

**COURSES OF STUDY
FOR
B.Sc. Pt. I Examination
(Three Year Degree Course)**

B.Sc. Geology Honours Part-I

THEORY PAPER-I

Full Marks-75

Time – 3 hours

In all ***Ten*** questions are to be set (*six* from Group A and *four* from Group B) and the students are required to answer *five* questions selecting ***at least two*** from each group

Group – A

GENERAL AND PHYSICAL GEOLOGY

Introduction : Aim, application and various branches of Geology

The Earth and the solar system, important physical parameters and properties of the planet.

Elementary Knowledge of earth's atmosphere, hydrosphere, lithosphere and biosphere.

Origin of the earth

Age of the earth

Geological Time Scale

Internal structure and composition of the earth

Elementary idea of the Plate Tectonics

Causes, intensity and magnitude and effects of earthquake

Seismograph, Seismicity in India

Volcano-types, distribution and product of volcanic activities.

Physiographic divisions and Tectonic framework of India

Surface processes: Weathering and Erosion, Normal Cycle of Erosion

Geological work of Rivers, Underground water, Wind, Lake, Glaciers, Causes of glaciation, evidences of ice age

Coral Reef

Group – B

STRUCTURAL GEOLOGY

Definition and objectives of structural geology.

Elementary concept of structural geology- idea of strain and stress in rocks.

Stratification and bedding, Attitude of Beds, Outcrops and outcrop patterns, Outliers and Inliers, Dip & strike, Clinometer compass and its uses.

Folds – Definition, Classification, causes, recognition and importance

Faults – Definition, Classification, causes, recognition

Unconformities – Definition, types, formation, recognition and geological significance.

Joints – Definition, geometric and genetic classification

Lineation, Foliation – Definition and types.

Criteria for the recognition of top and bottom of beds

THEORY PAPER-II

Full marks – 75

Time – 3 hours

In all ***Ten*** questions are to be set (***Five*** from each group) and the students are required to answer ***five*** questions selecting ***at least two*** from each group

Group – A

MINERALOGY

Minerals – Definition and physical properties – form, colour, streak, luster, cleavage, fracture, hardness, and specific gravity.

Isomorphism, Polymorphism and Pseudomorphism

Structure of silicates.

A detailed study of following rock forming mineral groups with reference to their *composition, structure, physical and optical properties and paragenesis*:

Quartz, Feldspar, Pyroxene, Amphibole, Mica

Detailed study of the following minerals – Garnet, Olivine, Nepheline, Talc, Gypsum, Calcite, Fluorite, Apatite, Beryl, Topaz, Corundum, Barite, Kyanite, Sillimanite, Tourmaline.

Group – B

CRYSTALLOGRAPHY

Definition and morphology of crystal, crystal notations,

Brief idea of space lattice,

Symmetry elements : Plane-, Axis- and Centre of symmetry

Parameter, indices and symbols

Laws of crystallography

Contact Goniometer

Stereographic Projections

Study of the following Crystal systems:

Isometric system, Tetragonal system, Hexagonal system, Orthorhombic system, Monoclinic system, Triclinic system

Crystal habits and twinning, laws of twinning

OPTICAL MINERALOGY

Elementary concepts of light, Propagation of light through minerals.

Polarization, Double refraction.

Construction of Nicol Prism,

Petrological Microscope and its function.

Isotropism and Anisotropism, Optical indicatrix

Important optical properties – R.I., Pleochroism, Pleochroic haloes, Extinction and extinction angle, Birefringence, Interference colours

Behaviour of convergent polarized light in Uniaxial and Biaxial minerals.

Optical Accessories – Mica plate, Gypsum plate and Quartz wedge

PRACTICAL

Full Marks – 50 (Practical – 40 marks, Sessional and viva – 10 marks)

Study of geological maps, drawing of geological section and description of their geological history.

