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॥ अंतरी पेटवू ज्ञानज्योत ॥



North Maharashtra University,
Jalgaon

Syllabus for S.Y.B.Sc.

GEOLOGY

w.e.f. June, 2003

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NORTH MAHARASHTRA UNIVERSITY, JALGAON.

**CORRECTIONS.
S.Y.B.Sc. Geology.**

Paper-I. Term-I.

Unit No.	Number of periods allotted	Number of marks allotted
Unit no.I	6	2
Unit no.I (2 A)	(Instead of-10)12	12
Unit no.I (2 B)	6	12
Unit no.II (a, b, c, d)	(Instead of-8) 11	8
Unit no.III	(Instead of-8) 9	10
Unit no.IV	8	6
Instead of 48 Periods	Total =52	Total =50

Paper-I. Term-II.

Unit No.	Number of Periods allotted	Number of marks allotted
I	18	18
II	18	18
III	16	14
Instead of 45 Periods	Total Periods=52	Total Marks=50

Paper-II. Term-I.

Unit No.	Number of Periods allotted	Number of marks allotted
I	40	35
II	(Instead of-11) 12	15
Instead of 45 Periods	Total Periods=52	Total Marks=50

Paper-II. Term-II.

Unit No.	Number of Periods allotted	Number of marks allotted
A & B	25	25
C	11	10
D	10	10
E	6	5
Instead of 48 Periods	Total Periods=52	Total Marks=50

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North Maharashtra University, Jalgaon

SYLLABUS FOR S.Y. B.Sc.
In GEOLOGY

(W.E. From June, 2003)

Scheme :

Paper - I Term - I : Mineralogy and Gemology

Term - II : Petrology

Paper -II Term- I : Principles of Stratigraphy and Palaeoecology

Term : Applied Geology

Paper -III : Practicals

North Maharashtra University, Jalgaon.

SYLLABUS FOR S.Y. B.Sc. In GEOLOGY (W.E. From June, 2003)

Paper - I Term - I Mineralogy

Unit- I: Mineralogy

(6)

1. Introduction

1. Definition of a mineral
2. Major elements constituting minerals
3. Size and shape of the elements and Ionic size
4. Distribution of bonds in minerals
5. Isomorphism, polymorphism, and Pseudomorphism.

2. Mineral groups

(10)

A) Silicate structures, chemical composition, physical and optical properties, occurrences and uses of:

1. Olivine Group,
2. Garnet group,
3. Mica group,
4. Silica group.

B) Introduction to silicate structure, chemical composition, list the mineral varieties and uses of

(6)

1. Pyroxene group,
2. Amphibole group,
3. Feldspar group,
4. Aluminosilicate group

Unit- II: Crystallography

(8)

- a) Crystal forms: Cube, Prism, Dome, Pinnacoid
- b) Definition of Holohedral, Hemimorphic, Hemihedral forms and their study.
- c) Crystallographic axis, symmetry, forms and indices of :
 - i. Cubic system - Pyrite and tetrahedrite type.
 - ii. Hexagonal system - Beryl, Calcite, Quartz, and Tourmaline type,
 - iii. Monoclinic system - Gypsum type,
 - iv. Triclinic system - Axinite type.
- d) Twin crystals: Definition, twin axis, twin plane and composition plane. Five types of twins in Rutile, Orthoclase, Gypsum, Staurolite, and Pyrite.

(2)

Unit -III: Mineral optics

(8)

- a) Phenomenon of color and pleochroism
- b) Phenomenon of relief and twinkling
- c) Principle of compensation and interference colors
- d) Sign of elongation
- e) Accessory plates and their uses
- f) Introduction to uniaxial and biaxial minerals definition, types and sign.

Unit -IV: Gemology

(8)

- a) Introduction, Definition, Origin and Occurrence of Gems
- b) Chemical, Physical and Optical Properties
- c) Gem testing techniques
- d) Physical and optical properties of : Diamond, Ruby, Sapphire, Emerald, Topaz, Garnet, Tourmaline, Peridot, Amethyst, Chalcedony, Malachite, Pearl, Opal.

