

Sl. No.

0006071

A-IGQ-O-JHB

## GEOLOGY

### Paper II

Time Allowed : Three Hours

Maximum Marks : 200

### INSTRUCTIONS

*Candidates should attempt SIX questions in all including Question No. 1, which is compulsory, from Part-I and attempt ONE question each from Sections A, B, C, D and E from Part-II.*

*The number of marks carried by each question is indicated at the end of the question.*

*All parts and sub-parts of a question are to be attempted together in the answer book.*

*Attempts of a part/question shall be counted in chronological order. Unless struck off, attempt of a part/question shall be counted even if attempted partly.*

*Any page or portion of the page left blank in the answer book must be clearly struck off.*

*Answers must be written only in ENGLISH.*

*Symbols and abbreviations are as usual.*

*Neat sketches are to be drawn to illustrate answers, wherever required.*

**Part – I**

**Compulsory Section**

1. Write short notes on each of the following :

5×10=50

- (a) Pyroxene quadrilateral
- (b) Uniaxial indicatrix
- (c) Bragg's Law
- (d) Graphic texture and its significance
- (e) Lopolith
- (f) Index minerals and isograd
- (g) Matrix and cement of a sedimentary rock
- (h) Stoke's Law
- (i) Geochemical cycle
- (j) Stable and radiogenic isotopes.

**Part – II**

**Section – A**

**(Mineralogy)**

2. (a) With the help of neat diagram, describe the structure of mica group of minerals. What is the difference between di- and tri octahedral mica ? 15
- (b) With the help of a mica/gypsum plate, how would you determine optic sign of a biaxial mineral. 15
3. Write short notes on : 6×5=30
- (i) Isomorphism
  - (ii) Symmetry elements of garnet
  - (iii) Co-ordination number in silicates
  - (iv) Spinel group of minerals
  - (v) Sorosilicates

**Section – B**

**(Igneous and Metamorphic Petrology)**

4. (a) With the help of phase diagram, explain crystallization of Ab-An. Comment upon zoning. 15
- (b) What do you understand by Bowen's Reaction Principle? Discuss its role in the fractional crystallization of a basaltic magma. 15

5. Write short notes on : 6×5=30

- (i) Thermal metamorphism of impure limestone
- (ii) Ropy and blocky lavas
- (iii) Ophitic texture
- (iv) Zeolite facies of metamorphism
- (v) Migmatites

**Section - C**  
**(Sedimentology)**

6. (a) Discuss various types of textures and structures found in sedimentary rocks. Comment upon their significance. 15

(b) How would you distinguish shallow marine and deep water marine environmental facies ? 15

7. Write short notes on : 6×5=30

- (i) Evaporites
- (ii) Heavy minerals in provenance-study
- (iii) Polymictic conglomerate and its significance
- (iv) Turbidites
- (v)  $\phi$  scale for grain size analysis.

**Section – D**  
**(Geochemistry)**

8. (a) Discuss classification, mineralogy and chemical composition of meteorites. Comment upon chondrites. 15
- (b) What do you understand by partition coefficient ( $K_D$  and  $D$ ) ? Discuss Goldschmidt's rule for elemental distribution. Give interpretation of Eu and Ce anomalies. 15
9. Write short notes on : 6×5=30
- (i) U-Pb system
  - (ii) Goldich's stability series
  - (iii) Garrel's  $E_h$  and pH diagram
  - (iv) Oddo-Harkins effect in REE normalization
  - (v)  $\log fO_2$  and its geological application.

**Section – E**  
**(Environmental Geology)**

10. (a) What do you understand by radioactive waste management ? Mention only few radioactive waste containments. Comment upon performance assessment of a radioactive waste containment in the geological repository. 15

- (b) Discuss geological disposal of Industrial CO<sub>2</sub>.  
How geological disposal of CO<sub>2</sub> is advantageous over the other methods of disposal?

15

11. Write short notes on :

6×5=30

- (i) Clays as barrier for pollutants
- (ii) Legislative measures for protection of environment in India
- (iii) Impact of open cast mining
- (iv) Sea water intrusion and ground water contamination
- (v) TDS and SAR for water quality.