

Geology

B.Sc.: Elective

Outlines of Tests

<u>Paper</u>	<u>Title of Course</u>	<u>Marks</u>
A	General Geology, Mineralogy Petrography	75
B	Geomorphology, Halaeontology/ Straitigraphy	75
C	Practical (Time: 4 hours)	50
Total:		200

Syllabi and Courses of Reading

PAPER A : GENERAL GEOLOGY, MINERALOGY, PETROGRAPHY

Section A: General Geology: 25 marks

The earth as a planet, its place in the universe and its origin. Introduction to Geomagnetism and the earth's gravity field. Earthquakes, the internal structure of the earth, the age of the earth. Volcanism, the material and Chemistry of the earth crust, plutonic rocks, metamorphic rocks. Faulting and folding, epeirogenic forces and Isostasy, organic forces and mountain building. Nature of Joining and cleavage. Introduction trends and techniques

Section B: Mineralogy and Petrography 50 marks

(i) Elementary crystallography.

Formation of crystals, development of the science of Crystallography. Regular arrangement of point in space, the space lattice, Elements of symmetry, relation of crystal lattice to the crystal symmetry, Crystal forces, each figures and solution pits, crystal axes and Miller Indices, Crystal edges, Latic rows and zone axes. The choice of axes in crystals. The crystal classes.

Symmetry operations, Triclinic system, Monoclinic system, Hexagonal system, Tetragonal system and Cubic system.

Crystal aggregates, twinned crystals, effect of twinning, causes of twinning.

(ii) Physical properties of minerals:

Colour, Streak: Cleavage Parting, fracture: hardness, tenacity: specific gravity properties depending upon light electricity, magnetism and heat.

Classification and description of common merial groups, namely: Native elements. Sulphides, sulphates oxides, halides, carbonates, nitrates, borates, chromatek, sulphates molyosdtes, tungstateat, phosphates, vanadates, sillicastes.

(iii) Optical mineralogy

Examination in plane polarized light.

Crystal from, clevgaes, inclusions, colour, pleoch, refractive index, relief be related to the regions studies in Paper B)

(d) Representation of statistical data in maps and diagrams (the data used shall be related to the regions studies in Paper B).

(e) Preparation of servey plan with the help of following:

(i) Chain surveying

(ii) Plane table surveying.

N.B: Map work and practical will be taught along with Paper A and B, as indicated above. But there shall be a separate examination carrying 50 marks. The examination in crossed polars:

Double refractions, isotropism and anistropism extinction and extinction angles, interferency colours, birefringence, elongation, twinings.

Examination in Covergent Light.

Interference figures, Uniaxial and Biaxial crystals, determination of optic sign and estimation 2V.

Deagnostic properties of common rock forming minerals in thin sections

(iii) Elementary classification of rocks and their petrography:

Forms Igneous Rock Bodies, nature of magma, sequence of events in the crystallitation of magma, textures and classification of igneous rocks on the basis of field, textural mineralogical and chemical criteria. The clan concept and petrography of common

rock types in (i) Ultramafic Clan (ii) Cala-Alkali Gabro Clan (iii) Diorite Monzonite and venith clans (iv) Granodiorite, Adamellite and Granite clans. Introduction to petrogenesis of Igneous rocks. Structures in Igneous rocks.

Pyroclastic Rocks:

Classification of volcanic ejecta according to size, mode of origin and composition, Alteration.

Metamorphic Rocks:

Concepts of regional contact and dynamic metamorphism, petrography of common type (gneiss schist quartzite, state marble, serpentine, hornfelse, cataclastic and mylonnes).

Sedimentary Rocks:

Petrography of common varieties calcareous, arenaceous, rudaceous argillaceous sedimentary rocks. Texture, size sorting, sphericity, roundness packing and orientation mineral grains in sediments. Introduction of modern trends and techniques.

PAPER B: GEOMORPHOLOGY: PALAEOLOGY/ STRATIGRAPHY

Marks: 75

Section A: Geomorphology:

25

Weathering and soils: process of physical and chemical weathering: their effects: growth and nature of soils.

Fluvial processes: Valley development: Base level and its types: drainage patterns and their significance; stream meandering and the development of Flood Plain; concept of a Geomorphic cycle; Rejuvenation and its evidence; Aggregation River Terraces and their significance. Glaciation: Types of Glacier; Glacial Erosional Feature; the unstratified Deposit (Till).

Wind action: Wind Erosional land forms, Dunes and Loess
Introduction of modern trends and techniques.

