

# GEOLOGY(HONOURS)

## SEMESTER-I

### C:1-GEOLOGY-I

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

(The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.)

#### UNIT- I: General geology-A

Geology - its perspective, scope and subdivisions; Earth in the Solar system; Origin of the Earth, Seismology and internal structure of the earth; Radioactivity and age of the earth.

#### UNIT-II: General geology-B

Volcanoes: Types, products and distribution. Earthquakes - intensity, causes and distribution.

#### UNIT: Geomorphology-A

Weathering and Erosion, Mass wasting; Geological works of rivers, glaciers, and landforms produced by them.

#### UNIT-IV: Geomorphology-B

Geological works of wind, underground water and oceans and landforms produced by them.

#### UNIT-V: Quaternary Geology

Scope, climate change, eustatic movement and other geological phenomena during Quaternary; Landforms and deposits with special reference to India; Neotectonics; Glaciation and its causes; Sea-level change during Quaternary.

### C:2-GEOLOGY-II

(Credit:6, Theory:4, Practical:2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1 hr. duration)

(The emphasis of course is on applications in solving problems of interest to physicists. The students are to be examined entirely on the basis of problems, seen and unseen.)

#### UNIT-I: Geotectonics-A

Tectonic movements Epeiorogeny and orogeny; Isostasy concept and theories; Geosynclines; Mountain building theories.

#### UNIT-II: Geotectonics-B

Plate tectonics concept and types of plate margins; Continental drift evidences and causes; Sea-floor spreading; Mid-oceanic ridge; Island arc.

#### UNIT-III: Photogeology

Principles of aerial photography; Scale, photo-elements and interpretation. Application of aerial photography in mineral exploration, ground water exploration and geomorphology.

#### UNIT-IV: Remote Sensing

Principles of remote sensing, Electromagnetic radiation, Scale, Sensors; Platforms, Photo mosaic and FCC. Application of remote sensing in mineral exploration, ground water exploration and geo-morphology.

#### UNIT-V: Marine Geology

Relief of ocean floor; Marine sediments and their classification; Marine resources; Submarine canyons, Sea mounts and guyots; Coral reef.

## SEMESTER-II

### C:3-GEOLOGY-III

(Credit:6, Theory:4, Practical: 2) Theory: 70

Marks, Practical: 30 Marks Theory: 40

Classes (1 hr. duration)

#### UNIT-I: Crystallography-A

Crystalline and non-crystalline substances, Crystals - definition, characteristics, intercepts, parameters, indices and forms. Symmetry elements and classification of crystals in to seven systems. International Symbol; Holohedrism, hemihedrism hemimorphism and enantiomorphism. Study of axial relationship, symmetry elements and forms present in  $4/m\ 2/m$ ,  $3m$ ,  $2/m$ ,  $4/m2/m2/m$  and  $2/m$  classes.

#### UNIT-II: Crystallography-B

Study of axial relationship, symmetry elements and forms present in  $6/m2/m2/m$ ,  $622$ ,  $2/m$ ,  $3m$ ,  $32$ ,  $2/m2/m2/m$ ,  $2/m$  and classes. Twinning, Fundamentals of stereographic projection of crystals. Zone and zonal laws.

#### UNIT-III: Mineralogy-A

Scope of mineralogy; chemical bonding and compound formation. Definition and classification of minerals. Physical properties of minerals, Silicate structure and its classification.

#### UNIT-IV: Mineralogy-B

Study of atomic structure, chemistry, physical, optical properties and uses of minerals of Olivine, Feldspar, Pyroxene, Amphibole, Garnet, Feldspathoids and Mica groups.

#### UNIT-V: Mineralogy-C

Isomorphism, polymorphism and pseudomorphism; Chemical composition, physical and optical properties of important rock forming minerals.

#### C:4-GEOLOGY-IV

(Credit:6, Theory:4, Practical: 2) Theory: 70

Marks, Practical: 30 Marks Theory: 40

Classes (1 hr. duration)

##### UNIT-I: Mineral Optics-A

Nature of light rays and their propagation, internal reflection, double refraction, interference and polarization. Nicol Prism and polaroids. Petrological microscope - parts and their functions.

##### UNIT-II: Mineral Optics-B

Preparation of thin section of minerals and rocks. Behaviour of light in thin section and production of interference colours. Order of interference colour and Twinkling. Optic axis, Uniaxial and biaxial minerals.

##### UNIT-III: Mineral Optics-C

Isotropism and anisotropism,. Extinction and extinction angle. Pleochroism, pleochroic scheme, Birefringence; Outline of study of optical characters of minerals in thin sections.

##### UNIT-IV: Geochemistry-A

Cosmic abundance of elements; composition of planets and meteorites. Structure and composition of earth.

