

510. GEOLOGY

UNIT – I

Mineralogy, Crystallography and Petrology – External symmetry, Internal symmetry, 32 symmetry classes.

Silicate structures, Isomorphism, Polymorphism. Structure, composition, optical and physical properties of Olivine, Pyroxene, Amphibole, Garnet, Silica, Feldspar and Felspathoids groups.

Magmatic and metamorphic processes. Petrography and petrogenesis of Granitoids, alkaline rocks, anorthosites, layered complexes and basalts. Zones, grades and facies of metamorphism. Metamorphism of pelitic rocks, basic rocks, calcareous rocks and Ultramaphic rocks. Goldschmidt's classification of elements.

UNIT – II

Structural Geology, Geotectonics and Geomorphology – Behaviour of elastic, plastic and viscous materials. Folds – Classification and causes of folding. Diapers and salt domes. Shear zones and recognition of faults and shear zones in the field. Mechanics of shearing and faulting. Geometry of thrust sheets, block faults and rifted regions. Wrench faults and associated structures. Foliation and lineation, classification, origin and significance.

Interior of the Earth. Isostasy, Concept of plate tectonics. Convection currents of Wilson cycle. Continental drift, computer fittings, geological and palaeontological, sea floor spreading, Hess concept evidences and evidences of sea floor spreading. Nature of convergent, divergent and conservant plate margins. Plate tectonics. Concept of plate and plate movements. Plate model of Morgan. Triple junction, Aulocogen, plume theory.

Definition, dynamics of geomorphology. Diastrophism, landforms from various geomorphological processes. Rock weathering, mass wasting, Fluvial geomorphic cycle, fluvial geomorphology, valley development, peneplanation, folded and faulted structures topography, desert and Aeolian landforms, Karst topography.

UNIT – III

Palaeontology – Origin and evolution of life, uses of microfossils, study of microfossils of Foraminifera, Radiolaria, bacteria, and Diatoms. Gondwana flora and their significance.

Classification and evolution of pisces. General characters of Amphibian and mammals. Evolution of horse and elephant.

Stratigraphy - Precambrian stratigraphy-- a) Archean stratigraphy - tectonic frame-work, geological history & evolution of Dharwar, and their equivalents (b) Proterozoic stratigraphy - tectonic framework, geological history, and evolution of Cuddapah, and their equivalents Stratigraphy of the Palaeozoic and Mesozoic formations of India with special reference to type localities. Palaeozoic and Mesozoic formations of India with special reference to their history of sedimentation, fossil content and palaeogeography. Gondwana System.

Cenozoic formations of India Rise of the Himalayas and evolution of Siwalik basin and Deccan volcanics. Boundary problems in Indian stratigraphy

Sedimentology – Analysis of sedimentary environments, facies models and environment reconstruction. Non marine environments: Fluvial, Glacial, Eolin and Lacustrine Transitional: Deltaic, Beach and Tidal Flats. Marine: Shelf (Clastic and Non clastic) and deep sea sediments, turbidites. Evolution of sedimentary basins – Sedimentary basins, geosynclinal concept. Plate movements and basin formation.

UNIT – IV

Hydrogeology - Origin, type, and age of groundwater. Hydrological cycle. Rock properties affecting groundwater.

Porosity, permeability, specific yield, specific retention, hydraulic conductivity, transmissivity, storage coefficient, precipitation, evapotranspiration, runoff and infiltration. Vertical distribution of groundwater. Water level fluctuation, causative factors. Artificial recharge of Groundwater. Water well technology- Well types, drilling methods, construction, design, development and maintenance of wells.

Surface and subsurface geophysical and geological methods of Groundwater exploration.

Application of Remote Sensing for exploration of groundwater and GIS

Ground Water quality- reporting of chemical analysis. Groundwater Pollution. Groundwater quality map of India. Quality criteria for groundwater use. Salt water intrusion in coastal aquifers.

Concepts of basin management. Groundwater modeling techniques.

Economic Geology - Concepts of ore genesis. Mineralization through geological time. Plate tectonics and ore deposits. Concept of ore bearing fluids, wall-rock alteration; structural, physico-chemical controls of ore localization. Fluid inclusions in ores. Stratiform and Stratabound deposits

Principles of application of Geothermobarometry. Stable isotopes in ore genesis. Ore deposition-Physical and chemical controls. Ore bearing fluids and their migration.

Petrological ore associations with Indian examples-Orthomagmatic ores of mafic-ultramafic rocks.

Ores of sedimentary affiliation Placer deposits. Ores of metamorphic affiliations. Ores related to weathering and weathered surfaces – laterite, bauxite.

Study of geology, nature of occurrence and the genesis of the following with case studies in India: 1. Iron formations and deposits. 2. Chromite deposits. 3. Manganese deposits. 4. Copper deposits. 5. Lead and Zinc deposits. 6. Bauxite deposits. 7. Magnesite deposits. 8. Barite deposits. 9. Mica deposits. 10. Gold deposits. 12. Diamond deposits. 13. Asbestos deposits. 14. Dimension and decorative stones.

Engineering Geology – Engineering properties of Rocks and soils. Rocks as a construction material – Building stone, concrete aggregate, Road aggregate, Ballast and rip-rap. Engineering Geological investigations in the selection of Dam site. Foundation Geology of some major dam sites of India. Problems associated with dams and reservoirs. Engineering geological investigations in choosing the alignment of tunnels. Geology of some well known tunnels. Importance of geology in the foundations of buildings and bridges. Geological Hazards – Elements at risk, typical effects and mitigation measures of Earth quakes, landslides, floods and cyclones.