Clinographic Projection of :

Isometric System – Cube, Octahedron,

Rhombdodecahedron, Pyritohedron,

Trapezohedron and Tetrahedron(+ve and –ve)

Tetragonal System – 1st and 2nd order Prism with Basal pinacoids

1st and 2nd order Pyramids

Zircon, Vesuvianite, Cassiterite

Stereographic Projection of :Zircon, Vesuvianite, Cassiterite and Barite

Megascopic study of ores and common rock forming minerals

Microscopic study of common rock forming minerals

Books recommended :

1. *Holmes, A.* : Principles of Physical Geology.
2. *Longwell and Flint* : Introduction to Physical Geology
3. *Dutta, A.K.* : An Introduction to Physical Geology
4. *Singh, S.* : Physical Geography
5. *Singh, Praveen* : Textbook of Engineering and General Geology
6. *Siddarth, K.* : Earth's Dynamic Surface
7. *De Sitter, L.U.* : Structural Geology
8. *Billings, M.P.* : Structural Geology
9. *Platt and Challinor* : Simple Geological Structure
10. *Chiplonkar, G.N.* : Geological Maps
11. *Lahee, F.H.* : Field Geology
12. *Turner, F.J. and Weiss, L.E.* : Structural Analysis of Metamorphic Tectonics

B.Sc. Geology Subsidiary (Pt. - 1)

Theory Paper – I

Full Marks – 75

Time – 3 hours

In all **Ten** questions are to be set (**Five** from each group) and the students are required to answer **five** questions selecting **at least two** from each group.

Group – A

PHYSICAL GEOLOGY

Aim, application and various branches of Geology

Earth as a planet - Its size, shape, origin and age,

Internal structure of the earth.

Earthquake – Causes, distribution and effects.

Elementary idea of the earth - Atmosphere, Hydrosphere, Lithosphere & Biosphere.

Surface processes : Weathering and Erosion,

Geological work of River, Glaciers, Underground water and Wind.

Volcanoes : types, products and distribution

STRUCTURAL GEOLOGY

Elementary concepts of stratification and bedding

Dip and strike

Clinometer Compass

Fold – definition and classification

Fault – definition, classification

Unconformity – definition, types

Joints-definition, types

Group – B

MINERALOGY

Minerals – Definition and physical properties – forms, colour, streak, luster, cleavage, fracture, hardness, specific gravity etc.

Moh's scale of hardness

Isomorphism and Polymorphism,

Structural Classification of silicates.

Mineralogy of important group of rock forming minerals with reference to *composition, structure, physical and optical properties* –

Feldspar, Pyroxene, Amphibole, Mica.

Study of physical and optical properties, chemical composition of following minerals-

Quartz, Olivine, Garnet, Talc, Gypsum, Calcite, Fluorite, Apatite, Topaz, Corundum.

CRYSTALLOGRAPHY

Definition of crystal

Morphology of crystal viz. faces, edges, solid angles,

Crystallographic axis, crystallographic planes, Crystal notations.

Symmetry elements : axis-, plane- and centre of symmetry

Contact goniometer and its use

Laws of crystallography

Crystal System, Study of the normal class of the following crystal systems:

Isometric system, Tetragonal system, Orthorhombic system

OPTICAL MINERALOGY

Propagation of light through minerals

Double refraction and polarization

Construction of Nicol Prism

Petrological Microscope and its function

Study of important optical properties – R.I., Birefringence, Pleochroism, Interference colour and Extinction.

PRACTICAL

Full Marks – 25 (Practical – 20 Marks and Sessional & Viva – 5 Marks)

Study of simple geological maps, drawing of geological section and description of their geological history.