##### UNIT-V: Geochemistry-B

Geochemical classification of elements, Primary geochemical differentiation; Atomic substitution and solid solution.

### SEMESTER-II

#### C:5-GEOLOGY-V

(Credit:6, Theory:4, Practical: 2) Theory: 70

Marks, Practical: 30 Marks Theory: 40

Classes (1 hr. duration)

##### UNIT-I: Igneous Petrology-A

Magma and its characteristics; Crystallization behaviour of unicomponent magma; bicomponent magma showing solid solution and eutectic relationships, Introduction to Di-Ab-An ternary system.

##### UNIT-II: Igneous Petrology-B

Introduction, Forms, Texture, Mega- and micro-structures of igneous rocks.

##### UNIT-III: Igneous Petrology-C

Bowens reaction series and its implications. Differentiation of magma and diversity of igneous rocks.

##### UNIT-IV: Igneous Petrology-D

Classification of igneous rocks. Preliminary idea on assimilation processes.

##### UNIT-V: Igneous Petrology-E

Petrographic notes on Basalt, Dolerite, Gabbro, Granite, Pegmatite, Syenite, Dunite, Diorite, Peridotite, Carbonatite, Anorthosite and Kimberlite and their occurrences in India.

## C:6-GEOLOGY-VI

(Credit:6, Theory:4, Practical: 2) Theory: 70  
Marks, Practical: 30 Marks Theory: 40  
Classes (1 hr. duration)

### UNIT-I: Sedimentary Petrology-A

Introduction, formation of sediments and sedimentary rocks. Elementary idea on sedimentary environments.

### UNIT-II: Sedimentary Petrology-B

Texture, structure and diagenesis of sedimentary rocks. Elementary idea on sedimentary facies.

### UNIT-III: Sedimentary Petrology-C

Classification of sedimentary rocks. Sedimentary basins of India.

### UNIT-IV: Sedimentary Petrology-D

Palaeocurrent; Heavy minerals and Provenance.

### UNIT-V: Sedimentary Petrology-E

Petrographic notes on sandstones, conglomerate, shale, limestone and breccia and their occurrences in India.

## C:7-GEOLOGY-VII

(Credit:6, Theory:4, Practical: 2)  
Theory: 70 Marks, Practical: 30 Marks  
Theory: 40 Classes (1hr duration)

### UNIT-I: Metamorphic Petrology-A

Introduction, agents and types of metamorphism; ACF and AKF diagrams.

### UNIT-II: Metamorphic Petrology-B

Texture and structure of metamorphic rocks.

### UNIT-III: Metamorphic Petrology-C

Classification of metamorphic rocks; Metamorphic differentiation.

### UNIT-IV: Metamorphic Petrology-D

Zone and grade and facies of metamorphism. Metasomatism.

### UNIT-V: Metamorphic Petrology-E

Petrographic notes on important rock types like schists, gneisses, marble, quartzite, slate, phyllites, khondalite and charnockite and their occurrences in India.

## SEMESTER-III

### C:8-GEOLOGY-VIII

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

#### UNIT-I: Palaeontology-A

Fossil-definition and conditions of fossilization; Mode of preservation and geological significance of fossils.

#### UNIT-II: Palaeontology-B

Morphology, evolution and geological history of Trilobite, Brachiopoda, Pelecypoda, Cephalopoda and Gastropoda.

#### UNIT-III: Palaeontology-C

Morphology, evolution and geological history of Echinoidea, Coral and graptolite. Index and Zonal guide fossils. Brief ideas on evolution of horse and man.

#### UNIT-V: Palaeobotany

Scope of paleobotany, taxonomy of plants, Gondwana flora and their significance.

#### UNIT-V: Palynology

Introduction; Separation of spores and pollens and mounting for study. Utility of palynological studies in different fields.

### C:9-GEOLOGY-IX

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

#### UNIT-I: Stratigraphy-A

Principle of Stratigraphy, Stratigraphic units; Stratigraphic correlation, Standard stratigraphic time scale and Indian equivalences; Geomorphic and tectonic divisions of India.

#### UNIT-II: Stratigraphy-B

Precambrian stratigraphy of Karnataka, Odisha, Jharkhand, Rajasthan, Madhya Pradesh and Maharashtra. Stratigraphy of Cuddapah and Vindyan basins.

#### UNIT-III: Stratigraphy-C

Gondwana rocks with special emphasis on fossils, climate and economic importance. Deccan traps and Tertiary of Assam.

#### UNIT-IV: Stratigraphy-D

Triassic of Spiti, Jurassic of Kutch and Cretaceous of Trichinopoly. Siwalik rocks.

