

U.G. 4th SEMESTER SYLLABUS
DEPARTMENT OF GEOLOGY
COTTON UNIVERSITY

PAPER: GLY401C

METAMORPHIC PETROLOGY

(Credits: 4+0+1=5)

THEORY

Metamorphic Petrology : *Number of Lectures: 64*

Concept of metamorphism: Limits of metamorphism, Agents of metamorphism, Types of metamorphism, Types of Protoliths, A preliminary classification of metamorphic rocks, concept of zones, grades and facies. Metamorphic textures and structures.

Chemical equilibrium in metamorphism: The phase rule and its application in metamorphic rocks. PT phase diagrams and compositional phase diagrams. Common chemographic diagrams, ACF and AKF diagrams.

Metamorphic reactions and its types: Polymorphic transformation, exsolution reactions, Solid - solid net transfer reactions, devolatilization reactions. Continuous reactions, oxidation/reduction reactions, reactions involving dissolved species, reactions and chemographics, phase diagrams for multicomponent systems.

Metamorphism of pelitic sediments: Diagenesis and low- grade metamorphism of pelites, medium P/T metamorphism of Pelites – The Barrovian sequence, Low P/T of metamorphism of Pelites, Partial melting of Pelites and migmatites.

Metamorphic Facies and facies series; metamorphism of mafic rocks: UHT and UHP metamorphism. P-T-t paths.

PRACTICAL *Number of Practicals: 16*

Identification of the various kinds of metamorphic rocks and identification of their textures and structures in handspecimen.

Slate, phyllite, various types of schists, gneiss, amphibolite, granulite, quartzite, hornfels, augen gneiss, calc-silicate rocks, marble, mylonite, migmatite, eclogite.

Study of the textures and assemblages of metamorphic rocks in thin section to know the petrogenetic history of the rock and nomenclature of the rocks.

Chlorite schist, biotite schist, garnet schist, sillimanite schist, hornblende schist, amphibolites, granulites, eclogites and quartzites.

Recommended Books:

1. Metamorphic Petrology – B.W.D. Yardley; *ELBS/Longman*
2. Petrology of Igneous and Metamorphic Rocks – D.W Hyndman (2nd Edition); *McGraw-Hill Book Company*
3. Igneous and Metamorphic Petrology – M.G. Best; *CBS Publishers and Distributors*
4. An introduction to igneous and metamorphic petrology - John, D Winter; *Prentice Hall*.
5. Petrology – W.T Huang; *McGraw-Hill book Company*
6. Metamorphism and Metamorphic Belts – A Miyashiro; *George Allen & Unwin Ltd*.
7. The Study of Rocks in Thin Section – W.W. Moorhouse; *CBS Publishers & Distributors*.

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8. Principles of Igneous and Metamorphic Petrology – A.R. Phillpotts; *Prentice-Hall of India Pvt.Ltd.*
9. Igneous and Metamorphic Petrology – F.J. Turner and J. Verhoogen; *McGraw-Hill book Company.*
10. Metamorphic Petrology – F.J. Turner; *McGraw-Hill book Company.*
11. Petrogenesis of Metamorphic Petrology – H.G.F. Winkler; *Springer Verlag, New York Inc.*

PAPER: GLY402C

PRINCIPLES OF STRATIGRAPHY & GEOLOGICAL FIELD -I
(Credits: 4+0+1=5)

THEORY : *Number of Lectures: 64*

A brief survey of classical geological reconnaissance.

Preliminary idea of crustal and biological evolution of earth through geologic time.

Different methods of measurement of geological time.

Fundamentals of litho-, bio- and chrono-stratigraphy.

International Stratigraphic Code – development of a standardized stratigraphic nomenclature. Concepts of Stratotypes. Global Stratotype Section and Point (GSSP).

Introduction to concepts of dynamic stratigraphy (chemostratigraphy, seismic stratigraphy and sequence stratigraphy).

Principles of stratigraphic correlation.

Paleoclimate, paleogeography and eustatic changes.

Principles of stratigraphic analysis.

Facies concept in stratigraphy and Walther's Law of Facies.

Concept of paleogeographic reconstruction.

PRACTICAL:

Geological Field Work – I : 1 credit

(a) Duration of the Fieldwork is to be of minimum 3 days.

(b) An area with good rock exposures is to be selected for this field trip.

(c) Students are to be trained how to take readings like strike direction, amount & direction of dip; plunge & bearing; front bearing & back bearing with the help of Clinometer and Brunton Compass.

(d) A Field report is to be submitted before the Fourth Semester Examination and Viva-voce to be conducted.

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Recommended Books:

1. Stratigraphic Principles and Practices – J.M.Weller; *Universal BookStall, Delhi.*
2. Principles of Stratigraphy – C.O.Dunbar and J.Rodgers; *John Wiley and Sons, Inc.*
3. Stratigraphy and Sedimentation – W.C.Krumbein and L.L.Sloss; *W.H. Freeman*
4. Boggs, S. Jr., Principles of Sedimentology and Stratigraphy (Fourth Edition), *Prentice Hall.*

PAPER: GLY403C

INDIAN STRATIGRAPHY AND SEMINAR & HOME ASSIGNMENT
(Credits: 4+0+1=5)

THEORY

Indian Stratigraphy : Number of Lectures: 64

A brief outline of the geology of India – Precambrian to Recent.