Crystal drawing of the following forms : Cube, Octahedron, Rhombdodecahedron, 1st and 2nd order Prisms and Pyramids of Tetragonal System, Zircon

Study of Physical properties of the following minerals : Quartz, Orthoclase, Microcline, Feldpars, Muscovite, Biotite, Hornblende, Tremolite, Actinolite, Olivine, Calcite, Gypsum, Talc, Fluorite, Apatite, Topaz, Corundum, Baryte, Kyanite, Tourmaline, Garnet, Magnetite, Hematite, Chalcopyrite, Pyrite, Bauxite, Chromite, Pyrolusite, Psilomelane.

Microscopic Study of the common rock forming minerals.

Books recommended :

1. *Holmes, A. : Principles of Physical Geology.*
2. *Dutta, A.K. : An Introduction to Physical Geology*
3. *Singh, S. : Physical Geography*
4. *Singh, Praveen : Textbook of Engineering and General Geology*
5. *Siddarth, K. : Earth's Dynamic Surface*
6. *De Sitter, L.U. : Structural Geology*
7. *Billings, M.P. : Structural Geology*
8. *Platt and Challinov : Simple Geological Structure*
9. *Lahee, F.H. : Field Geology*
10. *Mukherjee, P.K.: Text Book of Geology*
11. *Dana –*
12. *Rutley's –*
13. *Berry Mason –*
14. *Kerr, P.F.–*

**COURSES OF STUDY
FOR
B.Sc. Pt. II Examination
(Three Year Degree Course)**

B.Sc. Geology Honours Part –II

THEORY PAPER –III

Full Marks – 75

Time-3 hours

In all *Ten* questions are to be set and the students are required to answer *five* questions.

IGNEOUS PETROLOGY

Introduction to Petrology-distinguishing features of three types of rocks.

Igneous Petrology : Definition. Form Texture and Structure of Igneous rocks and their petrological significance.

Magma : Definition, generation and crystallization of magma, Elementary idea of relationship between magma generation and Tectonic setting,

Origin of primary basic magma.

Bowen's Reaction Principle & its petrological significance.

Diversity of Igneous Rocks.

Introduction to Phase Rule, Study of the following Phase diagrams :

Binary : Q – Or; Ternary : Ab – An – Di.

Petrographic description of the following rock types :

Granite Rhyolite, Syenite, Nepheline-syenite, Monzonite, Granodiorite, Diorite, Pegmatite, Anorthosite, Gabbro, Dolerite, Basalt, Peridotite, Pyroxenite, Norite, Dunite, Trachyte and Andesite.

THEORY PAPER –IV**Full Marks – 75****Time-3 hours**

In all *Ten* questions are to be set(*five* from each group) and the students are required to answer *five* questions selecting **at least two** from each group.

Group-A**SEDIMENTARY PETROLOGY**

Introduction

Processes of formation of sedimentary rocks,

Textures of clastic and non-clastic sedimentary rocks.

Structures of sedimentary rocks-Primary, Secondary, Biological,

Lithification and Diagenesis,

Classification of sedimentary rocks,

Provenance.

Petrographic description of the following rock types :

Conglomerate, Breccia, Sandstones – Orthoquartzite, Arkose, Greywacke
Limestone, Dolomite, Shale.

Group-B**METAMORPHIC PETROLOGY**

Introduction to metamorphism : Definition, aims and scope of study of metamorphic rocks

Limitations of metamorphism- Diagenesis, metamorphism, anataxis, palingenesis

Preliminary ideas of phase rule

Agents and kinds of metamorphism

Plate tectonics and metamorphism

Classification of metamorphic rocks

Textures and structures of metamorphic rocks

Concept of Zones, Facies, Facies series, Grades and Isograds

Preliminary ideas of metamorphic differentiation, Prograde, Retrograde, and

Poly-metamorphism, paired metamorphic belts, Index minerals

Thermal metamorphism of argillaceous and calcareous rocks

Regional metamorphism of argillaceous and calcareous rocks

Petrographic notes on the following metamorphic rocks :

Slate, Phyllite, Schists, Gneisses, Amphibolites, Marble, Quartzites, Hornfels, Charnockite, Khondalite, Eclogite, Kodurite and Skarns.