Section B: Palaeontology and Stratigraphy.

50

(i) Stratigraphy:

Introduction to the principles of stratigraphy: Stratigraphy of Pakistan in brief.

(ii) Paleontology (Invertebrates)

Fossils: Fossilisation, modes of preservation, Geological Significance.

Protozoa: Morphological features of the foraminiferal test, characteristic features of Nummulites, Discocyclina, Operaculina Assiliana, Lagena, Nodosaria, Lenticulina, Textularia, Uvigerina, Globigerina, Triloeulina, Ammonia, Geological significance of foraminifera,

Coelenterata: Morphology of Rugose, Scleractonian (Hexacorals) and Tabulate Corals and their geological distribution characteristic features of Calceola, zephyrentls, Heliophyllum, Parasmilia, Streptelaema, Lithostrotion, Lonsdaleia Fevosites, Halysites.

Graptozoa: Morphological features, evolution and geological importance of Graptolites, Characteristic features of Monograptus, Diplograptus, Tetragraptus Phylograptus Didymograptus.

Bryozoa: Salient features of Bryozoans and their geological importance.

Echinoderma: Morphology of the ancient and modern echinoid tests and their geological range, Characteristic features of Cidaris, Micraster, Clypeus, Scutelle. Hemicidaris Conulus, Morphological Features of the Crinoids and their geological distribution Characteristic features of Encrinns.

Pentacrinus, Apiocrinus. Salient features of blastoid genus Pentremites.

Brachiopoda: Morphology of the Brachiopod shells and their geological distribution, Characteristic features of Productus, Spirifer, Terabratula, Atrypa, Derbyia, Atgyis, Hebertella, Streptorhynchus, Spirigerella.

Mollusca: Morphology of the Lamellibranch shells, Characteristic feature of Aera, glycime is, Trigonia venus, Pecten, Ostrea, Exogyra, Gryphaea, Gervillea, Inceramus,

Hippuritis, Morphological features of the Gastropod shall, Characteristic features of Bellerophon, Trochus, Nerinea, Fusus, Turritella, Cerithium Murex, Voluta, Conus, Morphological features and geological importance of Caphalopods; Characteristic feature of Nautilus, Othoceras Harrisoceras, Goniatices, Ceratices, Baculites, Hildoceras, Bouleiceras. Periphinctes, Belemnopsis.

Arthropoda: Morphological features of Trilobites and their geological significance
 characteristic feature of Trmuicleus, Paradoxides, Calymene, Redlichia, Phacops.
 Introduction of modern trends and techniques.

PAPER C: PRACTICAL

Practical	40
Map work.	10
Total	50

(Time: 4 hours)

Map projections: Topographic maps.

Elementary geological map exercises including use of strike in map work
 construction of cross-sections, interpretation of geological maps involving straight strikes
 and onstant dips.

Paper B (ii)	(ii)	Mineralogy and Petrology	15
		Identification of crystal models: minerals and rock specimens related to Theory Paper A (ii)	
	(iii)	Palaeontology and Stratigraphy	15
	(iv)	Geological Excursion, Fields notes and Viva:	10

Books Recommended

- 1- Principles of Physical Geology 2nd Edition, Holmes
- 2- Introduction to Physical Geology: Longwell and Flint.
- 3- Dana's Manual of Mineralogy: Herbut.
- 4- Minerals and the Microscope: Smith revised by M.K. Wells
- 5- Principles of Petrology; G.W., Tyroll.
- 6- Petrology for students; A. Harker
- 7- Petrology of the Igneous Rocks; F.H Hotch and M.K. Wells (11th edn.)
- 8- Metamorphism: Harker
- 9- The study of Rocks in this section; W.W. Moorhouse. 1964 (I.S.E)
- 10- Invertebrate Fossils; Niirem Kakucker/ Fisher.
- 11- Stratigraphy and Introduction to Principles D.T. Donovan, 1966
- 12- Petrology; Haung.
- 13- Optical Mineralogy; P.F. Kerr.
- 14- Mineralogy; Berry and Mason.
- 15- Recognition structural features and their orientation.
- 16- Geological Raw Material, Mining and Industry.

Every student will maintain a field note book. He will carry out samples, labeling and books entries. This note book will be presented at the time of Viva Voce examination, which should be properly signed by the concerned teacher/s in the field.

At the end of field excursion, every student will write a field report carrying 100 marks distribution as below:

Distribution of marks:

Text based on field notes	Viva Voce	Total
60	40	100