

THE UNIVERSITY OF BURDWAN



Syllabus for B.Sc. 3-Yr. Degree Course in Geology (General)

w.e.f. 2014-15

1. For Three year B.Sc (General) course in Geology the total marks is 400 in Part-I, Part-II and Part-III.
2. At the end of 1st Yr. (Part-I) there will be one paper of 100 marks comprising of Unit I (Theoretical – 75 marks - 3 hours duration) and Unit II (Practical - 25 marks - 2 hours duration).
3. At the end of 2nd year (Part-II) there will be one theoretical paper of 100 marks (of 3 hours duration) and one practical paper of 100 marks comprising of two groups each of 50 marks and 3 hours duration. Before appearing at the B.Sc. Part-II examination a compulsory field work of about two weeks duration is to be undertaken by each and every student. Failure of any student(s) undertaking the field work shall have to be reported by the concerned Head of the Department to the Chairman of U.G. Board of Studies in writing so that the concerned student(s) is/are not allowed to appear in the B.Sc. Part-II (General) examination Practical Papers. The field work will cover basic idea about occurrences of rocks and minerals, measurements of structural elements and geographical mapping of a small area.
4. At the end of 3rd Yr. (Part-III) there will be one paper of 100 marks comprising of Unit I (Theoretical - 65 marks - 2 hours 30 minutes duration) and Unit II (Practical - 35 marks - 2 hours 30 minutes duration)
5. Each theoretical and practical paper/Unit will be held on different dates.

B.Sc. Part-I Examination (examination at the end of 1st year) :

Total marks : 100

Theoretical Paper I (Total Marks – 75)				
Paper	Group	Subject	Marks	No. of lectures
	A	Physical Geology	20	40
	B	Crystallography and Mineralogy	20	40
	C	Igneous petrology	20	40
	D	Principles of Palaeontology	15	30
			75	
Practical Paper I (Total marks – 25)				
		Crystals, Rocks and Minerals in hand specimens	20	60
		Laboratory Note book	5	
			25	

B.Sc. Part-II Examination (examination at the end of 2nd year):**Total marks : 200**

Theoretical				
Paper	Group	Subject	Marks	No. of Lectures
II	A	Optical Mineralogy	15	30
	B	Structural geology	20	40
	C	Sedimentary and metamorphic petrology	30	60
	D	Palaeontology	15	30
	E	Economic geology	20	40
Total			100	
Practical				
Paper	Group	Subject	Marks	No. of Lectures
III	A	Microscopic identifications of minerals and rocks	35	90
		Field notes and field report	10	
		Laboratory note book	5	
Total			50	
III	B	Identifications of fossils	20	40
		Structural problems and map	25	50
		Laboratory note book	5	
Total			50	

B.Sc. Part-III Examination (examination at the end of 3rd year)

Theoretical Paper IV (Total Marks – 65)				
Paper	Group	Subject	Marks	No. of lectures
IV	A	Stratigraphy	40	80
	B	Evaluation of surfacial resources	25	50
Total			65	
Practical Paper IV (Total marks – 35)				
		Interpretation of maps and solution of graphical problem	30	90
		Laboratory Note book	5	
Total			35	

DETAILS OF THE 3-YR B.Sc. (General) syllabus in Geology

B.Sc. Part- I

THEORETICAL PAPER I

Marks - 75

Group- A (Physical Geology)

Marks – 20

- The Origin of the Earth. Astronomical setting and important facts and figures of the Earth. Elementary ideas on the nature and the evolution of the Atmosphere, Crust, Mantle and Core. Principles of Uniformitarianism. Geological Time Scale.
- Sculpturing of the land surface: Weathering, Erosion and Deposition. Geological action of River, Glacier, Wind and Ocean.
- Earthquakes – causes and effects; earthquake belts.
- Elementary knowledge of structures of continents, ocean-basins, continental margins.
- Elementary concept of Continental Drift, Sea floor spreading and Plate Tectonics.

Suggested books

Holmes, A. – Principles of Physical Geology

Group- B (Crystallography & Mineralogy)

Marks – 20

- Definition of minerals : Crystalline & non- crystalline states of matter, Elements of symmetry in Crystals, Parameters & Miller Indices, Axial elements & characteristics of seven Crystals.
- Twinning: Definition, Twin plane & Composition plane.
- Important physical characters of minerals & methods of their determination.

