University of Rajasthan
Jaipur

SYLLABUS

M.Sc. GEOLOGY

(Annual Scheme)

M.A./M.Sc. (Previous) Examination  2021
M.A./M.Sc.(Final ) Examination  2022

Raj Jair
Dy. Registrar (Acad.)
University of Rajasthan
Jaipur
NOTICE

Ordinance governing the examinations in the faculties of Arts, Fine Arts, Social Sciences, Science, Commerce and Law are contained in a separate booklet. Students are advised to refer to the same.

Changes in Statutes/Ordinances/Rules/Regulations/ Syllabus and Books may, from time to time, be made by amendment or re-making and a candidate shall, except as the University determines otherwise comply with any change that applies to years he has not completed at the time of change.

All court cases shall be subject to the jurisdiction of University of Rajasthan headquarter at Jaipur only and not any other place.

University of Rajasthan, Jaipur
Published by Shri Book Depot, Jaipur for University of Rajasthan
Printed by Harish Printers, Jaipur

SCHEME OF EXAMINATION
(Annual Scheme)

| Each Theory Paper | 3 Hrs. Duration | 100 Marks
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<tr>
<td>Dissertation/Thesis/Survey Report/Field Work, if any.</td>
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<td>100 Marks</td>
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1. The number of papers and the maximum marks for each paper/practical shall be shown in the syllabus for the subject concerned. It will be necessary for a candidate to pass in the theory part as well as in practical part (wherever prescribed) of a subject/paper separately.

2. A candidate for a pass at each of the Previous and the Final Examinations shall be required to obtain:
   (i) Atleast 36% marks in the aggregate of all the papers prescribed for the examination, and
   (ii) Atleast 36% marks in practical(s) wherever prescribed at the examination, provided that if a candidate fails to secure atleast 25% marks in each individual paper at the examination and also in the dissertation/Survey report/field work, wherever prescribed, he shall be deemed to have failed at the examination notwithstanding his having obtained the minimum percentage of marks required in the aggregate for that examination. No division will be awarded at the Previous and the Final Examination. Division shall be awarded at the end of the Final Examination on the combined marks obtained at the Previous and the Final Examination taken together, as noted below:

   First Division 60% of the aggregate marks taken together of the Previous and the Final Examination.
   Second Division 48% of the aggregate marks taken together of the Previous and the Final Examination.

   All the rest will be declared to have passed the examination.

3. If a candidate clears any Paper(s)/Practical(s)/Dissertation prescribed at the Previous and/or Final Examination after a continuous period of three years, then for the purpose of working
M.Sc. (GEOLOGY)

Total Marks of M.Sc. Previous 600

Each of the following theory papers shall be of 60 marks

M.Sc. Previous

A. Theory Papers:
- Paper I: Mineralogy, Crystallography and Geochemistry
- Paper II: Environmental Geology, Geomorphology and Hydrogeology
- Paper III: Structural Geology and Tectonics
- Paper IV: Palaeontology
- Paper V: Sedimentology and Principles of Stratigraphy
- Paper VI: Precambrian Geology and Stratigraphy of India

B. Practical and Fieldwork:
- Part A: 100
- Part B: 115 (This includes 25 marks of the field as mentioned in para 'D')

C. Seminar Presentation: 25 marks

Seminar presentation shall be evaluated by the following committee:
(i) Head of Department
(ii) Supervisor
(iii) One member to be appointed by the Head on the basis of seniority

D. Field Work:
(i) Mapping 15 Marks
(ii) Gen. Field Work 10 Marks

M.Sc. Final

Total marks of M.Sc. Final 625

A. Theory Papers of 75 Marks each:
- Paper VII: Resource Geology
- Paper VIII: Igneous and Metamorphic Petrology
- Paper IX: Remote Sensing and Exploration Geology
- Paper X: Elements of Engineering Geology, Mining Geology and One Dressing

B. Project oriented Dissertation

Dissertation shall carry 100 marks and shall be evaluated by one external and the internal examiner

C. Practical:
- Part A: 125 Marks
- Part B: 100 (This includes 30 marks of the field as mentioned in Para 'D')

D. Field Work:
- (i) Mining Training: 15 Marks
- (ii) Gen. Field Training: 15 Marks
M.Sc. : GEOLOGY (PREVIOUS)

Mineralogy, Crystallography and Geochemistry

Section-A

Geographic Projection and Gnomonic projection Thirty two

Section-B

Chemical and mineralogical properties of important rock forming minerals

Section-C

Crystallography

Minerals: utilization of minerals by microscopic examination.

