gemstones. Mineral deposit of India

4. Igneous and Metamorphic and Sedimentary Petrology

Forms, textures and structures of igneous rocks. Petrology and geotectonic evolution of granites, basalts, andesites and alkaline rocks. Petrology of gabbros, kimberlites, anorthosites and carbonatites.

Textures and structures of metamorphic rocks. Regional and contact metamorphism of pelitic and impure calcareous rocks. Mineral assemblages and P/T conditions. Characteristics of different grades and fades of metamorphism. Metasomatism and granitization, migmatites. Plate

tectonics and metamorphic zones. Paired metamorphic belts.

Provenance and diagenesis of sediments. Sedimentary textures. Framework matrix and cement of terrigenous sediments. Definition, measurement, and interpretation of grain size. Primary structures, palaeocurrent analysis. Biogenic and chemical sedimentary structures. Sedimentary environment and facies. Classification of sandstones. Classification of limestone. Sedimentary basins of India.

5. Hydrogeology and Environmental Geology

Origin of water: meteoric, juvenile, magmatic and sea waters, Hydrologic cycle precipitation, runoff, infiltration and evapotranspiration, Hydrographs. Subsurface movement and vertical distribution of groundwater, Springs, Classification of aquifers, Concepts of drainage basin and groundwater basin. Hydrological properties of rocks - specific yield, specific retention, porosity, hydraulic conductivity, transmissivity, storage coefficient, water table fluctuations

Theory of groundwater flow, Darcy's Law and its applications, Types of wells, drilling methods, construction, design, development and maintenance of wells, specific capacity and its determination. Groundwater quality - physical and chemical properties of water, quality criteria for different uses, graphical presentation of water quality data, groundwater quality in different provinces of India - problems of arsenic and fluoride, Saline water intrusion in coastal and other aquifers and its prevention,

Natural hazards- preventive/precautionary measures- floods, landslides, earthquakes, river and coastal erosion. Impact assessment of anthropogenic activities such as urbanization, open cast mining and quarrying, disposal of industrial and radio- active waste, excess withdrawal of ground water, use of fertilizers, dumping of ores, mine waste and fly-ash. Organic and inorganic contamination of ground water and their remedial measures. Soil degradation and remedial measures. Environment protection- legislative measures in India.

NOTE: - It may be noted that apart from the topics detailed above, questions from other topics prescribed for the educational qualification of the post may also appear in the question paper. There is no undertaking that all the topics above may be covered in the question paper.