

SCHEME AND SYLLABUS OF EXAMINATION FOR THE PURPOSE OF FILLING UP THE POST OF ASSISTANT GEOLOGIST UNDER MINES, MINERALS & GEOLOGY DEPARTMENT

The examination will consist of 2 papers:-

| PAPERS | SUBJECT | FULL MARKS | TIME ALLOWED |
|----------|-------------------------------------|------------|--------------|
| PAPER-I | General English & General Knowledge | 150 | 2.30 hours |
| PAPER-II | Geology | 300 | 3.00 hours |

VIVA-VOCE/PERSONALITY 40

PAPER-I: GENERAL ENGLISH:-

The question will be designed to test the candidate's understanding and command of the English language. *The question will be of Conventional Type.*

ENGLISH

Candidate will be required to answer questions designed to test their understanding of English and workman like use of words. The pattern of questions would be broadly as follows:-

1. Comprehension of given passage.
2. Precise writing.
3. Usages and Vocabulary.
4. Short essay.
5. Translation.

GENERAL KNOWLEDGE

General Knowledge: Knowledge of current events of local, National and International importance and of such matter of everyday observation and experience in their scientific aspects as may be expected of any educated person who has not made a special study of any scientific subject. The paper will also include questions on Modern history (from 1857 onwards) of India, Indian culture, Indian policy, Indian economy and Geography of India of such nature as candidates should be able to answer without Special Study and questions on the techniques of Mahatma Gandhi. The question will be objective type.

VIVA-VOICE : The candidates will be interviewed by the Commission who will have before them a record of his career. He will be asked questions on matters of general interest. The object of the interview is to assess the personality suitability of the candidate for the service post.

The test is intended to judge the mental caliber of candidate. In broad terms this is really an assessment of not only his intellectual qualities but also social traits and his interest in current affairs. Some of the qualities to be judged are mental alertness, critical powers of assimilation, care and logical exposition, balance of judgment, variety and depth of interest, ability for social cohesion and leadership intellectual and moral integrity.

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PAPER -II

The question will be CONVENTIONAL TYPE and will cover areas of knowledge of the following subject and topics:-

1. General Geology : The Solar System, meteorites, origin and interior of the earth and age of earth; Volcanoes—causes and products, Volcanic belts. Earthquakes—causes, effects, seismic zone of India; Island arcs, trenches and mid-ocean ridges; Continental drift; Seafloor spreading, plate tectonics. Isostasy.

2. Geomorphology and Remote Sensing : Basic concepts of geomorphology. Weathering and soil formations; Landforms, slopes and drainage. Geomorphic cycles and their interpretation. Morphology and its relation to structures and lithology; Coastal geomorphology; Applications of geomorphology in mineral prospecting, civil engineering; hydrology and environmental studies; Geomorphology of Indian sub-continent. Aerial photographs and their interpretation—merits and limitations; The Electromagnetic spectrum. Orbiting Satellites and Sensor Systems. Indian Remote Sensing Satellites. Satellite data products; Applications of remote sensing in geology; The Geographic Information System (GIS) and Global Positioning System (GPS)—its applications.

3. Structural Geology: Principles of geologic mapping and map reading, projection diagrams, Stress and strain ellipsoid and stress strain relationships of elastic, plastic and viscous materials; Strain markers in deformed rocks. Behaviour of minerals and rocks under deformation conditions. Folds and faults classification and mechanics; Structural analysis of folds, foliations, lineations, joints and faults, unconformities; Time relationship between crystallization and deformation.

4. Paleontology : Species—definition and nomenclature; Megafossils and Microfossils. Modes of preservation of fossils; Different kinds of microfossils; Application of microfossils in correlation, petroleum exploration, paleoclimatic and paleoceanographic studies; Evolutionary trend in Hominidae, Equidae and Proboscidae. Siwalik fauna. Gondwana flora and fauna and its importance; Index fossils and their significance.