A detailed study of the Precambrian stratigraphy of India of the following with respect to lithology, tectonics, igneous activity, geochronology and economic importance :

(a) Dharwar Craton; (b) Bastar Craton; (c) Singhbhum Craton; (d) Aravalli Craton; (e) Bundelkhand Craton; (f) Eastern Ghat Mobile Belt; (g) Satpura Mobile Belt or CITZ; (h) Assam-Meghalaya Plateau (*Shillong Plateau*); (i) Southern Granulite Terrain; (j) Cuddapah Supergroup of Cuddapah basin; (k) Vindhyan Supergroup of Son Valley and (l) Chhattisgarh Supergroup of Chhattisgarh basin.

A brief study of the problems of correlation of the Precambrian rocks of India.

A detailed study of the Phanerozoic stratigraphy of the following areas with emphasis on the points mentioned therein (a to g) :

Palaeozoic of the Salt Range and Spiti – *Stratigraphic succession, lithology, palaeontology and age.*

Gondwana of Peninsular and Extra-peninsular India – *Classification, lithology, palaeontology, palaeogeography, igneous activity, structure and economic importance.*

Mesozoic of the Salt Range and Triassic of Spiti – *Palaeontology and lithology.*

Jurassic of Cutch – *Palaeontology and lithology.*

Cretaceous of South India, Central-Western India and NE India – *Lithology, palaeogeography, and palaeontology.*

Deccan Traps – *Distribution, lithology and age.*

Palaeogene and Neogene (Tertiary) & Quaternary of North-East India – *Lithology, palaeontology, structure and economic importance.*

Neogene and Quaternary of Siwalik Group – *Lithology, palaeogeography, palaeoclimate and palaeontology.*

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SEMINAR:

(a) Each student must take part individually in seminar which includes the presentation and discussion on the seminar topic with maximum duration of 20 minutes.

(b) The tentative list of topics for Seminar shall be notified at the beginning of the semester. The students are advised to discuss with the concerned teacher and get it approved by the HOD.

(c) The students shall be required to submit the draft of the seminar topic within two weeks of the notification. The concerned teacher shall make suggestions for modification in the draft.

(d) The final write-up must be submitted by the student prior to the date of seminar presentation.

HOME ASSIGNMENT

To be assigned by the concerned teachers on any topic related to the papers C1 to C10.

Recommended Books:

1. Precambrian Geology of India – S.M.Naqvi and J.J.W.Rogers; *Oxford University Press*.
2. Indian Precambrian – B.S.Paliwal (Ed.); *Scientific Publications (India), Jodhpur*.
3. Cratons and Fold Belts of India – R.S.Sharma; *Springer-Verlag*.
4. Geology of India, Vol. 1 & 2 – M. Ramakrishnan and R. Vaidyanathan; *Geological Society of India, Bangalore*.

(Generic Elective)

PAPER: GLY404G

SEDIMENTARY PETROLOGY, STRATIGRAPHY AND PALAEOLOGY
(Credits: 3+0+1=4)

THEORY

Sedimentary Petrology : *Number of Lectures: 12*

Introduction; Abundance of common sediments; Processes of formation of sedimentary rocks; Mineralogical composition of sedimentary rocks.

Textures of sedimentary rocks.

Sedimentary structures: *lamination, ripple marks, current bedding, graded bedding, mud cracks, rain drop imprints.*

Classification of sedimentary rocks; Petrographic description of sandstone and limestone.

Concept of sedimentary environment.

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Stratigraphy : Number of Lectures: 24

A brief survey of classical geological reconnaissance; Warner and Neptunism; Hutton and Uniformitarianism; Smith and Paleontological Correlation; Lyell's Principles.

Standard Geological time scale.

Stratigraphic classification & nomenclature – concepts of Time-Rock (Chronostratigraphic), Rock (Lithostratigraphic) & Biostratigraphic units.

Principles of stratigraphic correlation.

A brief outline of the geology of India – Precambrian to Recent.

Palaeontology : Number of Lectures: 12

Different branches of palaeontology; Definition of fossil; Mode of preservation of fossils; Types of fossils; Applications of fossils in - Correlation of Rocks, Palaeogeography, Palaeoenvironment. Broad divisions of invertebrates into different phylla; Study of the morphological characters and geological ages of the following phylla/classes:- Brachiopoda; Lamellibranchia, Gastropoda, Cephalopoda.

Elementary idea of vertebrate fossils and their paleontological significance.

A general idea of the plant fossils of India.

PRACTICAL Number of Practicals: 16

Sedimentary Petrology :

Identification and study of the following rocks in hand specimens:

Conglomerate, Breccia, Grit, Sandstone, Shale, Limestone.

Identification and study of following sedimentary structures:

Lamination, Ripple marks, Current bedding, Geode & Concretion.

Palaeontology :

Study of diagnostic morphological characters and age of various invertebrate and plant fossils.

Recommended Books:

1. Sedimentary Petrology by F. J. Pettijohn; *CBS Publishers and Distributors.*
2. Introduction to Sedimentology by S. M. Sengupta; *CBS Publisher & Distributors.*
3. Stratigraphic Principles and Practices – J.M.Weller; *Universal BookStall, Delhi.*
4. Principles of Stratigraphy – C.O.Dunbar and J.Rodgers; *John Wiley and Sons, Inc.*
5. Fundamentals of Historical Geology and Stratigraphy of India – R.Kumar; *New Age International Publishers*
6. Geology of India, Vol. 1 & 2 – M. Ramakrishnan and R. Vaidyanathan; *Geological Society of India, Bangalore.*
7. Principles of Invertebrate Paleontology – R.R.Shrock and W.H.Towenhofel; *CBS Publishers and Distributors.*
8. A Textbook of Palaeontology – A.K.Sen; *Modern Book Agency Pvt. Ltd.*
