

Geology

Unit – I: Physical Geology, Remote Sensing and Structural Geology

Internal structure and composition of Earth; Weathering and Erosion; Geological action of River, Wind and Glacier; Physiography of India; Application of geomorphology.

Continental drift, Plate tectonics, Mid Oceanic Ridges, Island arc.

Principles of Aerial Photography; Satellite Remote Sensing – Data products, their interpretation and application; Geographic Information System (GIS) – Principles and application.

Concept of stress, strain and rock deformation; Classification and mechanism of folds, joints, faults; Lineation and Foliation; Types of Unconformities.

Unit – II: Mineralogy and Petrology

Physical, chemical and optical characteristics of common rock forming silicate mineral groups (Garnet, Olivine, Pyroxene, Amphibole, Mica, Feldspar and Quartz); Structural classification of silicates; Minerals of Carbonate, Phosphate and sulphide groups; Atomic substitution, isomorphism, polymorphism; X-Ray analysis of crystal structures.

Form, texture, structure and classification of igneous rocks; Binary and Ternary phase diagrams; Magmatic differentiation, assimilation; Petrology of granites, basalts, anorthosites, ophiolite.

Sedimentary structures and textures; Provenance and diagenesis. Sedimentary environment and facies. Classification of sedimentary rocks. Heavy minerals and their significance; Sedimentary basins of India.

Texture and structure of metamorphic rocks, regional and contact metamorphism of argillaceous, basic and calcareous rocks. Characteristics of different grades and facies of metamorphism. Metasomatism, granitisation and paired metamorphic belts.

Unit –III: Economic Geology

Process of mineralization: magmatic, hydrothermal, supergene enrichment, sedimentary exhalation (SEDEX) processes; Classification of mineral deposits; Metallogenic epochs and provinces.

Mineralogy, mode of occurrence and distribution of Iron ores, Manganese ores, Bauxite, Chromite, Base metals and Gold.

Indian deposits of mica, asbestos, graphite, beach placer, gemstones, lime stones, gypsum; Strategic, critical and essential minerals.

Coal and Petroleum deposits: Their occurrence, genesis and Indian distribution.

Geophysical exploration: gravity, electrical, magnetic and seismic; Geological and Geochemical exploration; Mineral beneficiation, Drilling and Mining.

Unit – IV: Stratigraphy and Palaeontology

Geological Time Scale, Principles of Stratigraphy, Stratigraphic correlation, Code of Stratigraphic nomenclature;

Precambrian Stratigraphy: Dharwars, Eastern Ghats, Iron Ore Group, Aravallis, Cuddapahs and Vindhyaans;

Detailed study of type area of Triassic of Spiti; Jurassic of Kutch; Cretaceous of Trichinopoly, Tertiary of Assam and Siwaliks; Gondwana Super Group; Deccan Traps; Geology of Odisha.

Study of morphology, classification and evolution of Trilobites, Brachiopods, Lamellibranchs, Gastropods, Cephalopods, Echinoids, Corals and Graptolites;

Evolution of horse, elephant and man;

Gondwana flora and its significance;

Types of microfossils; Study of morphology and classification of foraminifers and Ostracods.

Unit – V: Geochemistry, Environmental Geology, Engineering Geology, Hydrogeology, and Marine Geology

Cosmic abundance of the elements, Primary geochemical differentiation of the earth, Geochemical classification of elements, Geochemical cycle, Meteorites

Natural hazards and their mitigation measures—floods, landslides, earthquakes, tsunami, coastal erosion.

Impact assessment of anthropogenic activities: opencast mining, river valley projects; solid and radioactive waste disposal; excess withdrawal of groundwater, oil spill; concept of global warming, sea level rise.

Engineering properties of rocks and soil; geological investigation for dams, reservoirs and Tunnels.

Vertical distribution of groundwater, classification of aquifers, hydrologic cycle; Hydrological properties, Darcy's law and its application; Groundwater provinces of India; Groundwater quality and contamination; groundwater recharge, rainwater harvesting.

Relief of Ocean floor, Marine Sediments, Marine mineral resources.