UNIVERSITY OF RAJASTHAN
JAIPUR

SYLLABUS

M.Sc. GEOLOGY

(ANNUAL SCHEME)

M.Sc. (Previous) Examination     2019
M.Sc. (Final) Examination         2020

Dv. Registrar
(Academic)
University of Rajasthan
JAIPUR
SCHEME OF EXAMINATION

Each Theory Paper
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 pre-
scribed 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
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

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR
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) Gen. Field Training 15 Marks
**M.Sc. : GEOLOGY (PREVIOUS)**

Mineralogy, Crystallography and Geochemistry

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

**Section-A**

Geographic Projection and Gnomonic projection Thirty two centres and their derivation Twinning type and laws. Bragg's law The powder and single crystal method of anisotropy medium, interference colour, dispersion in biaxial crystals. Use of Universal stage.

**Section-B**

Stability and polymorphism, classification of silicates, study of optical properties of important rock forming minerals. Weathering, chemical composition, crystal structure, metamorphic rocks, association of the following mineral families. Plagioclase, amphibole, garnet, feldspar, mica, aluminosilicates and other important rock forming.

**Section-C**

Revolution diagrams - concept and application, trace and rare earth elements. Isotope Geochemistry and isotopic isotope - their application to geological systems.

**Practical**

Mineralogy:

- Identification of minerals by microscopic examination.
- Determination of optical characters of important rock forming minerals under microscope.
- Introduction to crystallography in hand specimen.
- Stereographic projection and determination of orientation in problems related to stereographic projections.
- Calculation of mineral formulae and presentation of chemical data.

Recommended:

- Copyright Mineralogy, New York, McGraw Hill
- B. S. 1974, Laboratory Handbook of Petrographic Technique

**Paper-II : Environmental Geology, Geomorphology and Hydrogeology**

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

**Section-A**


**Section-B**


**Section-C**

Ground water - its origin, types, importance, occurrence, movement and uses; ground water in hydrological cycle. Aquifer properties, ground water flow and Darcy's law. Geo-environmental control of ground water, ground water provinces 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**

EIA and EMP formulation for mining, industrial and urban areas. Delimitation of vulnerable and hazardous zones, identification and setting up of geologically safe inhabited zone, safe waste disposal zone and rain water harvesting structures. Identification of present and past environment of deposits and evaluation of resources. Presentation of chemical analyses 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 irrigation and industrial purposes. Watershed delineation and geomorphometric analysis. Interpretation of ground water table and water quality contour maps. Plotting ground water basins of India.

**Books Recommended:**

Paper-III: Structural Geology and Tectonics

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

Structural principles and behaviour of rocks. Types of strain ellipsoids. Two-dimensional stress analyses. Primary and secondary structures and pencontemporaneous.

Section-B

Faults and joints. Their nomenclature, age relationships, origin and significance. Causes and dynamics of faulting-normal, strike-slip, normal, and reverse; strike-slip and wrench faults in deformed rocks; their chronology and significance.

Section-C


Section-D

Problem of structural problems by stereographic and orthographic structural analyses with stereonets and interpretation of geological maps, outcrops and structural problems concerning economic mineral deposits and plotting of field data. Plotting and interpretation of data and resultant diagrams. Study of large-scale tectonic units.

Recommended:


Syllabus: M.Sc. Geology


Paper-IV: Palaeontology

Note: The paper will contain nine questions having three 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.

Section-B

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

Section-C

Application of the following groups of fossils in stratigraphy and stratigraphic correlation/reconstruction of palaeoenvironment:
- Algae (Calcareous/Siliceous): Coccolithophores, Stromatolites, Dinoflagellates, Halimeda, Diatoms, Pollen grains and spores.
- Foraminifera, Radiolarian, Sponges, Corals, Serpulids, Trilobites, Ostracods, Monoplacophora, Gastropods, Nautiloids, Ammonoids.
- Belemnozoa, Lamellibranchs (with functional morphology).
- Brachiopods (with functional morphology).
- Echinoids (with functional morphology).

