

**B N University, Udaipur**

**Proposed Syllabus and Structure**

for

**B. Sc. with **Geology****

**(T.D.C.)**

under

**Annual Pattern**

I year: 2017-2018

II year: 2018-2019

III year: 2019-2020

## B.Sc. First Year, 2017-2018

### GEOLOGY

The examination shall consist of three theory papers and one practical

<b><u>A. Theory papers :</u></b>	Hrs/ week	Examination hours	Maximum Marks
Paper I: Physical Geology	2	3	50
Paper II: Palaeontology	2	3	50
Paper III: Crystallography and Mineralogy	2	3	50
<b>B. Practical:</b>	4	4	75
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<b>Total Marks</b>			<b>225</b>

Note: Each question paper will be divided into three parts:

Part I - Ten questions (answer not exceeding fifty words); two questions from each unit will be asked. Each question will be of ONE mark and the candidates are required to attempt ALL questions. Total : 10 marks

Part II - Five questions (answer not exceeding 250 words) one from each unit with internal choice will be asked and the candidates are required to attempt ALL questions. Each question will be of FOUR marks. Total: 20 marks

Part III - Four questions, may be in parts, covering all five Units ((answer not exceeding 300 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of 10 marks. Total: 20 marks

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#### **Paper- I: Physical Geology**

Time: 3 hrs; Maximum Marks: 50

##### Unit- I

Earth as a member of the Solar system. Origin of the Earth, Physical parameters of the earth, internal constitution of the earth. Concept of lithosphere, Isostasy.

##### Unit -II

Surface features of the earth. Distribution of land and ocean and peculiarities. Coral reefs. Distribution and causes of earthquakes. Seismic waves as indicator of the earth's interior. Volcanoes: causes and types.

##### Unit - III

Weathering and erosion. Geological work of wind, groundwater, rivers oceans and glacier

##### Unit - IV

Major tectonic features of the earth. Mountain belts, shields, island arcs, trenches, mid-oceanic ridges and ocean basins

##### Unit -V

Concept of Plate tectonics, evolution of Himalaya and Indo-Gangetic plain

## **Paper -II : Palaeontology**

Time: 3 hrs; Maximum Marks : 50

### Unit -I

Definition, subdivision of Palaeontology and its relation with allied subjects. Fossils, their modes of preservation. Uses of fossils. Habitats and Habits. Elementary ideas of organic evolution. Classification and Nomenclature.

### Unit -II

Morphology and geological distribution of Foraminifera, Graptoloidea and Echinoidea

### Unit - III

Morphology and geological distribution of Gastropoda, Pelecypoda and Cephalopoda

### Unit -IV

Morphology and geological distribution of Brachiopoda, corals and Trilobita

### Unit -V

Elementary knowledge of Gondwana plant fossils. Vertebrate fossils of Siwaliks of India, Evolutionary history of man

## **Paper -III: Crystallography and Mineralogy**

Time : 3 hrs; Maximum marks: 50

### Unit -I

Fundamentals of Crystallography. Elements of crystal symmetry. Millers and Weiss system of notations. Crystal forms and their classification into crystal system,

### Unit -II

Study of holohedral classs of following crystal systems:- Cubic system, Tetragonal system, Hexagonal system, Orthorhombic system, Monoclinic systemand Triclinic system

### Unit -III

Physical properties of minerals. Concept of isomorphism and polymorphism. Elementary ideas about structure and classification of silicate minerals. Study of physical properties of Quartz, Feldspar, olivine, Pyroxene, Amphibole and Mica families,

### Unit -IV

Petrologic microscope and its construction; principles of optics as applied to orthoscopic study of minerals; colour, form, birefringence and pleochroism. Ideas about uniaxial and biaxial characters of minerals

### Unit -V

Study of the optical properties of following rock forming mineral families: Olivine, pyroxene, amphibole, and nepheline. Study of optical properties in particular of following minerals: muscovite, biotite, quartz, orthoclase, microcline, albite, olivine, augite, diopside, hypersthene, hornblende and tremolite