Practical

Cement: Theoretical and practical aspects.

Minerals: utilization of optical characters of important rock forming

Mineralogy and Petrography

Syllabus M.Sc. Geology

Paper-II: Environmental Geology, Geomorphology

Note: The paper will contain nine questions having three questions

Section-A

Concept and definition of Environmental Geology, Major

Section-B

Geomorphological processes and resultant landforms. Landforms their
types and relationship with structure and tectonics: their role in

Practical

EIA and EMP formulation for mining, industrial and urban area

Books Recommended:

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Rajasthan
Syllabus : M.Sc Geology

- Paper IV: Palaeontology

Note: The paper will contain nine questions having three questions from each section, candidates are required to attempt five questions in all selecting at least one question from each section.

Section A
Evolution: mechanism, evidences and theories
Classification: taxonomy and species nomenclature.
Paleocology:
(a) Fundamentals
(b) Paleoecology: physical parameters and various approaches of reconstruction
(c) Fossiliferous sedimentary rocks and environments: understanding depositional processes
(d) Palaeoecological interpretation and its application

Section B
Application of the following groups of fossils in stratigraphy and biostratigraphy: correlation, reconstruction of palaeo-environment:
Algae (Calcareae/Silicococcales): Cocolithophorids, Stromatolites, Dinoflagellates, Halimeda, Diatoms, Pollen grains and spores, Foraminifera, Radiolarian, Sponges, Corals, Echinoderms, Cystoids, Ostracodes, Monoplacophora, Gastropods, Nautiloids, Ammonoids, Bivalves, Lamellibranchs (with functional morphology), Bryozoans, Echinoidea (with functional morphology), Brachiopods, Graptolites and Conodonts

Section C
Technology: Classification, description of common invertebrates, application

Goodman Flora: Systematic study of important Goodman plants, bearing on palaeoclimatic evolutionary history of man, elephant and other...
Practical:

1. Study and classification of fossil micro-fossils and macro-fossils from various strata.
2. Study the functional morphology in fossil specimens.
3. Collect and analyze miospore and palynomorphs from different rock strata.
4. Study and classification of fossil macro-fossils in their chronological order.
5. Study the occurrence and distribution of fossils from different rock strata.

Recommended:
1. Palaeontology - An Introduction to Palaeontology (Blackwell
2. Systematics and the Fossils Records (Blackwell)
3. Fossils - The Record of Life (John Wiley & Sons)
4. Invertebrate Palaeontology and Evolution (Blackwell)
5. Invertebrate Palaeontology and Evolution (Blackwell)
6. Invertebrate Palaeontology and Evolution (Blackwell)
7. Invertebrate Palaeontology and Evolution (Blackwell)
8. Invertebrate Palaeontology and Evolution (Blackwell)
9. Invertebrate Palaeontology and Evolution (Blackwell)
10. Invertebrate Palaeontology and Evolution (Blackwell)

Books Recommended:
1. Principles of Sedimentology (John Wiley & Sons)
2. Sedimentology and Palaeontology (Blackwell)
3. Sedimentology and Palaeontology (Blackwell)
4. Sedimentology and Palaeontology (Blackwell)
5. Sedimentology and Palaeontology (Blackwell)
6. Sedimentology and Palaeontology (Blackwell)
7. Sedimentology and Palaeontology (Blackwell)
8. Sedimentology and Palaeontology (Blackwell)
9. Sedimentology and Palaeontology (Blackwell)
10. Sedimentology and Palaeontology (Blackwell)

Paper-VI: Precambrian Geology and Stratigraphy of India

Note: The paper will contain nine questions having three questions from each section, candidates are required to attempt five questions in all selecting at least one question from each section.

