UNIVERSITY OF RAJASTHAN
JAIPUR

SYLLABUS

M.Sc. GEOLOGY

(ANNUAL SCHEME)

M.Sc. (Previous) Examination  2020
M.Sc. (Final) Examination     2021

Dy. Registrar
(Academic)
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/Statb and Books may, from time to time, be made by amendment or remaking 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 the Rajasthan University headquarter at Jaipur only and not any other place.

University of Rajasthan, Jaipur
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SCHEME OF EXAMINATION
(Annual Scheme)
Each Theory Paper 3 Hrs. Duration 100 Marks
Dissertation/Thesis/Survey Report/Field Work, if any. 100 Marks

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) At least 36% marks in the aggregate of all the papers prescribed for the examination, and

(ii) At least 36% marks in practical(s) wherever prescribed at the examination, provided that if a candidate fails to secure at least 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%

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 more than 3 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. Paper XI : 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) Geo-Field Training 15 Marks

Note: A candidate required more than 25% marks in order to secure a minimum aggregate as many mark out of those actually secured per cent of these three years; provided that in case of a candidate, he will be taken into account as would enable him to overcome the deficiency in the requisite minimum aggregate.
M.Sc. : GEOLOGY (PREVIOUS)

Mineralogy, Crystallography and Geochemistry

The paper will contain nine questions having three in each section. Candidates are required to attempt five selecting at least one question from each section.

Section-A


Section-B

 allotropy and polymorphism. Classification of silicates, study and optical properties of important rock forming minerals. Occurrence, chemical composition, crystal structure. X-ray work, association of the following mineral families: Feldspars, Amphiboles, Garnet, Feldspar, Mica, Aluminosilicates and other important rock forming minerals.

Section-C

Quantitative diagrams - concept and application, trace and rare element abundance and application. Isotope Geochemistry, U-Th-Pb dating - their application to geological systems. K-Ar, U-Pb and Sm-Nd Systematics.

Practical

Mineralogy:

Identification of minerals by microscopic examination. Preparation of optical characters of important rock forming minerals under microscope.

Crystallography:

Identification and description of crystal model in hand specimen. Projection of stereographic projection and determination of planes in problems related to stereographic projections.

Chemistry:

Calculation of mineral formulae and presentation of chemical data. Recommended:


H.S. A. 1974, Laboratory Handbook of Petrographic Technique

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Paper-II : Environmental Geology, Geomorphology, and Hydrogeology

Note: The paper will contain five questions having three questions from each section. Candidates are required to attempt five selecting at least one question from each section.

Section-A


Section-B

Geomorphological processes and resulting landforms. Landforms their types and relationship with structure and tectonics; their role in mineral and ground water exploration. Morphometry, slope type and its development. Soil and its types; soil erosion and its conservation. Terrain evaluation for strategic purpose. Landforms of Thar desert.

Section-C

Ground water: its origin, types, occurrence, movement and uses; ground water in hydrological cycle. Aquifers properties. Ground water flow and Darcy's law. Geo-environmental control on ground water. Ground water resources in India with special reference to Rajasthan. Ground water pollution, ground water development and management; artificial recharge of ground water, ground water sustainability; basic concept of ground water modelling.

Practical

ELA and EMP formulation for mining, industrial and urban areas. Delineation of vulnerable and hazardous zones; identification and zonation of geologically safe inhabitation zone, safe waste disposal zones and rain water harvesting structures. Identification of present and past environment of deposition and accumulation of resources. Presentation of chemical analysis data and plotting of chemical classification diagram. Study and identification of seismic, flood and drought prone areas. Classification of ground water for use in drinking and irrigation and industrial purposes. Watershed delineation and morphometric analysis. Interpretation of ground water table and ground water contour maps. Plotting ground water basins of India.

Books Recommended:


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Rajasthan University
Paper-III : Structural Geology and Tectonics

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

Section-A

Technical principles and behaviour of rocks. Types of strain ellipsoids. Two dimensional stress analyses. Primary and secondary structures and their contemporaneous.

Section-B

Structures and joints. Their nomenclature, age relationships, origin and significance. Causes and dynamics of faulting, normal, strike slip, and reverse maps. Planar and linear fabrics in deformed rocks; their chronology and significance. Concept of stereographic projection of fabric elements and its (0 and x diagrams). Section-C

Types: Shields, Platforms, Mountain chains, Rift valleys, Ridg, Islands arcs and Ocean basins. Theories: types and characteristics of Plate margins, passive margins and mountain belts and plate tectonics. Plate tectonics and subcontinent with special reference to evolution of continental and oceans plains.

Section-D

Solution of structural problems by stereographic and orthographic structural analyses with stereonet. Crust and interpretation of geological maps, outcrops and structural problems concerning economic mineral deposits. Plotting and interpretation of surface and resultant diagrams. Study of large scale tectonic features of the earth.

Recommended:


Paper-IV : Palaeontology

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

Section-A


Paleoecology:

(a) Fundamentals
(b) Paleoecosystem: physical parameters and various approaches of reconstruction.
(c) Taphonomy, taphocoenosis, taphoanecosis, time-averaging. condensation shell-beds and biostratigraphy.
(d) Palaeoecological interpretation and its application

Section-B


Section-C

Ichthology: Classification, description of common Ichthogenera, application.

Goodwana Flora: Systematic study of important Goodwana Flora. Plant bearing, on palaeoclimatic Evolutionary history of man, elephant and other...

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Practical

1. Field study of a well section for the identification and location of strata and fossils in their chronological order.

2. Functional morphology in fossil specimens.

3. Identifying and classifying macro and micro-fossils and their occurrence in rock strata.

4. Using trace fossils for interpreting paleoenvironments.

Recommended:

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.