PRACTICALS

Full marks – 50

(Practical – 40 ; Sessional & Viva-voce-10)

Megascopic study of the following rocks :

Granite, Syenite, Pegmatite, Diorite, Gabbro, Basalt, Rhyolite, Dunite, Trachyte, Obsidian, Pumice, Peridotite, Pyroxenite, Anorthosite, Norite, Schists, Gneisses, Marble, Charnockite, Phyllite, Amphibolite, Quartzite, Shale, Sandstone, Limestone, Conglomerate, Breccia.

Microscopic study of the following rocks :

Granite, Syenite, Nepheline–syenite, Granodiorite, Diorite, Gabbro Dolerite, Basalt, Peridotite, Anorthosite, Charnockite, Schists, Gneisses, Amphibolite, Marble, Quartzite, Sandstone, Orthoquartzite, Arkose, Greywacke, Limestone, Shale.

Identification and interpretation of important textures and structures of igneous, metamorphic and sedimentary rocks.

B.Sc. (SUBSIDIARY) Part –II

THEORY PAPER –II

Full Marks – 75

Time-3 hours

In all *Ten* questions are to be set(*five* from each group) and the students are required to answer *five* questions selecting **at least two** from each group.

Group-A

IGNEOUS PETROLOGY

Petrology-Definition, three-fold classification of rocks and their distinction.

Igneous Petrology-Elementary knowledge about Magma, Magma types and its composition.

Bowen's Reaction Principle

Forms, Texture and Structure of Igneous Rocks.

Classification of Igneous Rocks.

Petrographic description of the following rock types :

Granite, Granodiorite, Syenite, Diorite, Gabbro, Dolerite, Basalt, Rhyolite.

METAMORPHIC PETROLOGY

Metamorphism – Definition, agents and types.

Textures and structures of Metamorphic rocks.

Classification of Metamorphic rocks.

Petrographic study of the following metamorphic rocks :

Slate, Phyllite, Schist, Gneiss, Augen Gneiss, Amphibolite, Granulite, Charnockite, Marble, Quartzite.

SEDIMENTARY PETROLOGY

Definition and formation of sedimentary rocks

Textures of sedimentary rocks

Study of important primary sedimentary structures

Classification of sedimentary rocks

Petrographic study of sandstone, limestone, shale, conglomerate, breccia

Group-B

ECONOMIC GEOLOGY

Concept of ore, ore mineral, Gangue, Tenor of ores.

An elementary idea of the processes of formation of mineral deposit with special reference to magmatic concentration, supergene sulphide enrichment, placer deposits.

Study of the physical properties, chemical composition, distribution and uses of the following economic minerals :

- Talc, Gypsum, Calcite, Fluorite, Apatite, Orthoclase, Quartz, Topaz, Corundum.
- Chromite, Beryl, Barite, Kyanite, Pyrolusite, Psilomelane, Mica.
- Hematite, Magnetite, Chalcopyrite, Bauxite, Graphite, Galena.

STRATIGRAPHY

Definition, Principles of stratigraphy, Methods of stratigraphic correlation, Geological Time Scale,

An outline of Indian stratigraphy with special reference to Precambrian of Singhbhum, Vindhya, Gondwana, Siwaliks.

PALAEOLOGY

Definition- fossils, index fossils.

Condition and Modes of Preservation, Fossilization.

Morphology and Geological History of the following :

Gastropoda, Lamellibranchia, Brachiopoda, Cephalopoda and Trilobita.

PRACTICAL

Observation of the following economic minerals with reference to their physical properties :

Talc, Gypsum, Calcite, Fluorite, Apatite, Topaz, Corundum, Beryl, Barite, Kyanite, Sillimanite, Hematite, Magnetite, Chromite, Chalcopyrite, Malachite, Azurite, Bauxite, Galena, Sphalerite, Pyrite.

