

Geology (Code No. 16)

PAPER – I

General Geology and Geodynamics, Geomorphology, Structural Geology Stratigraphy and Palaeontology

1. General Geology & Geodynamics

The solar system, meteorites, origin and interior of the earth. Radioactivity and age of the earth. Volcanoes: Causes and products, volcanic belts. Earthquakes : causes, effects, earthquakes belts, seismicity of India. Intensity and magnitude, seismographs. Island arcs, deep sea trenches and mid-oceanic ridges. Continental drift: evidences and mechanics; sea floor spreading, plate tectonics, Isostasy, orogeny and epeiorogeny.

2. Geomorphology and Remote Sensing

Basic concepts of geomorphology. Weathering and mass wasting. Landforms, slopes and drainage. Geomorphic cycle and their interpretation. Morphology and its relation to structures and lithology. Elementary idea about applications of geomorphology. Geomorphology of Indian subcontinent.

Applications of remote sensing in geology.

3. Structural Geology

Fold, fault - their morphology, classification, recognition and effect on outcrops. joints : classification and importance. Unconformities : types, recognition and significance. Definition and classification of foliation and lineation and their relation to major structures. Recognition of top and bottom of beds. Concept of rock deformation. Tectonic framework of India. Geological maps : structural & lithological symbols and map reading.

4. Stratigraphy

Geological time scale, Principles of stratigraphy, stratigraphic classification and nomenclature. Stratigraphic correlation. Detail study of various geological formations of Indian - subcontinent. Brief

study of climates and igneous activities in Indian sub-continent during geological past. Permo - Triassic boundary problem.

5. Palaeontology

Fossilization, Mode of preservation and uses of fossils, Morphology and geological history of Rugose coral, Groptolite, Trilobite, Brachiopoda, Mollusca : Lamellibranchia, Gastrophoda, Cephalopoda, Echinoidea. Basic idea about micropaleontology. Brief study of vertebrate paleontology. Gondwana plant fossils. Applications of palaeontological data in palaeoecology, stratigraphy and palaeogeographic studies.

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PAPER – II

1. Mineralogy

Classification of crystals into seven systems. Study of forms of normal classes. International system of crystallographic notations. Twinning in crystals. Polarizing microscope. Isotropism and Anisotropism, Pleochroism, extinction, Double refraction, becke effect, interference colors, twinning, Classification of silicates. Isomorphism, Polymorphism and Pseudomorphism, solid solution. Physical, chemical and optical properties of feldspar, Pyroxenes, Amphiboles, Micas, Garnets, Olivine, Felspathoids, Quartz, Calcite, Kynite, andalusite, sillimanite and staurolite.

2. Igneous and Metamorphic Petrology

Generation and crystallization of magma. Crystallization of unicomponent (SiO_2), binary (albite - anorthite and diopside - anorthite) and ternary (diopside - albite - anorthite) component silicate system. Bowen's reaction series. Magmatic differentiation and assimilation. Forms and structures of igneous rocks. Textures and microstructures of igneous rocks. Classification of igneous rocks. Petrography and petrogenesis of granite, syenite, diorite, basic and

ultra basic groups, charnockite, anorthosite and alkaline rocks, carbonatites.

Metamorphism. Kinds and agents of metamorphism. Metamorphic grades and zones. Textures, structures and classification of metamorphic rocks. Metamorphic facies. Metamorphism of argillaceous and arenaceous sediments and impure limestone. Retrograde metamorphism and metasomatism. Petrography of Schist, Gneiss, Marble, Quartzite, Slate, Phyllites, Amphibolites, Khondalite, Gondite.

3. Sedimentology

Process of formation of sedimentary rocks. Diagenesis and lithification. Textures and structures and their significance. Classification of sedimentary rocks, clastic and non clastic rocks. Heavy minerals and their significance. Concept of sedimentary facies. Petrography of conglomerates, breccia, sandstone, limestone, shale.

4. Economic Geology

Ore, Ore minerals and gangue, tenor of ore, classification of ore deposits,. Process of formation of mineral deposits. Description of metallic and non metallic mineral deposits of India with reference to their mode of occurrence, mineralogical characters, geographic distribution and economic uses : Iron, Manganese, Chromium, Copper, Lead - Zinc, Aluminum, Gold, Uranium, Thorinium, Mica, Magnesite, Talc, Baryte, Asbestos, Kyanite, Diamond, Corundum, Beryl, Fluorite, Apatite, Gypsum, Non Metals related to refractory, fertilizer, cement, gemstone industry and important building stones. Deposits of coal, oil and natural gas in India. Marine minerals resources. Principles of mineral economics, strategic, critical and essential minerals. Existing national mineral policy.

5. Hydrogeology, Engineering Geology and Mining Geology

Hydrologic cycle, occurrence of ground water and hydrological properties of rocks. Groundwater provinces of India. Concept of Watershed management. Quality of groundwater.

Geological conditions for construction of Dams and tunnels.
Environmental considerations in the location and construction of large dams, reservoirs and tunnels.

Mineral exploration: Surface and sub-surface exploration methods.
Elementary idea about Gravity, Electrical, Magnetic, Airborne and seismic methods of exploration. Elementary idea about mining, beneficiation and conservation.