## B.Sc. First year Geology Practical- 2017-2018

**Time :4 hrs; Maximum Marks -75**

Physical Geology	05 marks
Crystallography - Mineralogy	20 marks
Palaeontology	20 marks
Field work	15 marks
Viva voce	05 marks
<u>Lab. Record</u>	<u>10 marks</u>
<b>Total</b>	<b>75</b>

i) **Physical Geology:** Preparation of charts and diagrams illustrating important process of erosion and weathering.

ii) **Crystallography and mineralogy:** Description and identification of following minerals in hand specimen:- Quartz, feldspar, muscovite, biotite, chlorite, hornblend, augite, olivine, garnet, kyanite, staurilite, sillimanite, tremolite, serpentine, calcite, dolomite, magnetite, hematite, epidote, tourmaline, talc, gypsum, apatite, fluorite, topaz and corundum.

Identification of following minerals under microscope:- Quartz, Plagioclase feldspar, microcline feldspar, muscovite, biotite, garnet, hornblende, calcite, olivine, hypersthene

iii) Palaeontology: Identification and description of following fossils in hand specimen:

- Foraminifera : *Nummulites, Assilina, Alvoelina* .
- Echinoidea : *Cidaris, Hemiaster, Micraster*.
- Brachiopoda : *Rhynchonella, Terebratula, Productus, Spirifer*.
- Pelecypoda : *Pecten, Ostrea, Trigonina, Lima, Exogyra*.
- Gastropoda : *Trochus, Murex, Voluta, Physa, Turritella, Conus*.
- Ammonoidea : *Phylloceras, Ceratites, Perisphinctes*.
- Coleoidea : *Belemnites*.
- Nautiloidea : *Nautilus, Orthoceras*,
- Trilobita : *Calymene, Phacops, Agnostus, Trinucleus, Paradixides*.
- Graptoloidea : *Monograptus, Diplograptus*.
- Plant fossils : *Glossopteris, Gangmopteris, Vertibraria, Ptilophyllum*

iv) Field work :Three days geological field excursion to study elementary aspects of course related field geology and submit a report thereon

**Students not taking part in the field work will not be awarded marks for the field work.**

**Books suggested, besides the internet:-**

- Datta, A.K.: Introduction to Physical Geology. Kalyani Publishers, New Delhi.
- Ford, W.E.: Dana's Textbook of Mineralogy. John wiley & sons, New York.
- Hamblin, W.K. : Earth's Dynamic System. MacMillan Publishing co. New York.
- Homes, A: Principles of Physical Geology. Thomas Nelson & Sons, London.
- Mahapatra, GB: A Textbook of Geology. The World Press Pvt. Ltd. Kolkatta.
- Parbin Singh: Engineering and General Geology. SS Kataria & Sons. New Delhi.
- Read, H.H. Rutley's Elements of Mineralogy. CBS Publishers & Distributors, Delhi. Woods,
- Henary: Palaeontology Invertebrate CBS Publishers & Distributors, Delhi

## B.Sc. Second Year, 2018-2019

### GEOLOGY

The examination shall consist of three theory papers and one practical

<b><u>A. Theory papers :</u></b>	Hrs/ week	Examination hours	Maximum Marks
Paper I: Structural Geology	2	3	50
Paper II: Petrology	2	3	50
Paper III: Stratigraphy	2	3	50
<b>B. Practical:</b>	4	4	75
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<b>Total Marks</b>			<b>225</b>

Note: Each question paper will be divided into three parts:

Part I - Ten questions ( answer not exceeding fifty words); two questions from each unit will be asked. Each question will be of ONE mark and the candidates are required to attempt ALL questions. Total : 10 marks

Part II - Five questions (answer not exceeding 250 words) one from each unit with internal choice will be asked and the candidates are required to attempt ALL questions. Each question will be of FOUR marks. Total: 20 marks

Part III - Four questions, may be in parts, covering all five Units ((answer not exceeding 300 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of TEN marks. Total: 20 marks

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### **Paper-I : Structural Geology**

**Time : 3 hrs; Maximum marks : 50**

#### Unit-I

Basic concept of structural Geology. Concept of strike and dip. Effects of topography on outcrops. Description and application of clinometer compass. Primary sedimentary structures, their use in determination of top and bottom of beds.

#### Unit-II

Folds: Characteristics and type. Elementary ideas of mechanism of folding, outcrop pattern of non-plunging, plunging and doubly plunging folds.