Megascopic study of the following Rocks :

Granite, Syenite, Pegmatite, Diorite, Gabbro, Dolerite, Basalt, Rhyolite, Trachyte, Obsidian, Schist, Gneiss, Marble, Charnockite, Sandstone, Limestone, Shale, Phyllite, Conglomerate, Breccia.

Microscopic study of the following rocks :

Granite, Gabbro, Dolerite, Basalt, Charnockite, Schist, Gneiss, Sandstone, Limestone, Quartzite.

Morphological identification and drawing of the following Fossils :

Corals, Hemicidaris, Micraster, Productus, Spirifer, Terebratula, Rhynchonella, Turritella, Conus, Murex, Physa, Voluta, Arca, Pecten, Ostrea, Gryphea, Exogyra, Trigonina, Cardita, Nautilus, Orthoceras, Glossopteris, Gangamopteris, Ptilophylum, Vertebraria.

Books Recommended :

1. *Tyrell, G.W.* : Principles of Petrology
2. *Huang* : Petrology
3. *Nockolds, Chinner and Kinnox*: Petrology for students
4. *Harker* : Petrology for students
5. *Blatt, Ehler*: Petrology (Igneous, Sedimentary and Metamorphic)
6. *Bose, M.K.* : Igneous Petrology
7. *Mc Birney* : Igneous Petrology
8. *Hall* : Igneous Petrology
9. *Best, M.G.* : Igneous and Metamorphic Petrology
10. *Hyndman, W.D.* : Petrology of Igneous and Metamorphic Rocks
11. *Turner and Verhoogen* : Igneous and Metamorphic Petrology
12. *Hatch and Wells* : Petrology of the Igneous Rocks
13. *Philpotts* : Principles of Igneous and Metamorphic Petrology
14. *Yardley* : Introduction to Metamorphic Petrology
15. *Mason, Roger* : Petrology of the Metamorphic Rocks
16. *Pettijohn, F.* : Sedimentary Rocks
17. *Greensmith* : Petrology of the sedimentary Rocks
18. *Tucker* : Sedimentary Petrology
19. *William, Turner and Gilbert* : Petrography
20. *Sengupta, S.* : Introduction to Sedimentology
21. *Moorehouse* : The Study of Rocks in Thin Section
22. *Winkler, HGF* : Petrogenesis of Metamorphic Rocks
23. *Blatt, Tracy and Owens* : Petrology (Igneous, Sedimentary and Metamorphic)
W.H. Freeman and Company, New York
24. *V.K. Verma* : Sedimentary Petrology

COURSES OF STUDY
FOR
B.Sc. Pt. – III Examination
(Three Year Degree Course)
B.Sc. Geology Honours Part – III

THEORY PAPER – V

Full Marks – 100

Time – 3 hours

In all ***Ten*** questions are to be set (***five*** from Group A. ***three*** from Group B and ***two*** from Group C) and the students are required to answer ***five*** questions selecting ***at least one*** from each group.

GROUP – A

ECONOMIC GEOLOGY

Introduction to ore minerals, gangue, ore, tenor, cut-off grade.

Classification of ore deposits

Processes of formation of mineral deposits with special reference to :

Magmatic Concentration, Supergene Sulphide enrichment, Hydrothermal and Placer deposits.

Brief idea of relationship between Plate Tectonics and mineral deposits.

Prospecting – Geological, Geophysical and Geochemical.

Elementary knowledge of Porphyry Copper.

Detailed study of the following economic mineral deposits of India –

Iron, Basemetals (Copper, lead and zinc), Bauxite, Manganese, Mica, Coal and Petroleum.

A brief study of the *physical properties, chemical composition, mode of occurrence, uses and distribution* of following economic minerals in India : Galena, Graphite, Gypsum, Talc, Calcite, Fluorite, Apatite, Feldspar, Quartz, Topaz, Corundum, Chromite, Barite, Ilmenite, Rutile, Monazite, Garnet, Beryl, Kyanite, Sillimanite, Asbestos, Diamond, Fire Clay and China Clay.