Suggested books

W.D. Nesse – Introduction to mineralogy

Group- C (Igneous Petrology)

Marks – 20

- Average major elemental composition of the crust: Broad subdivision of the rocks: Igneous Sedimentary and Metamorphic rocks.
- Forms of igneous rock bodies: lava Flows, sills, Dykes, Laccolith, Lopolith, Phacolith, Batholith.
- Classification of igneous rocks based on SiO₂% and colour index,. Outlier of Hatch Wells & Wells and I.U.G.S. Classifications.
- Common textures and microstructures of igneous rocks viz. Porphyritic, Poikilitic, Ophitic, Intergranular, Trachytic and Graphic textures.
- Petrography of the following rock types: Granite, Pegmatite, Rhyolite, Syenite, Trachyte, Gabbro, Anorthosite, Basalt, Dolerite, Peridotite.
- Indian distribution and brief petrography of Deccan Trap and Rajmahal Trap.

Suggested books

Bose, M.K. – Igneous Petrology

Group-D (Principles of Palaeontology)

Marks – 15

- Definition of Palaeontology and Fossil. Conditions of fossilization. Principal modes of preservation.
- Introduction of the terms: Phylum, Class, Order, Family, Genus and Species. Binomial system of nomenclature.

- Elementary ideas on the uses of fossils as Index fossil, Markers of age, Tools of Stratigraphic correlation, Evidences of organic evolution and Indicators of ancient environments.

Suggested books

Roy, A.K. - Fossils in Earth Sciences, Prentice Hall of India Private Limited

PRACTICAL PAPER I (Crystals, rocks and minerals in hand specimens) Marks 25

- Study of symmetry elements in crystal models of isometric, tetragonal and orthorhombic systems (Normal class only)
- Systematic study under specified heads of the following minerals in hand specimen: form and structure, color, Streak, hardness, Cleavage, Fracture, Luster, Sp.Gr and Spl. Property (if any): Graphite, Chalcopyrite, Pyrite, Sphalerite, Galena, Haematite, Magnetite, Chromite, Pyrolusite, Psilomelane, Bauxite, Calcite, Dolomite, Quartz, Jasper, Feldspar, Pyroxene, Amphibole, Garnet, Beryl, Asbestos, Muscovite, Biotite, Talc, Chlorite, Sillimanite, Tourmaline, Gypsum and Apatite.
- Study of the following rocks in hand specimen: Granite, Pegmatite, Syenite, Diorite, Gabbro, Anorthosite, Rhyolite, Basalt, Dolerite, Shale, Sandstone, Conglomerate, Limestone, Coal, Gneiss, Schist, Slate, Marble and Quartzite.
- Laboratory Notebook and Viva-voce.

B.Sc. Part-II

THEORETICAL PAPER II Marks - 100

Group- A (Optical Mineralogy) Marks – 15

- Polarization of light, isotropic and Anisotropic media; Double refraction, Birefringence, Pleochroism, interference phenomena in crystals; Parts of a polarizing microscope; Extinction of uniaxial and biaxial minerals; Optically positive and negative minerals.
- Basic knowledge of the physical (including optical) and chemical properties of the following groups: feldspar group, Pyroxene group, Amphibole group and Mica group)

Suggested books

W.D. Nesse – Introduction to mineralogy

Group B (Structural Geology) Marks – 20

- Primary Structures: Stratification, Current, Cross & Grabed Bedding, Rippled Marks, Flow layers.
- Brief description of (a) Folds: Antiform, Synform, Anticline, Syncline, Upright, Inclined, Isoclinal, Recumbent, plunging and non-plunging b) Faults: Normal, Reverse, Thrust, Net-slip, Throw and Heave; Nappe and Klippe.
- Unconformity : Definition, Types and their recognition in the field.
- Definition and Types of Foliation, Schistosity, Lineation and Cleavage.

Suggested books

Billings, M.P. – Structural Geology, Third Ed.

Ghosh S.K. – Structural Geology – Fundamentals and Modern Developments.

Group- C (Sedimentary and metamorphic petrology)**Marks- 30**

- Clastic and non-clastic sedimentary rocks: Sphericity and Roundness in sedimentary rocks, Classification of sedimentary rocks; Petrology of shale, sandstone and limestone.
- Definition, factors and kinds of metamorphism; Metamorphic facies and grade.
- Common textures and structures of metamorphic rocks viz. granoblastic, porphyroblastic, hornfelsic, schistose, gneissose, cataclastic etc.
- Petrography of common metamorphic rocks produced from shale, limestones and mafic igneous rocks.