#### Unit-III

Faults: Characteristics and classification. Effects of faults on outcrop. Criteria of their recognition in field.

#### Unit -IV

Mechanical principles: Stress and strain, Geological examples of strain in rocks. Types of unconformity: their recognition, significance and distinction from faults. Outliers, inliers, overlap and offlap

#### Unit-V

Preliminary ideas of foliation, lineation and joints. Structures of igneous rocks.

## **Paper-II ; Petrology**

**Time: 3 hrs; Maximum Marks: 50**

### Unit -I

Introduction to Petrology. Igneous rocks, Forms, structures, textures and microstructures. Composition of magma. Classification of igneous rocks

### Unit - II

Process of differentiation, gaseous transfer within liquid; immiscibility and assimilation. Description of following rock forming families:- granite, granodiorite, syenite, diorite, gabbro, feldspathoidal syenite, ultrabasic and ultramafic rocks

### Unit-III

Metamorphic rocks: Definitions, controls of metamorphism. Metamorphic processes and reactions. Types of metamorphism:- contact, cataclastic, regional and ocean floor metamorphism

### Unit- IV

Textures and structures of metamorphic rocks, Nomenclature and description of important metamorphic rocks. Metasomatism, anatexis and migmatization.

Sedimentary rocks: Process of formation of sediments, diagenesis. Textures of sedimentary rocks

### Unit-V

Major sedimentary structures- primary, secondary and biogenic and their significance. Classification of sedimentary rocks. Types of arenites, carbonate rocks and argillites

## **Paper- III. Stratigraphy**

**Time; 3 hrs ; Maximum Marks :50**

### Unit -I

Principles of stratigraphy, Stratigraphic classification, Stratigraphic correlation, Problems of early precambrian stratigraphy. Brief idea about the process of early crustal evolution. Major precambrian provinces of India, Physical divisions of India and their characteristics.

### Unit -II

Geological time scale and its equivalent formations in India. Precambrian stratigraphy of Rajasthan, Central India, Jharkhand, Bihar, Odissa, Eastern Ghats and southern India

### Unit -III

Middle and late Proterozoic plateforms: Cuddapah, Vindhyan and their equivalents. Precambrian belts of extra-peninsular region

### Unit-IV

Geology of Gondwana Supergroup and palaeozoic stratigraphy of India, their distribution, division, lithology, fossil content and economic importance

### Unit -V

Mesozoic and Cainozoic geology of India. Their distribution, division, lithology and fossil content

## B.Sc. Second year , Geology Practical 2018-2019

Time : 4 hrs

Maximum Marks : 75

### Petrology

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|-------------------------------------|----|
| 1. Study of rocks in hand specimens | 08 |
| 2. Microscopic study of rocks       | 07 |

### Structural Geology

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|---|----|
| 3. Interpretation and drawing of section of simple geological map | 10 |
| 4 Problem of true and apparent dip                                | 05 |

### Stratigraphy

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| 5. Stratigraphic rocks   | 10 |
| 6. Sketch map of Indian formations and palaeogeographic period | 05 |

7. Field Report	15
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8. Viva Voce	05
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9. Lab. Record	10
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Total 75

### Petrology:

(i) Identification of igneous, metamorphic and sedimentary rocks in hand specimen as per list given below

*Igneous rocks:* Granite, granodiorite, syenite, diorite, anorthosite, norite, gabbro, pyroxenite, peridotite, nepneline syenite, suenite, pegmatite, dolerite, basalt, rhyolite

*Metamorphic rocks:* Quartzite, marble, gneiss, mica schist, phyllite, slate, amphibolite, mylonite, migmatite, gneiss

*Sedimentary rocks:* Sandstone, limestone, shale, conglomerate, arkose, grit, graywacke, breccia

(ii) Petrographic study of following rocks under microscope: Granite, syenite, dolerite, gabbro, diorite, rhyolite, basalt, mica -schist, granite gneiss, amphibolite, marble, sandstone and limestone

### Structural Geology:

- Study of topographic maps. Interpretation of topography from contour map
- Orientation of planes and lines; dip, strike, pitch and plunge, use of clinometer compass
- Study and interpretation of outcrop pattern. True and apparent thickness of beds. Study of simple geological maps and drawing of sections
- Basic principles of stereographic and orthographic projections.