Early history of earth's crust, nature of early crust, formation and evolution of greenstone, Granitic and granulitic terrains, Precambrian geochronology and early crustal evolution, Precambrian provinces of India - their stratigraphy and correlation, Precambrian world stratigraphy - Boundary problems in stratigraphy.

Section-B

Geology of Rajasthan - Archaean and Proterozoic rock groups
Banded Gneissic Complex, Aravalli, Delhi and Vindhyan Super-groups (Proterozoic stratigraphy of Rajasthan including divisions, rock types, distribution, structure, correlation and economic significance.

Section-C

Nomenclature, division, rock types, distribution, structure, palaeogeography, flora, fauna, regional correlation and economic significance of the following groups in India:
(i) Palaeozoic (ii) Mesozoic and (iii) Cenozoic

Practical:

1. Description of important stratigraphic rocks and their order of stratigraphic sequence during the Precambrian period in India.
2. Description of paleo graphic maps during Precambrian of various geological formations on the outline map of India. Tectonic framework of India.

Books Recommended:
1. Geology of India and Burma (M.S. Krishna)
2. Geology of India (P.N. Naik)
3. Stratigraphy of India (C.S. Prasad)
M. Sc. FINAL GEOLOGY

Paper VII: Resource Geology

Note: The paper will contain nine questions having three questions compulsory and six questions having three questions each. In all, candidates are required to attempt five questions in all selecting at least one question from each section.

Section A

Studied its relation with mineral deposit. The development of theories of ore formation, Classification for ore deposits, Processes of ore formation: Magmatic concentration, contact metamorphism, hydrothermal, Residual and mechanical concentration, Genetic relationship, Metamorphism, supergene enrichment, Bacteriogenic, physical, chemical exhalations, Stratification and Uniform ore deposits. GC Evolution in ores: Principles, assumptions, limitations, use applications

Study of stable and unstable isotopes in relation to ore deposits. Section B

Occurrence of ore bodies - morphology and relationship to intrusive rocks. Textures, Paragenesis and Zoning of ore and their relationship to plate tectonics. Metalurgical provinces and epochs. Classification of ore formation and distribution in India of iron, lead-zinc, aluminium, iron, manganese and chromium. Section C

Definition and origin of Coal, Rank grade and type of coal. International Classification Geological and geographically classification of Coal deposits in India. Detailed geology for some fields of India. Its nature and composition. Origin and migration of Oil and gas. Characteristics of Reservoir (structural & stratigraphic) geology of oil bearing basins of India, position of oil and natural gas in India, future prospects and the economic scenario. Atomic pile. Mode of occurrence. Distribution of atomic minerals in India. Brief outline of the following important deposits: Bishnupur, chromite, kerukot deposits, iron, Pophry, copper deposit, Practice:

Megasopic study of structures and fabrics of different minerals and their associations. Mineralogical and textural studies of common ore minerals under the microscope and petrological study of other industrial and nonmetallic minerals. Diagrammatic representation of open cast and underground mining. Exercises on mine sampling and determination of tenor, cut-off grades and ore reserves.

Books Recommended:


Paper VIII: Igneous & Metamorphic Petrology

Note: The paper will contain nine questions having three questions from each section, candidates are required to attempt five questions in all selecting at least one question from each section.

Section A


Section B

Petrography, mode of occurrence, classification and petrogenesis of granites, alkaline rocks, anorthosites, pegmatites, lamprophyres, basalt, ultramafic rocks and rocks suites.

Metamorphism, its limits and variables. Phase rule and phase diagrams: ACF, AKF and APM, their application in understanding mineral paragenesis and parentage.

