

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 EIGHT questions in all, out of which FIVE are to be attempted.

Question Nos. 1 and 5 are compulsory. Out of the remaining SIX questions, THREE are to be attempted selecting at least ONE question from each of the two Sections A and B.

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.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Answers must be written in ENGLISH only.

Neat sketches may be drawn, wherever required.

SECTION—A

1. (a) Give a concise account on structural classification of silicates with labelled diagram. For each type, give suitable example. 8
- (b) Draw labelled sketches of perthite and myrmekite textures. Comment on their petrogenetic significance. 8
- (c) Write briefly on the use of projection diagrams to represent crystal symmetry. What are orthoscopic and conosopic arrangements during microscopic studies of minerals? 8
- (d) What are the characteristics of granulite facies metamorphism? Describe briefly any two granulite terrains of India. 8
- (e) Give the classifications of limestone proposed by Folk and Dunham, and draw comparisons. 8
2. (a) Describe the crystal structure, types, mineralogy, composition, physical and optical properties of mica group of minerals. 15
- (b) Draw a neat labelled sketch of the albite-anorthite phase diagram (1 atm dry). Describe the course of crystallization for an initial liquid (M_1) having composition $Ab_{30}An_{70}$. For different representative parts of this system, deduce the degrees of freedom (F). Comment on the petrogenetic significance of this system. 15
- (c) Discuss the concept of sedimentary facies and its application in the reconstruction of paleodepositional environment. 10
3. (a) Write a detailed account on the petrogenesis of basalts. Give a brief note on the Deccan volcanic province. 15
- (b) Write short notes on the petrographic characters of the following rocks :
Charnockite ; Anorthosite ; Carbonatite ; Peridotite ; Dunite. 15
- (c) What are primary sedimentary structures? Describe the erosional sedimentary structures preserved on the lower bedding plane. 10
4. (a) Write down the diagnostic physical properties of the following minerals :
Calcite ; Magnesite ; Apatite ; Galena ; Halite. 15
- (b) Describe the effects of regional metamorphism on argillaceous rocks and give the different mineral assemblages formed. 15
- (c) Explain tide-dominated shallow-marine environments with suitable sketch. Discuss the diagnostic sedimentary structures from each sub-environment. 10

SECTION—B

5. (a) Define banded-iron formation (BIF). Give James classification of BIFs with their mineral compositions. 8
- (b) With suitable examples, explain the residual concentration process. 8
- (c) During an exploration, ten boreholes have been drilled in a sulfide zone. The sample thickness and assay values are given below in the table. Determine the average sample thickness and weighted average assay values for Cu and Zn : •

Borehole no.	Sample thickness (in metres)	Assay values of Cu (in %)	Assay values of Zn (in %)
1	5.4	2.0	3.0
2	7.5	1.8	2.5
3	4.5	2.3	2.0
4	4.0	4.1	3.5
5	6.5	3.8	3.0
6	7.5	3.5	4.1
7	8.0	2.8	3.3
8	6.0	1.0	1.0
9	5.5	1.5	2.5
10	6.3	2.8	3.0

- 8
- (d) What are meteorites? What are 'finds' and 'falls'? Give briefly the characteristics of different important types of meteorite. 8
- (e) Explain the risks associated with radioactive waste. Add a note on radioactive waste management. 8
6. (a) Give the mineralogy, mode of occurrence and distribution of manganese ore deposits of India. 15
- (b) Explain the utility and working principle of the following equipments : 15
- (i) Gyratory crushers
- (ii) Ball mills
- (iii) Rod mills
- (c) Discuss the impacts of volcanic hazards. Comment on the measures to be taken to mitigate the volcanic hazards. 10

7. (a) What are polymetallic nodules? Discuss their compositional variations. What are the constraints involved in their exploration and exploitation? Add a note on their distribution in India's maritime zones. 15
- (b) Explain chip, muck, car, trench and auger sampling methods. 15
- (c) What is a trace element? What are compatible and incompatible trace elements? Briefly describe several types of bonding found in different minerals. 10
8. (a) With neat sketches and examples, explain the following textures in ore minerals and add a brief note on the genesis of each texture : 15
- (i) Cataclastic texture
- (ii) Cumulus texture
- (iii) Colloform texture
- (b) Explain the following methods of mining : 15
- (i) Undercut excavation method
- (ii) Glory hole method
- (iii) Block caving method
- (c) Discuss the various sources of surface water pollution. Comment on the methods employed to reduce surface water pollution. 10
