Geology (41)

Introduction

The subject of Geology is introduced at the Junior college level. It is the branch of Science and it considers various aspects of the earth. It deals therefore with the origin, interior and composition of the earth. It is not only the study of surface processes and surface geology but also studies various processes that operate in the interior of the earth in detail, taking the cognizance of their surface manifestations.

Geology primarily studies the rock, their constituents as minerals, their structures and the way of their distribution has taken place on the continents and also on the ocean floor. Consideration to economical aspects of rock and minerals is one of the major branches of the subject. The structure of rocks has also significance as it plays an important role in various civil engineering structures. Hosting of petroleum and natural gas, as energy source, is also related to the structure of rocks. Though the subject deals with pure and fundamental scientific aspects of rocks and minerals, it has much wider application in industries like refractory, abrasive and medicine, etc.

Major problem now being faced by mankind is of ground water. The subject of geology covers, all the aspects, like its surface and subsurface distribution, conservation and management of watershed and modelling to ground water basin constituents which is the major aspect of study.

In brief, Geology plays an important role in industrial and economic development of the country.

Objectives

To enable the students to

1. understand basic concepts, terminology and processes in Geology.
2. acquire knowledge about the Earth.
3. help to understand the problems of the physical environment and identify measures to overcome them.
4. get acquainted with fundamentals of Mineralogy, Petrology, Structural geology, Paleontology, Stratigraphy, Economic geology, Remote Sensing, Ground water geology.
5. develop scientific temper by promoting the spirit of enquiry by observing the nature and its processes at work.
6. develop geological skills, related to collection, processive and analysis of data/ information and preparation of report and use of computers wherever possible.
7. link geology with different fields in national development.
8. apply the knowledge of Geology in finding natural resources and sustainable developments.
9. understand the Geology of India and Maharashtra.

Std.XI - Paper – I

1. Introduction to Geology

1.1 Definition, importance and Interdisciplinary nature

1.2 Branches of Geology

1.3 The earth as a planet, Origin of the earth. Distribution and evolution of

continents and oceans, Major internal structure of the earth-crust, mantle and core.

2. External processes affecting the Earth's crust

2.1 Weathering – types, erosion, denudation and deposition

2.2 Soil : formation and classification

2.3 Geological action : Running water, Glaciers, Wind, Sea waves, Ground water

3. Organization

3.1 Organizations with reference to location and functions –
DGM, GSDA, GSI, ONGC, NIO, ISRO, CGWB, IBM, AMD

Paper – II

4. Minerology

4.1 Definition of Mineral, Crystal, Chemical – composition and Physical properties of minerals, - such as Colour, Streak, Lustre, Cleavage, Fracture, Hardness, Form, Specific– Gravity, Radioactivity, Electricity, Magnetism.

4.2 Study of rock forming mineral groups as –

(1) Feldspar group - Orthoclase

(2) Silica group - Rock crystal,, Amethyst, Agate,Opal

(3) Amphibole group - Hornblende

(4) Pyroxene group - Hypersthene

(5) Mica group - Muscovite

(6) Olivine group - Olivine

(7) Other minerals - Calcite, Stilbite, Apophyllite

5. Petrology

5.1 Definition of rock, Three fold classification of rocks as – igneous, sedimentary and metamorphic.

5.2 Igneous rocks – Definition, classification plutonic, hypabyssal and volcanic. Study of Granite, Gabbro, Dunite, Pegmatite, Dolerite, Rhyolite and Basalt.

5.3 Sedimentary rocks – Processes of formation of sedimentary rocks, Study of Laterite and Bauxite, Conglomerate, Breceia, Sandstone, Shale, Limestone.

5.4 Metamorphic rocks – Definition of metamorphism; Agents and types of metamorphism. Study of Slate, Marble, Chlorite schist, Granite gneiss

5.5 Study of rocks used as Building material with reference to Strength, Durability, Colour, Study of Granite, Basalt, Sandstone, Limestone, Marble.