Total Lectures = 48

Weightage:

Unit I.1: 5%,	Unit I.2A:25%,	Unit I.2B:25%,
Unit II: 15%,	Unit III: 20%,	Unit IV: 10%

Paper -I Term -II PETROLOGY

Introduction, Definition, Branches and Scope

(1)

Unit -I: Igneous Petrology

1. Types of magmas- Primary, Secondary, Granites, Basaltic, Tholeiitic. (2)
2. Phase equilibrium in Unicomponent, Bicomponent - (6)
 - i) Albite-Anorthite, ii) Orthoclase-Silica, iii) Leucite-Silica systems
3. Textures-Types of porphyritic, Poikilitic, Directive, Myrmekitic, Expansion Cracks. (1)
4. Structures- Flow, Vesicular, Amygdaloidal, Glassy, Megacrystic, Scoriaceous (1)
5. Classification- a) Tabular classification based on silica %, depth of formation & feldspar present, showing following rock types : (3)
Granite, Diorite, Syenite, Gabbro, Dunite, Graphic granite, Pitchstone, Orthoclase porphyry, Pegmatite, Dolerite, Rhyolite, Trachyte, Andesite, Obsidian, Basalt.
b) Shand's classification
6. Processes of economic mineral deposit formation : (3)
Early magmatic, Late magmatic Sublimation, Cavity filling.

Unit -II Sedimentary Petrology

(1)

1. Introduction (1)
2. Classification of sediment admixture by Shepard (3)
3. Classification of sandstones (Okada), and limestones (Folk). (6)
4. Descriptive Sedimentary Petrology
Residual deposits- Laterite and soils
Rudaceous deposits- Conglomerate and breccia
Arenaceous deposits- Varieties of sandstones, Arenites, Greywackes, Arkose, Grit

Argillaceous deposits-Mudstones, Shales

Chemical deposits-Concretions, Nodules, Calcareous, Ferruginous, Siliceous deposits

Organic deposits- Calcareous, Siliceous, Ferruginous, Phosphatic, Carbonaceous deposits

5. Structures- Stylolites, Nodules, Concretions, Borings, Tracks and trails. (2)
6. Processes of economic mineral deposit formation : (4)
Residual deposits, Mechanical concentration, Oxidation and supergene enrichment, Evaporites, Sedimentary deposits through solution.

Unit - III Metamorphic Petrology

1. Definition and general characters of metamorphism (1)
2. Equilibrium and non-equilibrium reactions in metamorphic processes (1)
3. Cataclastic metamorphism of pelitic rocks, Thermal and Regional metamorphism of pure calcareous, basic igneous rocks and Arenaceous rocks (10)
4. Structures- Idioblastic, Porphyroblastic, Deccusate (Idiotropic), Polygonal, Granoblastic (1)
5. Processes of formation of economic mineral deposits: Contact metamorphism, Contact metasomatism, Hydrothermal replacement deposits, Metamorphic deposits (2)

Total lectures : 49

Weightage:- Igneous : 35%, Sedimentology : 35% Metamorphic : 30%

LIST OF BOOKS

1. Rutley's Elements of Mineralogy- Gribble
2. Introduction to rock forming minerals- Deer, Howie, Zussman
3. Textbook of Mineralogy- J.D.Dana
4. Textbook of Geology- Kulkarni et al
5. Optical Mineralogy- Kerr
6. Gemmology- P.G.Read
7. Principles of Petrology- G.W.Tyrrell
8. Igneous and metamorphic petrology- Ehlers and Blatt
9. Sedimentary Rocks- F.J.Pettijohn
10. Principles of Stratigraphy and Practices- Weller
11. Metamorphic Petrology- R.Mason
12. Textbook of Economic Geology- Sen and Guha
13. Petrography- William, Turner, Gilbert