GROUP – B

HYDROGEOLOGY

Hydrogeology : concept and scope.

Hydrologic Cycle : Distribution of water in the earth's crust; Components of hydrologic cycle – evaporation, evapo-transpiration, precipitation, Infiltration and run-off.

Definition and classification of subsurface water; Vertical distribution of groundwater – zone of aeration and zone of saturation. Origin and age of groundwater; Importance of groundwater.

Types of groundwater – juvenile water, magmatic water, connate water, metamorphic water.

Aquifers : unconfined, confined and leaky aquifers; water table and piezometric surface;

Geological formations serving as aquifers;

Properties of water-bearing formations : porosity, permeability, specific yield, specific retention, storage coefficient, hydraulic gradient;

Springs and their types; Thermal springs;

Ground water exploration : Geological and hydrologic studies : Exploratory drilling; Electrical Resistivity Surveying; Seismic Refraction Surveying;

Chemical character of Groundwater: hardness, electrical conductance, pH, dissolved minerals; water quality requirements; drinking water standards;

Geological provinces : Groundwater resources of Bihar, Occurrence of groundwater in hard rock terrain;

GROUP – C
FIELD GEOLOGY

Basic idea of Field Geology

Methods and techniques of sampling and geological mapping

Field equipments and their functions

Interpretation of Topographical and Geological maps.

ENGINEERING GEOLOGY

Engineering properties of rocks.

Role of geology in Planning and construction of engineering projects – Dam site selection, Road alignment.

THEORY PAPER – IV

Full Marks – 100

Time – 3 hours

In all **Ten** questions are to be set (**six** from Group A and **four** from Group B) and the students are required to answer **five** questions selecting **at least two** from each group.

GROUP – A

GENERAL GEOLOGY AND TECTONICS

Concept of Diastrophism – Orogeny and Epirogeny

Wegener's Hypothesis of Continental Drift, Evidences of Continental Drift, Sea Floor Spreading and Plate Tectonics. Causes of Plate motion.

Brief idea of Palaeomagnetism, Polar wandering, Island – Arc, Rift Valley, Palaeoclimate

Mountains – Type, characteristics, and origin,

Structure and tectonic evolution of the Himalayas

Seismology and the internal structure of the earth ; Thermal history of the earth.

Seismic Belts of the earth, Seismicity in India.

Plate movement and Seismicity; Seismograph

Radioactivity and its application in Geology

Basic idea of Remote sensing and GIS

GROUP – B

GEOMORPHOLOGY

Nature and scope of Geomorphology

Fundamental concepts of geomorphology.

Classification of geomorphic processes – weathering, mass – wasting and erosion.

Concept of geomorphic cycle and their interpretation

Landforms resulting from various processes – Fluvial, Eolian, Marine, Tectonic, Volcanic, Karst Topography

Brief introduction of – causes of rejuvenation, peneplanation, soil profile and relief of ocean floor.

Drainage patterns and their significance.

Comparative account of drainage characteristics of Peninsular and Extra-Peninsular India.

Geomorphology of Chhotanagpur Plateau

Applied Geomorphology.

THEORY PAPER – VII

Full Marks – 100

Time – 3 hours

In all ***Ten*** questions are to be set (***six*** from Group A and ***four*** from Group B) and the students are required to answer ***five*** questions selecting ***at least two*** from each group.

GROUP – A

STRATIGRAPHY

Methods of stratigraphic Correlation,

Brief idea about Lithostratigraphy, Biostratigraphy, Chronostratigraphy, Magnetostratigraphy, Seismic and Sequence stratigraphy.

