

**DEPARTMENT OF GEOLOGY**  
**FACULTY OF SCIENCES**  
**A.M.U., ALIGARH**  
**Syllabus for Admission to Ph.D Programme 2022-23 onwards**

**SECTION-B**

**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.

**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.

**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 the following important suite of rocks and their origin: TTG, Komatiite, Granitoids, Basalts, Anorthosites, Andesites, ultramafic and alkaline rocks

**Metamorphic Petrology:**

Metamorphic facies of low, medium and high. 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  
UHP and UHP metamorphism

**Geochemistry:**

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

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**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.

**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.

**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 Theim, Theis, and Walton equations.

**Environmental Geology:**

Structure and evolution of atmosphere, vertical structure, chemical evolution of atmosphere, thermal inversion. Global warming in present atmosphere due to indiscrete exploitation of fossil fuel, 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.  
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.

**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, 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.

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