6. Maharashtra

6.1 Location – its relation with India

6.2 Physiography – Physiographic divisions, relief features, Geological structure.

6.3 Distribution of major rock types and their economic significance.

6.4 Distribution of economically important minerals – varieties of Silica, Zeolites, Kyanite,Bauxite,Iron and Manganese ores, Coal, Oil and Natural gas.

Practicals

1. Mineralogy

1.1 Identification and Description of minerals – Physical properties – Colour, Streak, Lustre, Cleavage, Fracture, Hardness and Chemical composition of following mineral groups –

(1) Feldspar group - Orthoclase
(2) Silica group - Rock crystal, Amethyst, Agate, Opal
(3) Amphibole group - Hornblende
(4) Pyroxene group - Hypersthene
(5) Mica group - Muscovite
(6) Olivine group - Olivine
(7) Other minerals - Calcite, Stilbite, Apophyllite

1.2 Determination of specific gravity of Quartz, Orthoclase, Hornblende, Calcite, Baryte.

2. Petrology

Identification and Description of rocks :

(1) Igneous rocks – Granite, Gabbro, Dunite, Pegmatite, Dolerite, Rhyolite and Basalt.
(2) Sedimentary rocks – Laterite and Bauxite, Conglomerate, Breccia, Sandstone, Shale, Limestone.
(3) Metamorphic rocks – Slate, Marble, Chlorite Schist, Granite Gneiss
(4) Building stones, Granite, Basalt, Limestone, Marble, Sandstone

3 Topographical Map

Acquaintance with topographical maps. Map making agency – Survey of India, Reading of Topsheets of Maharashtra. Use of conventional signs and symbols. Identification of landforms.

4 Field work and it's brief report

5 Certified Practical Journal

Std. XII : Paper – I

1. Dynamic Geology

1.1 Earthquakes – Definition, Causes, Seismic waves, Magnitude and Intensity
1.2 Volcanoes – Types, Products, Associated features
1.3 Mountains – Types
1.4 Natural Hazards and Disasters – Classification
i) Tectonic – Earthquakes – Effects, Precautions, Seismic Zones of India
ii) Topographic – Landslides – Causes, Forms and Effects. Disaster Management.

2. Structural Geology

2.1 Outcrop, Dip and Strike of bed
2.2 Fold
Definition, Elements of fold, Anticline, Syncline, Symmetrical and Asymmetrical
2.3 Fault
Definition, Elements of fault, Normal, Reverse, Horst and Graben
2.4 Joint
Definition, Geometrical and Genetical classification

2.5 Unconformity
Definition, formation of Unconformity Disconformity, Nonconformity and Angular unconformity.

3. Palaeontology and Stratigraphy

3.1 Fossils
Conditions and Modes of preservation and Uses.

3.2 Stratigraphy of Peninsulor India
Principles, Correlation and its methods. Standard Geological Time Scale.

3.3 Stratigraphy of Peninsular India.
Physiographic Divisions of Peninsular India, Brief outline of stratigraphy of Peninsular India.

Paper – II

4. Materials of the Crust

4.1 Mineralogy – Definition :
Rock forming mineral groups

1. Feldspar Group – Microcline, Plagioclase.
2. Silica group – Quartz, Amethyst, Chalcedony, Flint, Jasper, Opal.
3. Amphibole group – Hornblende, Asbestos
4. Pyroxene group – Augite
5. Mica group – Biotite, Phlogopite.
6. Olivine group – Olivine.
7. Other minerals – Kyanite, Corundum, Gypsum, Calcite, Garnet

4.2 Petrology
Definition of rock, rock cycle

A) Igneous -
Definition, classification based on silica percentage, mode of occurrence, colour, Texture-Crystallinity, Granularity, Mutual relationship, Granitic, Porphyritic.
Structure – Vesicular and Amygdaloidal. Forms – Extrusive and Intrusive

B) Secondary / Sedimentary
Definition, classification – based on products of weathering.
Texture – Size, Shape, Form. Structure – Stratification, Lamination, Graded bedding, Cross bedding, Ripple marks.