### Stratigraphy:

Identification and description of important stratigraphic rocks of India and their assignment to respective stratigraphic position. Plotting of following stratigraphic unie and their equivalents in the outline map of India (i) Delhi- Aravalli fold belts, (ii) main Vindhyan basin, (iii) Gondwana supergroup (iv) Deccan Trap (v) Siwalik group

Preparation of palaeographic maps of Permocarboniferous and Cretaceous period

iv) Field work :Three days geological field excursion to study elementary aspects of course related field geology and submit a report thereon

**Students not taking part in the field work will not be awarded marks for the field work.**

**Books suggested, besides the internet: B.Sc II year**

**Billings, M.P. :** Structural Geology; Prentice Hall of India Pvt Ltd, New Delhi

**Bolton, T:** Geological Maps; their solutions and interpretation, Cambridge univ, Press

**Haung ,G N:**, Petrology

**Krishnan, M.S.:** Geology of India and Burma, CBS Publishers and distributors

**Lemon, R R :** Principles of Stratigraphy, Merill Publishing Co. Londoan

**Mukerjee, P.K;** A Textbook of Geology, The world press Pvt. Ltd. Kolkatta

**Naqvi, S.M and Rogers J.J.W.:** Precambrian Geology of India, Oxford Univ.Press

**Parbin Singh:** Engineering and General geology; SK Kataria & Sons, New Delhi

**Pettijohn ,F.J.;** Sedimentary rocks, CBS Publishers and distributors, New Delhi

**Ravindra Kumar:** Fundamentals of Historical Geology and stratigraphy of India. Wiley Easternltd,  
New Delhi

**Sinha Roy, S; Malhotra G and Mohanty M :** Geology of Rajasthan

**Tyrrel, G.W.:** Principles of Petrology. BI Publishers Pvt Ltd Delhi

**Weller, J.M.:** Stratigraphic Principles and Practice. Universal Book Stall, Delhi



## B.Sc. Third Year, 2019-2020

### GEOLOGY

The examination shall consist of three theory papers and one practical

<b><u>A. Theory papers :</u></b>	Hrs/ week	Examination hours	Maximum Marks
Paper I: Mineral Resources	2	3	50
Paper II: Geoexploration and Principles of Mining	2	3	50
Paper III: Geology of Rajasthan and Groundwater Geology	2	3	50
<b>B. Practical:</b>	4	4	75
<hr/>			
<b>Total Marks</b>			<u>225</u>

Note: Each question paper will be divided into three parts:

Part I - Ten questions ( answer not exceeding fifty words); two questions from each unit will be asked. Each question will be of ONE mark and the candidates are required to attempt ALL questions. Total : 10 marks

Part II - Five questions (answer not exceeding 250 words) one from each unit with internal choice will be asked and the candidates are required to attempt ALL questions. Each question will be of FOUR marks. Total: 20 marks

Part III - Four questions, may be in parts, covering all five Units ((answer not exceeding 300 words) will be asked. The candidates are required to attempt any TWO questions. Each question will be of TEN marks. Total: 20 marks

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#### **Paper -I : Mineral Resources**

**Time : 3 hrs; Maximum Marks : 50**

##### Unit -I

Magma and its relation with mineral deposits. Elementary ideas of magmatic concentration and hydrothermal process

##### Unit -II

Elementary ideas of process of ore formation by Sedimentation, Volcanogenic, Evaporation, Oxidation and Supergene Enrichment, Metamorphism, Mechanical and Residual Concentration

##### Unit -III

Brief ideas of Contact Metasomatism and Skarn formation. Coal, Petroleum and Radioactive mineral deposits of India

##### Unit- IV

Brief knowledge of mode of occurrence, distribution, uses and origin of important metallic mineral deposits of India - Lead, Zinc, Copper, Iron

##### Unit -V

Brief knowledge of mode of occurrence, distribution, used and origin of important non-metallic mineral deposits of India: Rock Phosphate, Gypsum, Talc, Asbestos, Barytes, Fluorite, Garnet, Kyanite, Sillimanite and Clay deposits

## **Paper -II : Geoexploration and Principles of Mining**

**Time: 3 hrs;      Maximum Marks : 50**

### Unit -I

Geological techniques and procedures of exploration stages, planning and operation of exploration. Procedure for obtaining a mining lease

### Unit-II

Geological aspects of drilling; drilling methods, selection of sites, angles and direction of bore holes. Core - logging

### Unit - III

Methods of sampling, weighing of samples and calculation of average grades. Classification of ore reserves. Calculation of cut-off grade. Grade and tonnage. Principles of geochemical and geophysical prospecting.