#### UNIT-5: Paleogeography

Elements of paleogeography; Paleogeography of Indian subcontinent during Permo-Carboniferous, Triassic, Jurassic and Cretaceous periods.

## C:10-GEOLOGY-X

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

### UNIT-I: Structural geology-A

Introduction, Attitude of beds; Vs rule; Deformation, concept of stress and strain; Outlier, Inlier, Nappe, Klippe and Window.

### UNIT-II: Structural geology-B

Fold - geometry, classification, recognition in field and map, causes of folding. Top and bottom criteria of deformed strata.

### UNIT-III: Structural geology-C

Fault- classification, mechanism, significance, recognition in the field and map, general effects of faulting. Joints - geometry, classification and significance.

### UNIT-IV: Structural geology-D

Unconformity - types, significance, recognition in the field and map, difference between fault and unconformity.

UNIT-V: Structural geology-E Foliation - types and relation with major structures, Lineation - types and relation with major structures; Salt domes and diapirs.

## SEMESTER-V

### C:11-GEOLOGY-XI

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

### UNIT-I: Ore Genesis-A

Process of formation of ore bodies: Magmatic concentration, Hydrothermal processes, Wall rock alteration and Paragenesis, Zoning.

### UNIT-II: Ore Genesis-B

Process of formation of ore bodies: Residual and mechanical concentration, Oxidation and Supergene enrichment.

### UNIT-III: Ore Genesis-C

Process of formation of ore bodies: Sedimentation, Evaporation, Metamorphism.

### UNIT-IV: Energy Resources

Origin, occurrence, distribution and uses of coal and petroleum; Atomic minerals.

### UNIT-V: Mineral Economics

Strategic, essential and critical minerals. Sustainable developments of minerals; Conservation of mineral resources.

## C:12-GEOLOGY-XII

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

### UNIT-I: Mineral Resources-A

Mineralogy, mode of occurrence, origin, Indian distribution and uses of ores of Fe and Mn. Important ore deposits of India.

### UNIT-II: Mineral Resources-B

Mineralogy, mode of occurrence, origin, Indian distribution and uses of ores of Cr and Al. Important ore deposits of India.

### UNIT-III: Mineral Resources-C

Mineralogy, mode of occurrence, origin, Indian distribution and uses of ores of Cu, Pb and Zn. Important ore deposits of India.

### UNIT-IV: Mineral Resources-D

Mineralogy, mode of occurrence, origin, Indian distribution and uses of Mica, Asbestos, Kyanite, Sillimanite, Graphite and Magnesite.

### UNIT-V: Mineral Resources-E

Controls of ore localization, Classification of mineral deposits; Metallogenic epochs and provinces; Ore districts.

## SEMESTER-VI

### C:13-GEOLOGY-XIII

(Credit:6, Theory:4, Practical: 2)

Theory: 70 Marks, Practical: 30 Marks

Theory: 40 Classes (1hr duration)

### UNIT-I: Groundwater-A

Hydrological cycle, vertical zonation of ground water, Properties of water bearing formations - porosity, permeability, specific yield, specific retention, storativity. Aquifer types- Confined and unconfined aquifers, aquitard, aquiclude, aquifuge. Darcy's law.

### UNIT-II: Groundwater-B

Ground Water exploration - types of wells, groundwater provinces of India and Odisha. Sea-water intrusion, Quality of ground water and its use in domestic, agriculture and industries; Ground water pollution.

### UNIT-III: Engineering Geology-A

Introduction, Engineering properties of rocks and soils, Geological considerations of Dam and reservoir site selection.

### UNIT-IV: Engineering Geology-B

Geological considerations of tunnel alignment, bridge site selection. Earthquake resistant structures, Soil - classification, erosion and conservation.

### UNIT-V: Exploration Geology

Geological, Geophysical and Geochemical exploration methods.

C:14-GEOLOGY-XIV  
(Credit:6, Theory:4, Practical: 2)  
Theory: 70 Marks, Practical: 30 Marks  
Theory: 40 Classes (1hr duration)

UNIT-I: Mining

Terminology in mining, Open-cast and Underground mining methods, Drilling, Surveying.

UNIT-II: Disaster Management

Natural disasters and their management Earthquake, Landslide, Flood, Tsunami and Cyclone.

UNIT-III: Environmental Geology-A

Renewable and non-renewable resources; Conservation of mineral resources; Impact of mining on environment; Fundamentals of environmental impact assessment.

UNIT-IV: Environmental Geology-B

Management of solid wastes including mining wastes; Fly ash, Radioactive wastes; Environmental protection- Legislative measures in India; Fluorosis problems and arsenic poisoning in India Causes and remedial measures.

UNIT-V: Resource Evaluation

Sampling; Assaying; Ore-reserve estimation