5. Indian Stratigraphy: Classification of stratigraphic sequences: lithostratigraphic, biostratigraphic, chrono-stratigraphic and magnetostratigraphic and their interrelationships; Distribution and classification of Precambrian rocks of India; Study of stratigraphic distribution and lithology of Phanerozoic rocks of India with reference to fauna, flora and economic importance. Major boundary problems--Cambrian/ Precambrian, Permian/Triassic, Cretaceous/Tertiary and Pliocene/Pleistocene; Study of climatic conditions, paleogeography and igneous activity in the Indian subcontinent in the geological past. Tectonic framework of India. Evolution of the Himalayas.

6. Hydrogeology and Engineering Geology :

Hydrologic cycle and genetic classification of water; Movement of subsurface water; Springs; Porosity, permeability, hydraulic conductivity, transmissivity and storage coefficient, classification of aquifers; Water-bearing characteristics of rocks; Groundwater chemistry. Salt water intrusion. Types of wells. Drainage basin morphometry; Exploration for groundwater; Groundwater recharge; Problems and management of groundwater; Rainwater harvesting; Engineering properties of rocks; Geological investigations for dams, tunnels highways, railway and bridges; Rock as construction material; Landslides causes, prevention and rehabilitation; Earthquake-resistant structures.

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Mineralogy : Classification of crystals into systems and classes of symmetry; International system of crystallographic notation; Use of projection diagrams to represent crystal symmetry; Elements of X-ray crystallography.

Physical and chemical characters of 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; Clay minerals.

Optical properties of common rock forming minerals; Pleochroism, extinction angle, double refraction, birefringence, twinning and dispersion in minerals.

8. Igneous and Metamorphic Petrology: Generation and crystallisation of magmas. Crystallisation of albite—anorthite, diopside—anorthite and diopsidewollastonite—silica systems. Bowen's Reaction Principle; Magmatic differentiation and assimilation. Petrogenetic significance of the textures and structures of igneous rocks. Petrography and petrogenesis of granite, syenite, diorite, basic and ultrabasic groups, charnockite, anorthosite and alkaline rocks. Carbonatites. Deccan volcanic province. Types and agents of metamorphism. Metamorphic grades and zones; Phase rule. Facies of regional and contact metamorphism; ACF and A KF diagrams; Textures and structures of metamorphic rocks. Metamorphism of arenaceous, argillaceous and basic rocks; Minerals assemblages. Retrograde metamorphism; Metasomatism and granitisation, migmatites. Granulite terrains of India.

9. Sedimentary Petrology : Sedimentas and Sedimentary rocks: Processes of formation; diagenesis and lithification; Clastic and non-clastic rocks-their classification, petrography and depositional environment; Sedimentary facies and provenance. Sedimentary structures and their significance. Heavy minerals and their significance. Sedimentary basins of India.

10. Economic Geology : Ore, ore mineral and gangue, tenor of ore. Classification of ore deposits; Processes of formation of mineral deposits; Controls of ore localisation; Ore textures and structures; Metallogenic epochs and provinces; Geology of the important Indian deposits of aluminium, chromium, copper, gold, iron, lead, zinc, manganese, titanium, uranium and thorium and industrial minerals; Deposits of coal and petroleum in India, National Mineral Policy; Conservation and utilization of mineral resources. Marine mineral resources and Law of Sea.

11. Mining Geology : Methods of prospecting—geological, geophysical, geochemical and geobotanical; Techniques of sampling. Estimation of reserves of ore; Methods of exploration and mining-metallic ores, industrial minerals, marine mineral resources and building stones. Mineral beneficiation and ore dressing.

12. Geochemistry and Environmental Geology : Cosmic abundance of elements. Composition of the planets and meteorites. Structure and composition of earth and distribution of elements. Trace elements. Elements of crystal chemistry-types of chemical bonds, coordination number. Isomorphism and polymorphism. Elementary thermodynamics. Natural hazards—floods, mass wasting, costal hazards, earthquakes and volcanic activity and mitigation; Environmental impact of urbanization, mining, industrial and radioactive waste disposal, use of fertilizers, dumping of mine waste and fly-ash. Pollution of ground and surface water, marine pollution. Environment protection—legislative measures in India; Sea level changes: causes and impact.