Section-C

Ichnology: Classification, description of common ichnogenera, application.

Gondwana Flora: Systematic study of important Gondwana Flora, bearing on palaeoclimate. Evolutionary history of man, elephant and others.

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(Academic)
University of Rajasthan
Practical

1. Grid sketches, classfication, morphological description and location of available macro-and micro-fossil index fossils in their chronological order.
2. Functional morphology in fossil specimens.

Recommended:

Paper-V: Sedimentology and Principles of Stratigraphy

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. Concept of sedimentation-process of transport, deposition, lithification and diagenees.
3. Rock of sedimentary rocks and their graphical representation.
4. Palaeocurrents and basin analysis.
5. Interaction of sedimentary rocks.

Section-B


Section-C

1. Nomenclature, division, rock types, distribution, structure, palaeography, 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.
2. Tracing of paleo graphic maps during Pernozoic. Distribution of various geological formations on the outline map of India. Tectonic framework of India.

Books Recommended:
- M.S. Kushal (1966) Geology of India and Bursa
- D.N. Wadia (1949) Geology of India

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basins of India, position of oil and natural gas in India, future prospects and
economic Scenario.

Atomic Fule: Mode of occurrence Distribution of atomic minerals
in India. Brief outline of the following important deposits; Bushveld
chromite, kuruko deposit iron, Porphyry copper deposit

Practical:
Megasopic study of structures and fabrics of different minerals
and their associations. Mineralogical and textural studies of common
ore minerals under ore-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:
- Bateson, A.M. (1951), Economic Mineral Deposits
- Brown, J.C. and A.K. Dey (1955) India’s Mineral Wealth
- Sinha, R.K. and Geology of Ore Deposits

Paper VIII: Igneous & Metamorphic Petrology

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

Section A

Magmas - Origin and emplacement; factors affecting magma
formation, differentiation and assimilation. Mineralogical, chemical
and textonical classification of igneous rocks; principles of IUGS
systematics.

Crystallization of silicate melt-phase rule, crystallization behavior
of albite-anorthite; albite-orthoclase; Forsterite-silica, Nepheline-
Kalsilite-silica, Quartz-Albite-Anorthite-Orthoclase.

Section B

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

Metamorphism, its limits and variables. Phase rule and phase
diagrams: ACF, AKF and AFM, 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-greenschist,
amphibolite and granulate. Facies of high pressure (eclogite and
blown schist facies), Origin of migmatisation in light of experimental
studies. Origin of charnockites. Elements of Geothermometry, P-T
paths of regionally metamorphosed rocks. Metamorphism and crustal
Elements of ore search and ore guides, surface prospecting methods; exploratory drilling, drill hole logging, deviation of boreholes; Geochronological prospecting, concept of anomaly, Geochemical cycle, 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 radioactive 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 hydrogeomorphology, 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:
- Druy S.A. 1987 Image Interpretation in Geology Allen and Unwin.

Paper X: Element 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 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.
Elements of alluvial mining.

 отлично open cast mining, benching method, stripping ratio, advantages and disadvantages. Under ground methods; mine development, mine terminology, stopping, Underground drilling machines, Explosives: their types and blasting techniques, blast hole patterns, blast holeation.

Methods of sampling, drill hole samples, chip and channel samples.

Preparation samples for analysis.

Section C

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

Advantages of ore dressing. Commnuation: jaw, gyatory and cone crushers, their principle and use, types of grinding mills, methods of sulphide beneficiation, concept of forth flotation.


Practical :

Survey by Plane Table and Prismatic Compass and Theodolite.

Leveling and contouring by Dumpy Level and profile drawing by survey level.

Recommended :


Training :

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

Field training of mining methods with emphasis on geological controls of mineralization and mining. The duration of the training should be for two weeks.

Field studies/training is compulsory and students not taking part in the training shall not be allowed to appear in the examination.

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