

GEOLOGY
Paper - II

Time Allowed : Three Hours

Maximum Marks : 200

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

There are **ELEVEN** questions divided under **SIX** sections.

Candidate has to attempt **SIX** questions in all.

The **ONLY** question in Section A is **compulsory**.

Out of the remaining **TEN** questions, the candidate has to attempt **FIVE**, choosing **ONE** from each of the other Sections **B, C, D, E** and **F**.

The number of marks carried by a question / part is indicated against it.

Unless otherwise mentioned, symbols, abbreviations and notations have their usual standard meanings.

Neat sketches are to be drawn to illustrate answers, wherever required. They shall be drawn in the space provided for answering the question itself.

Wherever required, graphs/tables are to be drawn on the Question-cum-Answer Booklet itself.

Attempts of questions shall be counted in sequential order. Unless struck off, attempt of a question shall be counted even if attempted partly.

Any page or portion of the page left blank in the Question-cum-Answer Booklet must be clearly struck off.

Answers must be written in **ENGLISH** only.

SECTION A

(Compulsory Section)

Q1. Describe the following in brief with diagrams, wherever necessary : **5×10=50**

- | | |
|--|---|
| (a) Crystal defects | 5 |
| (b) Interference phenomenon in Petrological microscope | 5 |
| (c) Siderophile and Chalcophile elements | 5 |
| (d) Eu-anomaly and its significance | 5 |
| (e) Rapakivi texture | 5 |
| (f) Congruent and Incongruent melting | 5 |
| (g) Paired metamorphic belt | 5 |
| (h) Hornfelsic texture and its implications | 5 |
| (i) Difference between Seismic and Petrological Moho | 5 |
| (j) Kerguelen hotspot | 5 |

SECTION B

Attempt any **one** question.

- Q2.** (a) Write the projection for C_{2h} and D_{2h} class and give its symmetry and Hermann-Mauguin symbols. 10
- (b) Give an account on structure, chemistry and classification of Garnet group of minerals. 20
- Q3.** (a) Write the procedure to obtain conoscopic vision in a Petrological microscope. How would you determine optic sign of a uniaxial mineral? 10
- (b) Give an account on structural classification of silicate minerals with examples and neat sketches. 10
- (c) Explain Twin and Twin laws. Describe different types of twinning in Feldspars. 10

SECTION C

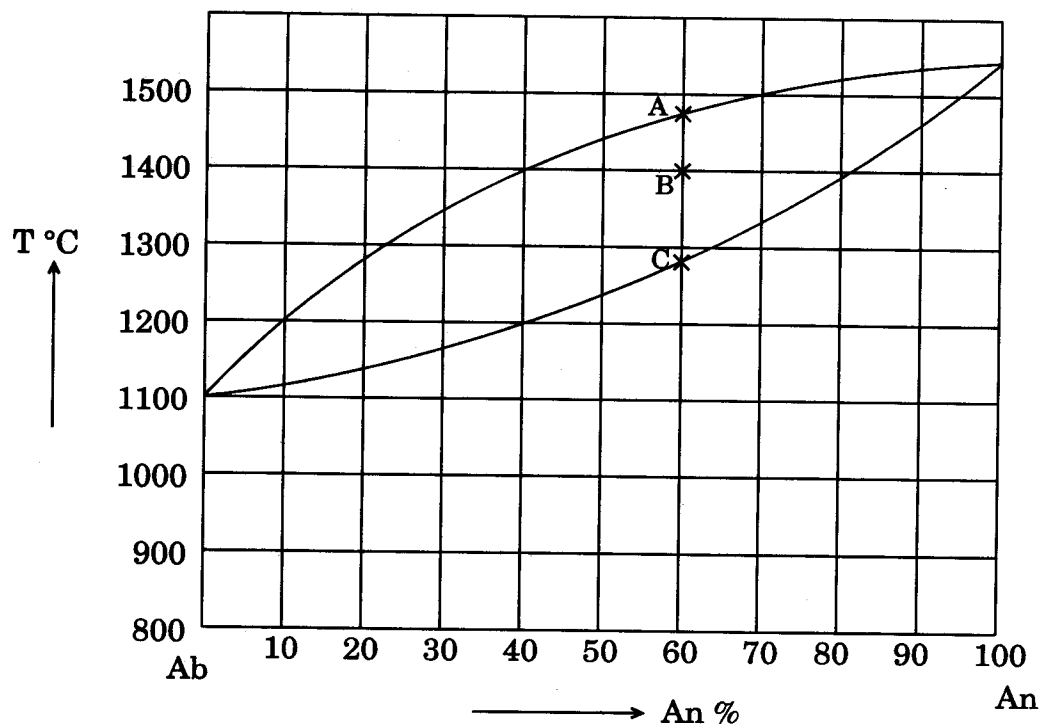
Attempt any one question.

- Q4.** (a) Give an account on classification, mineralogy and composition of meteorites. 10
- (b) Define partition coefficient (K_D or D). Discuss Goldschmidt's Rules that govern chemical fractionation of elements in silicate melts. 10
- (c) Using partition coefficients of compatible and incompatible elements, explain batch melting in magma evolution. 10
- Q5.** (a) What do you understand by isotopic fractionation? Discuss isotopic evolution of the ocean. How is PDB (Pee Dee Belemnite) useful in the study of carbon isotopes? 10
- (b) Discuss mass fractionation and bond strength with suitable examples. 10
- (c) Write the application of Radio-nuclei in geochronology and discuss the Sm - Nd system. 10

SECTION D

Attempt any **one** question.

- Q6.** (a) What are petrographic characteristics of Kimberlites ? Add a note on their tectonic setting. 10
- (b) Explain the factors responsible for magma generation. 10
- (c) What is an ophiolite suite ? Draw a neat sketch of an ophiolite section. Label and add a comment on each unit. 10
- Q7.** (a) What are the conditions to form Layered Igneous Complexes ? Give a brief account on Bushveld Layered Igneous Complex. 10
- (b) Describe eutectic and peritectic crystallisation with reference to Forsterite – Silica T – X phase diagram. Add a note on corona formation. 10
- (c) Explain Lever's rule. Find the composition and relative proportions of liquid and solid at points A, B and C in a given Albite – Anorthite phase diagram. 10



SECTION E

Attempt any **one** question.

- Q8.** (a) What are metamorphic facies and metamorphic facies series ? Give suitable examples. 10
- (b) Describe Clausius-Clapeyron equation. Add a note on its applications to metamorphic reactions. Discuss in brief, the prograde regional metamorphism of pelitic rocks. 20
- Q9.** (a) Discuss in brief, the role of fluids in metamorphism. 10
- (b) Give ideas with suitable examples on (i) Retrograde metamorphism, and (ii) ACF diagram.
- Describe with neat sketches the following textures :
Helicitic and Cataclastic. 20

SECTION F

Attempt any **one** question.

- Q10.** (a) Explain seismic discontinuities within the Earth with suitable diagram. Mention the role of Olivine – Spinel phase transition in geodynamic setting. 10
- (b) What are mantle plumes ? Discuss their origin and significance. 20
- Q11.** (a) Give evidences in support of Continental Drift theory. 10
- (b) Briefly mention the Gravity and Magnetic anomalies of the ocean floor. 10
- (c) Illustrate different types of plate boundaries and add a note on their inter-relationship. 10

[The page contains extremely faint and illegible text, likely bleed-through from the reverse side of the document. No specific words or phrases can be discerned.]