Syllabus
for
Geology, Earth Sciences (SCQP14)

Note:

i. ***The Question Paper will have 75 questions.***
ii. ***All questions will be based on Subject-Specific Knowledge.***
iii. ***All questions are compulsory.***
iv. ***The Questions will be Bilingual (English/Hindi).***

Geology, Earth Sciences (SCQP14)

UNIT-I

Physical Geology:

Introduction to Geology and its scope, Earth and solar system: origin, size, shape, mass,density and its atmosphere. A brief account of various theories regarding the origin andage of the Earth. Brief idea of interior of earth and its composition. Weathering and erosion: factors, types and their effects. Earthquakes: nature of seismic waves, their intensity and magnitude scale; Origin of earthquake. Volcanoes: types, products and causes of volcanism.

Geomorphology:

Basic principles of Geomorphology, geomorphological cycles, weathering and erosion; geomorphic mapping- tools and techniques. Epigene/ exogenic processes: degradation and aggradation. Hypogene/endogenic processes; Diastrophism and volcanism, Extraterrestrial processes; Geological work of wind, glacier, river, underground water andocean.

Geodynamics:

Earth as a dynamic system. Elementary idea of continental drift, sea-floor spreading andmid-oceanic ridges. Paleomagnetism and its application. Plate Tectonics: the concept, plate margins, orogeny, deep sea trenches, island arcs and volcanic arcs.

Environmental Geology:

Earth and its spheres: atmosphere, hydrosphere, lithosphere, biosphere and Man; Earth Material. Energy budget: Solar radiation. Global environments: coastal, riverine, desertic,tropical, cold, polar. Concept of global warming and climate change. Geological hazards: Earthquakes, volcanism, landslides, avalanches, floods, droughts; Hazard mitigation.
Resource Management: Energy resources (Conventional and non-conventional), watershed management, land use planning, management of water resources, landreclamation.

Structural Geology:

Introduction to Structural Geology; contours, topographic and geological maps; Elementary idea of bed, dip and strike; Outcrop, effects of various structures on outcrop. Clinometer/Brunton compass and its use. Elementary idea of types of deformation; Folds:nomenclature and types of folds. Faults: nomenclature, geometrical and genetic classifications, normal, thrust and slip faults. Definition, kinds and significance of joints and unconformity.

Hydrology:

Definition of hydrogeology, Hydrological cycle. Hydrological parameters - Precipitation, evaporation, transpiration and infiltration. Origin of groundwater; Vertical distribution ofgroundwater. Types of aquifers;

Water bearing properties of rocks - Porosity and Permeability; specific yield, specific retention. Surface and subsurface geophysical and geological methods of ground water exploration. Groundwater provinces of India.

Physical Geography

Definition and Scope, Components of Earth System. Atmosphere – Heat Balance, Global Circulation Pattern, Tropical Cyclones, Monsoon, Climatic Classification (Koppen).Lithosphere – Internal Structure of Earth based on Seismic Evidence, Plate Tectonics andits Associated Features. Fluvial Cycle of Erosion – Davis and Penck. Hydrosphere – Hydrological Cycle, Ocean Bottom Relief Features, Tides and Currents.

Fundamentals of Remote sensing & GIS:

Remote sensing systems; remote sensing sensors; signatures of rocks, minerals and soils. Application of remote sensing in geoscience and geomorphological studies. Types of Indian and Foreign Remote Sensing Satellites, Digital image processing; fundamental stepsin image processing; elements of pattern recognition and image classification.

Introduction to Geographic Information System (GIS); components of GIS; productgeneration in GIS; tools for map analysis; integration of GIS with remote sensing.

UNIT-II

Crystallography:

Crystals and their characters, form, face, edge, solid angle; Interfacial angle and their measurements; Crystallographic axes and angles. Crystal parameters, Weiss and Miller system of notations. Symmetry elements and description of normal class of Isometric, Tetragonal, Hexagonal, Trigonal, Orthorhombic, Monoclinic and Triclinic systems.

Mineralogy:

Introduction to Mineralogy, Definition and characters of mineral. Physical properties of minerals. Chemical composition and diagnostic physical properties of minerals such as: Quartz, Orthoclase, Microcline, Hypersthene, Hornblende, Garnet, Muscovite, Biotite, Chlorite, Olivine, Epidote, Calcite. Polarizing microscope, its parts and functioning; Ordinary and polarized lights; Common optical properties observed under ordinary, polarized lights and crossed nicols. Optical properties of some common rock forming minerals (Quartz, Orthoclase, Microcline, Olivine, Augite, Hornblende, Muscovite, Biotite,Garnet, Calcite).

Geochemistry:

Introduction to geochemistry: basic knowledge about crystal chemistry. Types of chemical bonds, coordination number; Colloids in geological systems, ion exchanges and geological evidence for earlier colloids. Elementary idea of Periodic Table. : Cosmic abundance of elements; Composition of the planets and meteorites; geochemical evolution of the earth and geochemical cycles. Gold Schmidt's geochemical classification of elements; Distribution of major, minor and trace elements in igneous, metamorphic and sedimentary rocks. Elements of geochemical thermodynamics; Isomorphism and polymorphism.

Petrology:

Igneous Petrology: Magma: definition, composition, types and origin; Forms of igneousrocks; textures of igneous rocks. Reaction principle; Differentiation and Assimilation;Crystallization of unit-component and bi-component (mix-crystals) systems; Bowen’s reaction series. Mineralogical and chemical classification of igneous rocks. Detailed petrographic description of Granite, Granodiorite, Rhyolite, Syenite, Phonolite, Diorite, Gabbro. Processes of formation of sedimentary rocks; Classification, textures and structures of sedimentary rocks. Petrographic details of important siliciclastic and carbonate rocks such as - conglomerate, breccia, sandstone, greywacke, shale, lime stones. Process and products of metamorphism; Type of metamorphism. Factors, zonesand grades of metamorphism. Textures and structures of metamorphic rocks. Classification of metamorphic rocks. Petrographic details of some important metamorphicrocks such as - slate, schists, gneiss, quartzite, marble.

Geology, Earth Science (SCQP14)

Economic Geology:

Concept of ore and ore deposits, ore minerals and gangue minerals; Tenor of ores;Metallic and non-metallic ore minerals; Strategic, Critical and essential minerals.
Processes of formation of ore deposits; Magmatic, contact metasomatic, hydrothermal,sedimentation. Study of important metallic (Cu, Pb, Zn Mn, Fe, Au, Al) and non-metallic(industrial) minerals (gypsum, magnesite, mica). Distribution of coal and petroleum in India.

Mineral exploration:

Elementary idea of geological, geochemical and geophysical prospecting. Elementary ideaof mining and environmental considerations for mining.

Stratigraphy:

Definition, Principle of stratigraphy; Geological Time Scale and stratigraphic classification;Physiographic division of India. Study of following Precambrian succession: Dharwar, Cuddapha, Vindhyan and Delhi Supergroups; Brief idea of Palaeozoic succession of northwestern Himalaya; Triassic of Spiti; Mesozoic type secession of Kutch and Rajasthan;Cretaceous of Tiruchirapalli. Study of following type localities: Gondwana and Deccan Trap. Paleogene- Neogene sequences of northwest Himalaya and Assam.

Paleontology:

Definition, Fossils: definition, characters, binomial nomenclature in taxonomy, mode of preservation, condition of fossilization and significance of fossils. Morphology and geological distribution of brachiopods, pelecypods, cephalopods. Morphology and geological distribution of trilobite, echinoidea. Evolutionary history of horse. Morphology,distribution and significance of Gondwana flora.