

DEPARTMENT OF GEOLOGY
FACULTY OF SCIENCE
Syllabus for Ph.D Admissions Test 2026-27 onwards

SECTION-B

Igneous Petrology

Mineralogy and chemistry of Earth's mantle. Magma and its evolution. Mantle geochemical components. Criteria for classification of igneous rocks and IUGS classification. Texture of igneous rocks. Magmatism in relation to plate tectonics. Mineralogical, textural and geochemical characteristics of important rock suites: TTG, Komatiite, Granitoids, Basalts, Anorthosites, Andesites, Ultramafic and alkaline rocks.

Metamorphic Petrology

Metamorphic facies of low, medium and high pressure. Schreinemakers rules and construction of petrogenetic grid. Metasomatism. Fabric and texture of metamorphic rocks. Graphical representation: ACF, AKF, AFM diagrams. Metamorphism and tectonics. Metamorphic Facies series. Paired metamorphic belt. P-T-t paths and their implications. UHT and UHP metamorphism.

Sedimentology

Mineralogy and chemical composition of carbonate minerals. Sandstone classification. Diagenesis and fluid flow: diagenesis of mudstones, sandstones and carbonate rocks. Evaluation of sedimentary basins: tectonics and sedimentation. Craton facies, geosyncline and related facies.

Structural Geology

Stress and Strain analyses in deformation of rocks and minerals. Geometry of folds and mechanics of folding. Fractures and jointed structures – their analysis. Classification and genesis of foliation and lineation.

Economic Geology

Relationship of formation of mineral deposits with plate tectonics. Mineral exploration and mining methods. Renewable and non-renewable sources of energy. Mode of occurrence, genesis and distribution of important metal and non-metal deposits in India.

Geochemistry

Nucleosynthesis and geochemical classification of elements. Major elements, trace elements, compatible and incompatible elements. HFSE, LILE (low field strength elements), PGE. Partition coefficient: general principle and determination in natural and experimental systems. U-Pb, Rb-Sr, Sm-Nd, K-Ar, Ar-Ar methods of dating. Radiogenic and stable isotopes. Isotopes as petrogenetic indicators. Application of geochemical studies in solving geological problems.

Paleontology

Origin of life, origin of metazoans. Precambrian fossil record and major events in the history of Phanerozoic life. Taphonomy and its significance in applications of fossils in Geology. Microfossils and their advantages over megafossils. Morphology and geological applications of major groups of microfossils with special reference to foraminifera. Origin and important landmarks in the evolution of vertebrates through geological time. Evolution and extinction of dinosaurs. Evolution of horse and man.

Hydrogeology

Ground water: origin, types, importance, occurrence, reservoir and movement. Hydraulic properties of aquifer and aquitard and their controlling factors. Transmissivity, storativity, and specific yield. Darcy's law and its validity. Evaluation of aquifer parameters using Thiem, Theis, and Walton equations.

Environmental Geology

Structure and evolution of atmosphere. Vertical structure and chemical evolution of atmosphere. Thermal inversion. Global warming in present atmosphere due to indiscrete exploitation of fossil fuel and volcanic eruptions. Contamination of surface water and ground water quality due to industrialization and urbanization. Natural hazards: influences of neotectonics in seismic hazard assessment. Distribution, magnitude, intensity and geological effect of earthquakes.

Remote Sensing and GIS

Global and Indian remote sensing missions: IRS, Landsat, SPOT series of satellites. Resolution of remotely sensed data: spatial, spectral, temporal, and radiometric. Types and geometry of aerial photographs and their utility in geosciences. Scale of aerial photograph. Image interpretation: visual and digital analysis of remotely sensed data. Elements of image interpretation. Digital image processing techniques. GIS: Function, data formats, data generation and applications in geosciences. GPS: Function, operation principle, data generation and applications. Scanning and framing systems. EMR interaction with atmosphere and Earth's surface. Drainage patterns and their characteristics. Identification of lithological and geomorphological landforms on remotely sensed data. Microwave remote sensing missions. Concept of datum, ellipsoid and spheroid. Map projections: Conical, Cylindrical and Azimuthal.

Engineering Geology

Engineering properties of rocks. Rock mass discontinuities: RQD, engineering classification of rock mass. Q-system and geochemical classification. Improvements of properties of rock mass: grouting, guniting, rock bolting, cable anchorage. Engineering properties of soil: Atterberg limits, Soil classification, Aggregates. Alkali aggregate reactions and artificial aggregate. Mass movements with special emphasis on landslides and causes of hill slope instability. Geological consideration for evaluation of dams and reservoir sites. Dam foundation rock problems. Geotechnical evaluation of tunnel alignments, bridges and coastal barriers.