C) Metamorphic Definition, Agents, Types and Zones
Structure – Slaty, Granulose, Schistose and Gneissose.

5. Economic Geology

5.1 Definition of
Ore, Ore mineral, Industrial mineral, Gangue, Tenor of ore

5.2 Ores

1. Iron Ore – Hematite, Magnetite
2. Manganese Ore – Pyrolusite, Psilomelane
3. Copper Ore – Chalcopyrite
4. Lead Ore – Galena
5. Aluminium Ore – Bauxite

5.3 Mineral/Rock Based Industries –
Fuel –

Coal, Petroleum
Cement –
Limestone, Gypsum
Fertilizers –
Gypsum
Refractories –
Bauxite, Kyanite
Abrasives –
Diamond, Corundum
Electric and Electronics
Mica and Quartz
Medicines –
Mica, Iron ore, Copper ore

6. Applied Geology

6.1 Ground Water –
Source and Zones of ground water, Water table and Aquifer and their types.
Conservation and Management of ground water.

6.2 Remote Sensing –
Definition, Elements of photo recognition Tone, Texture, Size, Shape, Association, Recognition of terrain features – Relief (Plain, Hills and Ranges), Drainage (Streams, River), Exposures- (Vegetation, Soil and Rocks, Lineaments)
Manmade features – (Road, Town/ village, Agriculture field)

6.3 GIS –
Components of Geographical Information System. Importance and significance of G.I.S.

Practicals

1. Mineralogy

(A) Identification and Description of minerals

With reference to Chemical Composition. Colour, Streak, Lustre, Fracture, Cleavage, Hardness and Form of following mineral groups :

1) Feldspar group –
Microcline, Plagioclase
2) Silica group –
Quartz, Amethyst, Chalcedony, Flint, Jasper, Opal
3) Amphibole group –
Hornblende, Asbestos
4) Pyroxene group
Augite
5) Mica group –
Biotite, Phlogopite
6) Olivine group
Olivine.
7) Other minerals –
Kyanite, Corundum, Gypsum, Calcite, Garnet.

(B) Identification and Description of ore minerals

With reference to Chemical composition, Colour, Streak, Lustre, Fracture, Cleavage, Hardness, Form and Uses of following ore minerals.

1) Iron Ore –
Hematite, Magnetite
2) Manganese Ore –
Pyrolusite, Psilomelane
3) Copper Ore –
Chalcopyrite

4) Lead Ore –
Galena
5) Aluminium Ore –
Bauxite

2. Petrology

Identification and description of rocks with reference to Colour, Texture/Structure, Mineral Composition and Classification.

1) Igneous –
Granite, Syenite, Gabbro, Dunite, Pegmatite Dolerite, Rhyolite, Basalt.
2) Sedimentary – Laterite and Bauxite, Breccia, Boulder bed, Grit, Sandstone, Shale, Siltstone, Limestone.
3) Metamorphic – Phyllite, Marble, Quartzite, Mica schist, Hornblende gneiss

3. Structural Geology

Drawing and study of sketch diagrams of the following
Dip and Strike of bed,
Fold-
Anticline, Syncline, Symmetrical, Asymmetrical
Fault -
Normal, Reverse, Horst, Graben
Joint -
Strike, Dip, Bedding, Oblique, Columnar
Unconformity –
Disconformity, Nonconformity, Angular
Igneous forms –
Sill, Dyke, Laccolith, Lopolith, Batholith, Phacolith

4. The Geological Map of India

Outline map of India the with outline of geological formations of peninsular India are to be supplied to the student and a student has to fill the appropriate colours/ signs and prepare the index of the following geological formations – Dharwar, Cuddapah, Vindhyan, Gondwana, Deccan traps and Tertiary Super groups.

5. Topographical Maps

Reading of topographical maps with reference to prominent physical features and drawing of cross section with reference to horizontal series of beds.

6. Field Work

Visit to near by geologically interesting and important places and their brief report.

7. Record

Certified Practical Journal.

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