### Unit -IV

Mineral Economics and its concepts, tenor, grade and specifications for important minerals used in industries. Methods of ore reserves estimation. Principles and methods of ore dressing

### Unit -V

Introduction to remote sensing. Elements of mining methods. Introduction to open cast and underground mining methods

## **Paper - III : Geology of Rajasthan and Groundwater Geology**

**Time : 3 hrs ;                      Maximum marks : 50**

### Unit -I

Geomorphologic divisions of Rajasthan and their characteristics. Geological time scale and its equivalents in Rajasthan. Banded Gneissic Complex, Aravalli and Delhi Supergroups, their distribution, classification, lithology and igneous intrusives

### Unit -II

Younger Precambrian formations of Rajasthan. Sirohi Group, Sindreth Group and Malani Igneous suite. Vindhyan and Marwar Supergroups of Rajasthan, their distribution, classification, lithology, fossil content and economic importance

### Unit -III

Palaeozoic, Mesozoic, Tertiary and Quarternary geology of Rajasthan, their distribution, classification, lithology, fossil content and economic importance

### Unit -IV

Source and origin of groundwater. Hydrologic cycle. Hydrological properties of rocks. Types of aquifers, porosity, permeability, transmissibility, storage coefficient, specific yield and specific retention. Water table and artesian well. Occurrence of ground water in : igneous, metamorphic and sedimentary rocks

### Unit -V

Groundwater prospecting methods. Prospecting and groundwater resources in Rajasthan

## B.Sc. Third Year Geology Practicals : 2019-2020

Examination will be of FOUR hours duration

Maximum Marks : 75

1. Mineral Resources: Plotting and spotting	15
2. Geoexploration and Principles of mining : Survey	10
3. Geology of Rajasthan and Groundwater Geology: Plotting and Identification of rocks	15
4. Field work	15
5. Viva-voce	10
6. Record	10

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**Total**

**75**

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### **Mineral Resources :**

1. Identification and description of important economic minerals and rocks in hand specimen
2. Plotting of important economic mineral deposits in the outline map of India

### **Geoexploration and Principles of Mining:**

1. Survey: Chain and Plain Table surveying

### **Geology of Rajasthan and Groundwater Geology:**

1. Identification and description of important stratigraphic rocks of Rajasthan and their assignment to respective stratigraphic position
2. Plotting of important stratigraphic units in the outline map of Rajasthan

### **FIELD WORK:**

A **Five day** field -work to study elementary aspects of course related field geology  
Students will submit a report thereon.

**Fieldwork is compulsory. Students not taking part in the field work will not be allowed to appear in the Final Examination**

### **Books suggested besides the internet**

Arogyaswamy, R.N.P.: Courses in Mining Geology. Oxford & IBH publishing Co. Pvt Ltd, New Delhi.  
Chouhan, T.S. Encyclopedia of Rajasthan. Vol. I Vigyan Prakashan, Jodhpur.  
Deb, S. Industrial Minerals and Rocks of Rajasthan. Allied Publ. New Delhi.  
Garg, S. P. Groundwater and Tubewells. Oxford & IBH Publ Co. New Delhi.  
Jensen, M.L. and Bateman, A.M.: Economic Mineral Deposits. John Wiley & Sons, Singapore.  
Krishnaswamy, M.S. India's Mineral Resources, Oxford & IBH Publ Co. New Delhi.  
Naqvi, S.M. and Rogers, JJW: Precambrian Geology of India. Oxford University Press..  
Pandey, S.N. : Principles and Application of Photogeology. Wiley Eastern Ltd, New Delhi.  
Sinha Roy, S. Malhotra G and Mohanty M Geology of Rajasthan. Geol Surv. India, Kolkatta.  
Todd, DK : Groundwater Hydrology. John Wiley & Sons, Singapore

