

2 0 1 9

GEOLOGY

(THEORY)

Full Marks : 70

Time : 3 hours

The figures in the margin indicate full marks for the questions

General Instructions:

- (i) Write all the answers in the Answer Script.
- (ii) Attempt Part–A Objective Questions serially.
- (iii) Attempt all parts of a question together at one place.

(PART : A–OBJECTIVE)

(Marks : 35)

1. Choose and write the correct answer : 1 x 6 = 6

(a). Water combining with a mineral component to give rise to a new mineral is

- (i) solution
- (ii) hydration

(2)

- (iii) hydrolysis
- (iv) reduction
- (b) Topset, foreset and bottomset beds are associated with
 - (i) medial bar
 - (ii) point bar
 - (iii) alluvial fan
 - (iv) delta
- (c) Change in colour of a mineral under crossed-Nicols as the microscope stage is rotated is called
 - (i) extinction
 - (ii) pleochroism
 - (iii) interference color
 - (iv) twinning
- (d) A change in shape, size, location or orientation of a rock body is called
 - (i) deformation
 - (ii) folding
 - (iii) faulting
 - (iv) jointing

(9)

GROUP – E

(Metamorphic Petrology)

15. Briefly explain the common types of metamorphic structures. Draw suitable sketches. 7
16. Answer any *two* of the following: $3\frac{1}{2} \times 2 = 7$
- (a) Explain how contact metamorphism takes place.
 - (b) Write briefly on how metamorphic textures are described.
 - (c) Explain how the grade of metamorphism of argillaceous material can be ascertained.

★★★

(5)

(6)

- (c) A very greatly enlarged depression at the top of a volcanic cone.
- (d) A group of minerals indicating the degree of metamorphism.
- (e) A group of crystal faces intersecting the vertical crystallographic axis.

5. Match Column A with Column B and write the corresponding numbers : $1 \times 6 = 6$

<u>Column A</u>	<u>Column B</u>
(a) Shadow zone	(i) continuous reaction
(b) Solid solution	(ii) contact metamorphism
	(iii) isotropism
(c) Aureole	(iv) hybrid rocks
(d) Folds	(v) outer core
	(vi) ductile
(e) Glass	(vii) discontinuous reaction
	(viii) anisotropism
(f) Assimilation	(ix) inner core

6. Answer in one or two lines on: $1 \times 6 = 6$
- (a) Seismograph
- (b) Polarization of light
- (c) Crystal
- (d) Strike and dip of rocks
- (e) Felsic and mafic igneous rocks
- (f) Gneissose fabric

(PART : B-DESCRIPTIVE)

(Marks : 35)

Answer five questions selecting one from each Group

GROUP – A

(General Geology)

7. List the erosional work of a river. Explain the formation of any two depositional landforms by rivers. $1 + 6 = 7$
8. Answer *any two* of the following : $3\frac{1}{2} \times 2 = 7$
- (a) Draw a neat labelled sketch of the interior of the earth.
- (b) Write a note on recent thoughts about the origin of the earth and the solar system.

(4)

- (e) In metamorphism, the formation of new minerals take place in the solid state, without undergoing melting.
- (f) The North-East of India is categorized as zone I in the earthquake zone Map of India.

3. Fill in the blanks : 1 x 6 = 6

- (a) The _____ makes up the crust and uppermost mantle.
- (b) Ordinary light breaking up into two polarized light is called _____.
- (c) Folds with parallel limbs are called _____ folds.
- (d) The point at which two minerals crystallize simultaneously from a melt is called the _____.
- (e) Granulites or eclogites is indicative of _____ grade of metamorphism.
- (f) _____ gives the inclination of a line in a rock.

4. Express in one word : 1 x 5 = 5

- (a) Very large, almost bottomless, igneous intrusion.
- (b) Actual relative displacement along a fault.

(7)

- (c) Write the Geological Time Scale in tabular form.

GROUP – B

(Crystallography and Mineralogy)

9. List the symmetry elements of the Normal Class of the Hexagonal System. Draw a clinographic sketch of the Hexagonal System. List the forms developed in the Normal Class of the Hexagonal System. Name a mineral crystallizing in the Hexagonal System.

$$1\frac{1}{2} + 1 + 4 + \frac{1}{2} = 7$$

10. Answer *any two* of the following: $3\frac{1}{2} \times 2 = 7$

- (a) Explain the construction and working of the Nicol prism.
- (b) Distinguish isotropic minerals from anisotropic minerals.
- (c) Distinguish between the Cubic, Tetragonal and Hexagonal Systems.

GROUP – C

(Structural Geology and Geotectonics)

11. Define hinge line, fold axis and axial surface of folds. State two points of difference between a fold and a fault. What are recumbent folds, anticlines, and tight folds?

$$3 + 1 + 3 = 7$$

(8)

12. Answer any *two* of the following: $3\frac{1}{2} \times 2 = 7$

- (a) Plunge and rake / pitch, dip and strike.
- (b) Dip-slip faults
- (c) Plate boundaries

GROUP – D

(Igneous Petrology)

13. Outline the different processes of magmatic differentiation. 7

14. Answer any *two* of the following: $3\frac{1}{2} \times 2 = 7$

- (a) Explain the crystallization of a simple unicomponent melt.
- (b) Outline the types of inequigranular texture seen in plutonic igneous rocks.
- (c) Explain any four intrusive igneous structures with sketches.

(3)

(e) Early formed heavy crystals settling to the bottom of the magma chamber is called

- (i) fractional crystallization
- (ii) gravity settling
- (iii) liquid immiscibility
- (iv) filter pressing

(f) A metamorphic fabric with a dominance of large equidimensional minerals are called

- (i) granoblastic texture
- (ii) porphyroblastic texture
- (iii) blasto porphyritic texture
- (iv) blasto ophitic texture

2. State 'True' or 'False' : $1 \times 6 = 6$

- (a) Natural earth processes were different at different points in earth's history.
- (b) All crystals are divided in six systems.
- (c) Along dip-slip faults the hanging wall always moves down relative to the foot wall.
- (d) In ophitic texture, bigger crystals of plagioclase enclose smaller grains of augite.