Exams -II Term-I

Principles of Stratigraphy and Palaeoecology

Unit - I : Principles of Stratigraphy

1. Stratigraphy and Time : Definition and Importance of Stratigraphy, Time : Estimation of Time, measurement of time, Geologic Time Scale (4)
2. Development of Stratigraphy : Superposition of strata, Hutton, Smith and Stratigraphic Principles. (2)
3. Geologic Systems- Brief Historical Review(Kumar), Standard Systems. (2)
4. Stratification- Processes controlling Stratification (5)
a. physical, b. chemical, c. biological controls

- Vertical succession, Lateral succession (6)
- Unconformity : Hiatus, Importance of unconformity, Classification: Structural & Environmental. Evidences of unconformity: Magnitudes and measures. (5)
- Stratigraphic classification: Development of Stratigraphic classification, Relation of stratigraphic unit, Rock unit: Formation, groups and members, Bio-Stratigraphic unit, Time-Rock unit, Time Units, Chronostratigraphic unit(Kulkarni) (6)
- Correlation : Evidences & methods, Physical and Paleontology correlation (6)
- Relation of paleontology to stratigraphy (2)

Unit - II Palaeoecology (11)

- 1 Introduction and viewpoint to palaeoecology(Imbrie)
- 2 Foundations of palaeoecology (Imbrie)
- 3 Environments : Lithologic, Biologic evidences, Fossil assemblages(Weiler)
- 4 Ecological Factors : Marine, Pelagic, Freshwater, Terrestrial environment(Weller)
- 5 Sedimentary structures and Palaeoecology (Imbrie)
- 6. Digenetic approaches to palaeoecology (Imbrie)

Total Lectures : 49

Weightage : Stratigraphy : 70%, Palaeoecology : 30%

Paper- II Term -II Applied Geology

Introduction to the importance of Applied Geology

- A) Remote Sensing: A brief outline of: (13)**
 - What is Remote Sensing? Air borne photography, Satellite Remote Sensing, Optical Remote Sensing, Microwave Remote Sensing, Remote Sensing Images. Satellite types in India.
 - 1. Electromagnetic Energy and Remote Sensing
 - 2. Sensors and Platforms
 - 3. Multispectral Scanners
 - 4. Aerial Photography
 - 5. Radar Remote Sensing
 - 6. Applications of Remote Sensing
- B) Computer Applications in Geology: (10)**
 - 1. Introduction to basics of computer and its parts.
 - 2. Introduction to different softwares for GIS, GPS, Statistical Plotting, Ternary diagrams, 3-D Modeling for different purposes like petroleum exploration, groundwater exploration and other branches of geology, MS Word, MS Office, MS Excel, MS PowerPoint
 - 3. Internet and e-mail, e-geology learning.
- C) Field techniques in geology : (10)**
 - 1. Instruments: Clinometer compass, brunton compass, prismatic compass, plane table, chain, abney level, theodolite, curvimeter, planimeter, GPS, altimeter, WOC, I.T., VT, dip.
 - 2. Geological mapping: strike, dip, contact mapping,
 - 3. Sample collection, sampling techniques

D) Prospecting of Natural resources:

1. Introduction to prospecting and objectives.
2. Stages of prospecting
3. Geochemical prospecting
4. Drilling and logging

(5)

E) Lab Techniques:

Brief description and uses of the instruments like pH meter, Colorimeter, Flame photometer, Spectrophotometer, AAS, ICP, XRD, XRF, IR spectroscopy, Scanning Electron Microscopy, Microphotography, Instruments used for dating. Preparation of micro thin section slides of rocks, minerals, fossils

Total lectures : 48

**Weightage : Remote Sensing : 30%, Computer Applications : 10%,
Field tech : 20%, Prospecting : 20%, Lab tech. : 20%**

Books:

1. Principles and applications of Photo geology – SN Panley
2. Remote Sensing and Image interpretation – Lillisand and Kiefer
3. Mathematics – A simple tool for Geologists – David Waitlam
4. Statistics and data analysis in Geology – Davis
5. Field Geology - Lahee
6. Courses in Mining Geology – Arogyaswamy
7. Elements of Prospecting, Bagchi et al
8. Stratigraphic Principles and Practices – Weller
9. Stratigraphy and Sedimentation – Krumbein and Sloss
10. Approaches to Palaeoecology Imbric and Newell
11. Fundamentals of Historical geology and Stratigraphy of India R Kumar
12. Principles of Stratigraphy – Dunbar and Rogers