Geological Time Scale

A brief account of the stratigraphy of India with special reference to the *classification, distribution, lithology and economic importance* of the following geological formations of India – Precambrian of Dharwar and Singhbhum, Cuddapah, Vindhyan, Gondwana, Jurassic of Kutch, Cretaceous of South India, Siwaliks and Tertiary of Assam

Palaeogeography of Permo – carboniferous and Cretaceous periods.

GROUP – B

PALAEONTOLOGY

Definition and sub-disciplines : Fossils, index fossils

Uses of Fossils ; Life through ages;

Theory of Evolution

Invertebrate Palaeontology – morphology, classification and geological history of following groups –Gastropoda, Lamellibranchia, Brachiopoda, Cephalopoda, Trilobita and Echinoidea.

Brief study of Suture line development of Ammonoids, Dentition of Lamellibranchia, Classification of Brachiopoda and Evolutionary trends in Trilobita.

Vertebrate Palaeontology – Stratigraphic distribution of Vertebrates in India; Siwalik vertebrate fauna.

Palaeobotany – Fossil records of land plants and their stratigraphic distribution; Brief study of the Gondwana flora in India.

Micropalaeontology. Microfossils and their importance.

PRACTICAL

Full Marks – 100

(Practical – 80 and Field work - 20)

Study and interpretation of geological maps, drawing of Geological sections.

Completion of outcrops.

Structural problems relating to dip and strike & thickness of beds, three-point problems.

Prismatic compass and plane-table survey by Intersection and Closed Transverse methods.

Megascope study of important ore and economic minerals.

Megascope study of important Indian stratigraphic rocks.

Preparation of stratigraphic maps of India showing distribution of Archaeans, Vindhyan, Gondwana and Tertiary

Preparation of Palaeogeographic maps of Permo-carboniferous and Cretaceous periods.

Morphological identification and drawing of the following fossils with special reference to their *morphological characters* and *geological age* – *Nummulites*, *Alveolina*, *Corals*, *Calceola*, *Zaphrentis*, *Cidaris*, *Hemicidaris*, *Micraster*, *Hemiaster*, *Productus*, *Spirifer*, *Terebratula*, *Rhynchonella*, *Cerithium*, *Turritella*, *Conus*, *Physa*, *Murex*, *Voluta*, *Arca*, *Pecten*, *Inoceramus*, *Spondylus*, *Ostrea*, *Gryphaea*, *Exogyra*, *Trigonia*, *Cardita*, *Perisphinctes*, *Gonatite*, *Ceratites*, *Nautilus*, *Orthoceras*, *Belemnites*, *Calemene*, *Phacops*, *Paradoxides*, *Glossopteris*, *Gangamopteris*, *Vertebraria*, *Senizoneura*, *Ptillophylum*.

Geological Field work

Sessional work

Book Recommended

1. *Jenson and Bateman* : Economic Mineral Deposits
2. *Prasad, U.* : Economic Geology
3. *Wadia* : Minerals of India
4. *Brown, C. and Dey, A.K.* : Indian Mineral Wealth
5. *Sinha and Sharma* : Mineral Economics
6. *Tarlings* : Economic Geology and Geotectonics
7. *Riley, Charles M.* : Our Mineral Resources
8. *Bagchi, Sengupta and Rao* : Elements of Prospecting and Exploration
9. *Kesler, Stephen E.* : Mineral Resources, Economics and the Environment
10. *Todd* : Groundwater Hydrology
11. *Karanth* : Hydrogeology
12. *Raghunath* : Hydrology
13. *Lahee, F.H.* : Field Geology
14. *Singh, Praveen* : Text Book of Engineering and General Geology
15. *Singh, S.* : Physical Geography
16. *Valdia, K.S.* : Aspects of Tectonics
17. *Wiley* : Dynamic Earth
18. *Steers, J.A.* : The Unstable Earth
19. *Worcester, P.G.* : A Text Book of Geomorphology
20. *Rice, R.J.* : Fundamentals of Geomorphology
21. *Thornbury, W.D.* : Principles of Geomorphology.