Section C

Metamorphic zones, facies and grade, fabric and mode of occurrence of metamorphic rocks, Facies of low pressure (contact metamorphism) and of medium pressure metamorphism-green schist, amphibolite and granulite. Facies of high pressure (eclogite and blue schist facies). Origin of migmatites in light of experimental studies. Origin of charnockites. Elements of geothermometry, P-T paths of regionally metamorphosed rocks. Metamorphism and crustal

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**Section C**

Elements of ore search and ore guides, surface prospecting methods; exploratory drilling; drill hole logging, deviation of bore holes; Geochemical prospecting, concept of anomaly, Geochemical tracer, mobility and association of elements, Geochemical tracers and isotopes, Primary and Secondary dispersion patterns, Geophysical prospecting - concept and application of seismic, gravity, magnetic, electrical and radioactivity methods; Classification of reserves, calculation of resources grade and tonnage relationship.

**Practical:**

- Familiarity with photogeology and satellite data products
- Familiarity with photogeology and satellite data interpretation instruments.
- Transfer of principal and conjugate points; determination of scale; interpretation of aerial photographs and satellite data for various applications such as hydrogeology, geomorphology, geology, and land use & land cover, drainage and gully pattern, soil type identification, urban planning and environmental studies.
- Numerical and map interpretation of seismic, gravity, magnetic and electrical data.

**Book recommended**

- Drury S.A. 1987 Image Interpretation in Geology Allen and Unwin
- Drury S.A. 1987 Image and Application of Photogeology Wiley Eastern, New Delhi
- Sharma P.V. 1986 Geophysical Methods in Geology Elsevier
- Dobrin M.B. 1976 Introduction to Geophysical Prospection, McGraw Hill
- Anggawinata RNP 1980 Courses in Mining Geology, Oxford, New Delhi

**Paper-X:**

- Elements of Engineering Geology
- Mining Geology and ore Dressing

**Note:** The paper will contain nine questions having three questions from each section, candidates are required to attempt five questions in all selecting at least one question from each section.

**Section A**

- Application of geology in planning, designing and construction of civil engineering projects. Engineering properties of rocks, specific gravity, porosity, absorption, compressive and shear strength.
- Rocks as construction material - previous and impervious clays, aggregates.
- Dam classification, terminology, types of spillways, Forces acting on dams, Geotechnical investigations for dam site selection, geological mapping, trial pits, drilling, geophysical methods, their interpretation, Dam failure, leakage, sliding and settlement Foundation treatment, grouting, Pumps - classification and nomenclature, ecological aspects for tunnel alignment, tunnel supports and lining.
Elements of alluvial mining. 
Advantages of open cast mining. Bencasting method, stripping, ratio, 
Cylinder removal, advantages and disadvantages. Under ground 
mining methods. Mine development, mine terminology, stopping 
Underground drilling machines, Explosives: their types and 
Blasting techniques, blast hole patterns, blast hole 
Preparation. Methods of sampling, drill hole samples, chip and channel 
Preparation samples for analysis. 
Concept of ore dressing, its technical necessity. Physical 
processes used in ore dressing. 
Advantages of ore dressing. Communciation practice: jaw, gyratory 
crusher, their principle and uses; types of grinding mills 
Processes of sulfide beneficiation, concept of forth flotation 
Classification: sink - float techniques, gravity separation 
Flow process of coal washing. Heavy media separation, 
magnetite & Magnetic Separation. 

to: 
Survey by Plane Table and Prismatic Compass and Theodolite. 
Leveling and contouring by Dumpy Level and profile drawing by 

Recomended: 

Ravemy, R.N. 1996 Courses in Mining. Geology Oxford IBH Clark, 
H. 1997 Mining Geology. John Wiley 
Monsen 

Chand, P. V. 1997 Environmental and Engineering geophysics. Cambridge 

Sargal, K.V. 1990 Experiments in Engineering Geology 


Training: 
Field studies of outcrops of Igneous and Metamorphic rocks and 
Economic mineral deposits. The duration of field training should 
be for three weeks. 
All training of mining methods with emphasis on geological 
Method of mineralization and mining. The duration of the 
Training should be for two weeks. 
All students training is compulsory and students not taking part in training shall not be allowed to appear in the examination.

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