Suggested books

Sengupta, S.M. – Introduction to Sedimentology

Blatt, H and Tracy, R.J. Petrology – igneous, Sedimentary and Metamorphic.

Group- D (Palaeontology)**Marks – 15**

- Study of hard-part morphology, in brief, of the following: Trilobita, Pelecypoda, Brachiopoda, Gastropoda, Cephalopoda and Echinoidea.
- An outline of evolutions of Equidae and Man.
- Brief discussions on Indian Gondwana Flora.

Suggested books

Roy, A.K. - Fossils in Earth Sciences, Prentice Hall of India Private Limited

Group – E (Economic geology)**Marks – 20**

- Concept of metallic and non-metallic deposits; Definition of ore, gangue, tenor, hypogene and supergene deposits.
- Brief description of the processes of formation of mineral deposits
- Very brief outline of classification of ore deposits.
- Mode of occurrence, stratigraphic position, geographic distribution and present resource position of the following deposits in India: Iron, Copper, Lead and Zinc, Manganese, Mica, Bauxite, Coal, Petroleum, Nuclear fuel.

Suggested books

Jensen, and Bateman, A.M. – Economic Mineral Deposits, Hohn Willey & Sons.

PAPER – III**Marks - 100****PRACTICAL****Group A Microscopic identifications of minerals and rocks****Marks 50**

- Study of the following minerals under petrographic microscope: Quartz, Orthoclase, Microcline, Plagioclase, Orthopyroxene, Clinopyroxene, Hornblende, Muscovite, Biotite, Chlorite, Garnet, Tourmaline, Kyanite, Sillimanite and Calcite.
- Study and identification of the following rocks under microscope: Granite, Dolerite, Basalt, Schist, Gneiss and Limestone.
- Laboratory Notebook and Viva-voce.

Group B Identifications of fossils, structural problems and map**Marks 50**

- Clinometer compass and its uses. Study of topographic maps.
- Solution of simple problems of dip, strike and outcrop.

- Interpretation of geologic maps containing horizontal beds, homoclines, monoclines, simple folds,
- faults, unconformity, large intrusions, dykes, sills and faults.
- Identification of the following genera of fossils by their hard-part morphology;
 - a) Spirifer, Productus, Terebratula.
 - b) Arca, Pecten, Ostrea, Hippurites.
 - c) Physa, Natica, Cyprea, Turritella.
 - d) Nautilus.
- Laboratory Notebook and Viva-voce.
- Reconnaissance study of igneous, sedimentary and metamorphic rocks in the field. Use of clinometer compass and topo-sheets. Collection of samples and preparation of field report. The fieldwork will be of about two weeks duration.

B.Sc. Part- III

THEORETICAL PAPER IV

Marks - 65

Group- A (Stratigraphy)

Marks – 40

- Succession of rocks as records of the geologic past. Stratigraphic column – an expression of the sequence of geologic events through ages. Scope of stratigraphy. Erection of rock succession and correlation.
- Principal physiographic divisions of India.
- Distribution of major stratigraphic units in India: Archaean, Proterozoic, Palaeozoic, Mesozoic, Cenozoic
- Broad outline of the stratigraphy of the following:
 - Precambrian of Singhbhum Region
 - Cuddapah Basin
 - Vindhians of Son Valley
 - Palaeozoic of Spiti
 - Mesozoic of Spiti and Trichinopoly
 - Gondwana: General characters, subdivisions, Indian distribution.

Suggested books

Sarbadhikary, T. – Bharater Shilastor o Bhutatiya Itihas.

Krishnan, M.S –Geology of India and Burma.

Group – B. (Evaluation of surficial resources)

Marks 25

- Water: Hydrologic cycle; Earth water resources; Occurrence of surface and ground water (Ground water profile, aquifer, aquiclude, aquifuges, aquitards); water table and piezometric surface; water abstraction structures; water pollution and remedial measures; groundwater exploration and management .
- Engineering Geology: Dams (Types and classification); Land slides; Slope stability; Building materials; Geologic features for selection of sites of dams and reservoirs.
- Elementary knowledge of Geological, Geophysical and Geochemical explorations.

Suggested books

Subinoy Gangopadhyay – Engineering Geology

Reedman, J.H. – Techniques in mineral exploration

Todd, D.DK. – Ground Water Hydrology.

PRACTICAL PAPER IV**Marks - 35****Interpretation of maps and solution of graphical problems****Marks 35**

- Interpretation of topographical and geological maps (including hydrological and engineering geological maps)
- Bore hole problems (graphical)
- Laboratory Notebook and Viva-voce.