

**2023**

**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 (**any 6**) :  $1 \times 6 = 6$

(a) The combined effect of weathering and erosion is called

(i) aggradation

(ii) denudation

(iii) decomposition.

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11. Writes short notes on **any two** of the followings:

$$3\frac{1}{2} \times 2 = 7$$

- (a) Cleavage and fracture of minerals.
- (b) Isotropism and anisotropism
- (c) Symmetry elements of crystals

12. Define polarization of light. Explain the construction and working of a Nicol prism.

$$1 + 6 = 7$$

GROUP – C

( Structural Geology and Geotectonics )

13. Write brief notes on the types of faults with neat sketches.

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

- (a) Strike and Dip.
- (b) Elastic, plastic and brittle deformations.
- (c) Joints.

15. What are folds. Write briefly on any four elements of folds. Distinguish between (a) antiform and anticline

(b) plunging and non-plunging folds.  $1 + 2 + 2 + 2 = 7$

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(f) The first mineral to crystallize out from a basaltic magma is

- (i) quartz
- (ii) K-feldspar
- (iii) olivine

(g) Acid magmas are rich in

- (i) Si, Na, K
- (ii) Ca, Mg, Fe
- (iii) Si, Fe, Mn.

(h) With increasing metamorphism, the grain size of minerals

- (i) increase
- (ii) decrease
- (iii) remain constant.

2. State 'True' or 'False' (**any six**):

$$1 \times 6 = 6$$

- (a) P-and S-waves travel through solids, liquids and gases alike.
- (b) Waterfalls are features due to stream erosion.

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- (e) The crystallization of plagioclase with albite and anorthite as end members is an example of \_\_\_\_\_ reaction series.
- (f) Two or more joints parallel to each other with a regular spacing is called a joint \_\_\_\_\_.
- (g) When no fault block moves up or down, but slip past each other in a horizontal manner, then the fault must be a \_\_\_\_\_ fault.
- (h) A fine-grained dark colored low grade metamorphic rock is \_\_\_\_\_.

4. Express the following in one word (**any five**) :  $1 \times 5 = 5$

- (a) Younger rocks towards the top and older rocks towards the bottom in a rock succession.
- (b) Country rock fragments in intruding magma.
- (c) Magma splitting into parts with different composition as a result of cooling.
- (d) A group of metamorphic minerals that form under the same set of physical and chemical conditions.
- (e) Rock below a fault plane.
- (f) Difference between the maximum and minimum refractive index of a mineral.

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

Column A	Column B
(a) Hexagonal	(i) Graphic granite
(b) Convection currents	(ii) low amplitude
(c) Continuous reaction	(iii) metamorphism
(d) Intergrowth	(iv) hkl
(e) Aureole	(v) Solid solution
(f) P-wave	(vi) high amplitude
	(vii) asthenosphere
	(viii) volcanic rock
	(ix) hkil

6. Answer in 1 (one) or 2 (two) lines (**any six**) :  $1 \times 6 = 6$

- (a) Bed load
- (b) Lustre
- (c) Isoclinal fold
- (d) Gneiss
- (e) Directed pressure
- (f) Cryptocrystalline texture
- (g) Boss
- (h) Inequigranular texture

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- (c) Curved fractures in minerals showing concentric lines are called “uneven” fractures.
- (d) Displacement along fault is called slip.
- (e) When an oceanic plate collides with a continental plate, the oceanic plate moves over the continental plate.
- (f) Cavities on top of volcanic igneous rocks give rise to ‘trachytic texture’.
- (g) Igneous mineral grains without any faces are said to be ‘anhedral’.
- (h) Large well-shaped crystals in metamorphic rocks are called porphyroblasts.

3. Fill in the blanks (**any six**) :  $1 \times 6 = 6$

- (a) A mass of minute particles of gases, dusts and icy particles that ultimately formed the solar system is called the solar\_\_\_\_\_.
- (b) The upper solid and rigid part of the earth is called the \_\_\_\_\_.
- (c) The symmetrical intergrowth of two or more crystals is called \_\_\_\_\_.
- (d) A \_\_\_\_\_ is a dome shaped igneous rock body with a flat base and domed top.

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( PART : B–DESCRIPTIVE )

( Marks : 35 )

Answer **five** questions, selecting **one** from each Group

GROUP – A

( General Geology )

- 7. Outline how earthquake waves help to X-ray the earth’s interior. 7
- 8. Write short notes on **any two** of the following :  $3\frac{1}{2} \times 2 = 7$ 
  - (a) Uniformitarianism
  - (b) Products of volcanoes
  - (c) Types of stream erosion.
- 9. Distinguish weathering from erosion. List the agents of weathering. Explain briefly any two chemical and any two physical processes of weathering.

$1 + 2 + 2 + 2 = 7$

GROUP – B

( Crystallography and Mineralogy )

- 10. List the symmetry elements of the Normal class of the Isometric system. Draw a clinographic sketch of the Isometric system. List the forms developed. Name a mineral crystallizing in the Isometric system.

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

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- (b) Eocene time is immediately followed by
- (i) Oligocene
  - (ii) Paleocene
  - (iii) Miocene.
- (c) Under crossed-Nicols, the colour of a mineral, except at extinction, is called
- (i) anisotropism
  - (ii) interference colour
  - (iii) pleochroism.
- (d) An example of a brittle structure is
- (i) fold
  - (ii) fault
  - (iii) tectonic plate.
- (e) The inclination of a line in a rock is measured by
- (i) trend
  - (ii) rake
  - (iii) dip.

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GROUP – D

( Igneous Petrology )

- 16.** Illustrate the process of crystallization of a bi-component magma. 7
- 17.** Write short notes on **any two** of the following :  $3\frac{1}{2} \times 2 = 7$
- (a) Assimilation
  - (b) Discontinuous reaction series of Bowen.
  - (c) Filter pressing.
- 18.** Write brief notes on the common textures of igneous rocks with neat sketches, based only on mutual relationship of grains. 7

GROUP – E

( Metamorphic Petrology )

- 19.** Write notes on the types of metamorphism. 7
- 20.** Write short notes on **any two** of the following :  $3\frac{1}{2} \times 2 = 7$
- (a) Riecke's principle
  - (b) Grades of metamorphism and index minerals.
  - (c) Metamorphic facies.
- 21.** Write brief notes on any seven metamorphic texture/structure with neat sketches. 7

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