Section-A

- Concept of sedimentation - process of transport, deposition, lithification and diagenesis.
- Sedimentary environments and facies - Continental, alluvial, fluvial, lacustrine and glacial sedimentary system. Volcanoclastic, deep water basins.
- Types of sedimentary rocks and their graphical representation.
- Rock successions and basin analysis.
- Sedimentation and its environment of deposition of sedimentary rocks.

Section-B

- Trace fossils - the importance of trace fossils in understanding paleo-environments.
- Description of various trace fossils, sandstone, greywacke, shale, limestone, and evaporite rocks.
- Tectonic framework of sedimentary basins.

Section-C

- Standard stratigraphic scale and Indian equivalent.
- Stratigraphic classification - Lithostratigraphy, biostratigraphy and chronostratigraphy and their units.
- Sequence stratigraphy - concepts and application.
- Megastратigraphy.
- Climat stratigraphy.
- Graphic representation of stratigraphic data.

Practical

Books Recommended:

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.


Section-B

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

Section-C

- Nomenclature, division, rock types, distribution, structure, palaeontology, flora, fauna, regional correlation and economic significance of the following groups in India:
  - Palaeozoic
  - Mesozoic
  - Cenozoic

Practical:

- Description of important stratigraphic rocks and their order.
- Tracing out of paleo-geologic maps during Cenozoic. Distribution of various geological formations on the outline map of India. Tectonic framework of India.

Books Recommended:
- M. S. Nair (1966) Geology of India and Burma.
- A. N. West (1949) Geology of India.
- Former (1969) Stratigraphy of India.

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Paper VII: Ore Geology

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

1. Ore deposit and its relation with mineral deposit. The development of ore deposits: theories of ore formation, classification for ore deposits, processes of ore formation, magmatic concentration, contact metamorphism, hydrothermal, residual and mechanical concentration, diagenetic and metamorphism, supergene enrichment, Bacteriogenesis, and genetic exhalations, Stratal bound and Stratiform ore deposits.

2. Exploration of ore deposits: Principles, assumptions, limitations, and applications.


Section B


Section C

1. Definition and origin of Coal, Rank grade and type of coal. International Classification Geological and geographical characteristics of Coal deposits in India. Detailed geology for some fields of India.


3. Atomic Fuel: Mode of occurrence, Distribution of atomic minerals in India. Brief outline of the following important deposits: Bastar chromite, Jharkhand deposit iron, Pophyrhy, copper deposit.

4. Megascopic study of structures and fabrics of different minerals and their associations. Mineralogical and textural studies of common ore minerals under ortho-microscope and petrological study of other industrial and nonmetallic minerals. Diagammetric representation of open cast and underground mining. Experiments 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

1. Magma - Origin and emplacement, factors affecting magma generation, differentiation and assimilation. Petrological, chemical and tectonic classification of igneous rocks, principles of IUGS systematics.


Section B

1. Petrography, mode of occurrence, classification and petrogenesis of granites, alkaline rocks, anorhostites, pegmatites, lamprophyre, basalt, ultramicro rocks and rock suites.

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

Section C

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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 indexes, 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
• Miller VC. 1961 Photogeology McGraw Hill
• Sabin EP. 1963 Remote Sensing - Principles and Applications Freeman
• Drury SA. 1987 Image Interpretation in Geology Allen and Unwin
• Drury SA. 1987 Image and Application of Photogeology Wiley Eastern, New Delhi
• Wolf PR. 1974 Elements of Photogrammetry McGraw Hill
• Sharma PV 1985 Geophysical Methods in Geology Elsevier
• Dobson M.B. 1976 Introduction to Geophysical Prospection, McGraw Hill
• Anggrawan RNP 1980 Courses in Mapping Geology, Oxford, New Delhi

Paper-X : Element of Engineering Geology, Mining Geology and ore Dressing

Note: The paper will contain nine questions having three question from each section, candidates are required to attempt five question 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 soils, aggregates. Dams classification, terminology, types of spillways, Forces acting on dams, Geological investigations for dam site selection, geological mapping, trial pits, drilling, geophysical methods, their interpretation. Dam failure, leakage, sliding and settlement. Foundation treatment, grouting. Pneumatics, classification and nomenclature, ecological classification and tunnel alignment, tunnel supports and lining.
Rectangular water in tunnels, in hilly terrains. Landslides: Types, process of landslides, landslide prevention and remedial measures.

Section B

Elements of alluvial mining.

Open cut mining, underground mining, erosion by various methods, Mine development, mine terminology, stopping.

Underground drilling machines, Explosives: their types and usage, Blast hole patterns, blast holes for injection.

Methods of sampling, drill hole samples, chip and channel samples. Preparing samples for analysis.

Section C

Concept of ore dressing, its technical necessity. Physical processes used in ore dressing.

Advantages of ore dressing. Condemnation practice. Jaw, gyratory and hammer crushers, their principle and uses, types of grinding mills.

Beneficiation: concept of froth flotation, classification: size - float techniques, gravity separation.

Process of coal washing. Heavy media separation techniques, Magnetic & Magnetic Separation.

Practical:

Survey by Plane Table and Prismatic Compass and Theodolite.

Boring and sounding by Dumpy Level and profile drawing by Tracer Level.

Recommended:


Joffe, H. and Judd, W.K., 1988 Principles of Engineering Geology. CBS.


Training:

Field studies of outcrops of Igneous and Metamorphic rocks and economic mineral deposits. The duration of field training should be for three weeks.

On-siting of mining methods with emphasis on geological aspects 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 the training shall be allowed to appear in the examination.

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