

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) ϕ 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 CO₂.
How geological disposal of CO₂ 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.