Paper - III Practicals**A) Mineralogy :**

1. Physical properties of minerals (in addition to FY BSc) :
Olivine, Garnet, Muscovite, Biotite, Milky Quartz, Smoky Quartz, Banded Agate, Blood stone, Moss Agate, Aventurine(Green fuschite quartzite), Augite, Asbestos, Hornblende, Orthoclase, Microcline, Plagioclase, Moonstone, Sillimanite, Tourmaline, Barites, Chlorite
2. Physical properties of ore minerals (in addition to FY BSc) :
Chalcopyrite, Chromite, Stibnite, Magnesite, Sphalerite, Limonite.
3. Optical properties of :
Quartz, Microcline, Plagioclase, Garnet, Andalusite, Actinolite, Augite, Calcite, Muscovite, Tourmaline
4. Sign of elongation
5. Identification of Uniaxial and Biaxial minerals
6. Study of following Gem stones :
Coral, Pearl, Corundum, Garnet, Yellow Quartz, Tourmaline.

3) Crystallography:

- 7) Elements of symmetry, crystallographic axis, forms with indices of:
 - a) Cubic system - Pyrite and Tetrahedrite type
 - b) Hexagonal system - Beryl, Calcite and Quartz type
 - c) Monoclinic system - Gypsum type
- 8) Study of twin crystals - Zircon, Pyrite, Staurolite, Calcite, Gypsum

C) Geological Maps

- 9) Topography, Geology and section of
 - a) Inclined beds (2 maps)
 - b) Inclined beds with vertical dyke (2 maps)

D) Petrology :

Megascopic and microscopic study of textures like equigranular, inequigranular, porphyritic, poilitic, myrmekitic, clastic, schistose, gneissose, granulose and

- 10) Description of Megascopic rocks
 - a) Igneous rocks : Diorite, Syenite, Dunite, Pitchstone, Graphic granite, Orthoclase porphyry, Rhyolite, Trachyte, Andesite
 - b) Sedimentary rocks : Laterite, Ferruginous sandstone, Siliceous sandstone, Grit, Arkose, Ferruginous shale, Carbonaceous shale, Calc. tuff, Kankar, Coralline limestone, Nummulitic limestone, Crinoidal limestone, Fossiliferous limestone
 - c) Metamorphic rocks - Quartzite, Phyllite, Mica-Tourmaline schist, Actinolite schist, Biotite schist, Granite gneiss, Augen gneiss, Banded-haematite Quartzite, Marble.
- 11) Description of Microscopic Petrology :
 - a) Igneous rocks - Dunite, Graphic Granite, Trachyte, Basalt
 - b) Sedimentary rocks : Ferruginous sandstone, Siliceous sandstone, Golden Oolite, Fossiliferous limestone
 - c) Metamorphic rocks : Quartzite, Marble, Actinolite schist, Augen Gneiss

E) Sign and symbols of different lithotypes used in Geological maps - Different rocks, Structural features, Unconformity.

F) Use of Clinometer/ Brunton Compass

G) One assignment on any topic in each term.

H) Each student will be assigned Field work in respective villages/ local area in the First term and report to be submitted in the second term.

I) Demo practical in pocket stereoscope and its use and aerial photographs

J) Map of India showing different ore & economic mineral distribution

K) Tectonic Map of India

L) Palaeoecology and palaeocurrent analysis of sedimentary Structures : Ripple marks, Mud cracks, graded bedding, track and trails, & trace fossils.

M) Demo practical on Computer software like GIS, Stats application etc.

N) Demo introduction to Different Instruments.

O) Geological maps and sections (in second term) of one series with one fault (3 maps) and Two series map (3 maps).

P) Problems on the width of outcrop, vertical and true thickness, dip of strata without hill slope (5 problems).