

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.

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

Neat sketches may be drawn, wherever required.

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

1. (a) Compare and contrast the structure of SiO_2 and feldspar group. 8
- (b) Give the diagnostic properties of the following minerals as observed under petrological microscope :
 - (i) Quartz
 - (ii) Albite
 - (iii) Augite
 - (iv) Olivine 8
- (c) Describe carbonatites and their common rock associations. What are the non-carbonate minerals generally present in carbonatites? 8
- (d) What are the different types of regional metamorphism? Describe the characteristic differences in the metamorphic rocks which result from these. 8
- (e) Discuss the morphological parameters used to characterize clastic grains in the sedimentary rocks. 8
2. (a) Explain the characteristics of crystallographic axes and holding position of crystals belonging to various systems. 15
- (b) Describe the changes in mineral assemblages in transformation of basic rocks from greenschist facies to amphibolite facies. What are the typical assemblages of these two facies for the intermediate P-T series? Display these in typical chemographic sketch diagrams. 15
- (c) Give the criteria adopted for classification of sand ripples. Discuss the variety of ripples and their significance. 10
3. (a) Explain diffraction of X-rays in minerals and derive Bragg's law. 15
- (b) Diopside-Anorthite binary phase diagram represents a simple binary system with no solid solution. Describe the crystallization behaviour of two melts with compositions equivalent to $\text{Di}_{90}\text{An}_{10}$ and $\text{Di}_{25}\text{An}_{75}$, focussing on the textural differences of the crystallized rocks. 15
- (c) Justify the titles of 'pseudocomponent', 'chemographic', 'phase' and 'compatibility' diagrams for AKF diagrams. Show the fields of the following assemblages in AKF diagrams :
 - (i) Muscovite + biotite + cordierite + quartz
 - (ii) Muscovite + andalusite + cordierite + quartzAre these compatible assemblages? 10
4. (a) Draw and label an ideal beach and shoreface cross-section. Discuss the sediment characteristics for each zone. 15
- (b) What are the fundamental differences between textures of plutonic igneous rocks and volcanic rocks? Illustrate your answer with sketches. 15
- (c) Explain the trioctahedral and dioctahedral groups of phyllosilicate citing suitable examples. 10

SECTION—B

5. (a) Draw a schematic diagram of a sulfide-bearing vein showing supergene enrichment. Explain the processes of formation of such deposits. 8
- (b) Describe the major types and different facies of Banded Iron Formation (BIF). 8
- (c) A wolframite deposit contains 78500 tons of ore having an average grade of 0.21 wt% WO_3 . If the ore recovery is 70%, how many tons of wolframite concentrate containing 65 wt% WO_3 can be produced from this deposit? 8
- (d) Describe the phenomena of solid solution and exsolution in minerals with suitable examples. 8
- (e) Describe the environmental impact associated with fly ash. 8
6. (a) Give a detailed account of mineralogy, geological setting and distribution of aluminium deposits in India. 15
- (b) Describe the field evidence of ore mineralization useful in mineral prospecting. 15
- (c) Explain the causes of coastal erosion and discuss the remedial measures. 10
7. (a) Why is magnesite considered as an industrial mineral? Discuss the types, lithological association and origin of magnesite deposits. 15
- (b) What are the types of geochemical anomalies observed in bedrocks? How are geochemical anomalies recognized in bedrock geochemical survey? 15
- (c) Describe the nature, composition and occurrence of polymetallic nodules on seafloor. 10

8. (a) In a bauxite prospect, nine vertical boreholes were drilled in square grid pattern at 100 m interval along latitude and longitude. The thickness (in m) of bauxite and assay value (wt% Al_2O_3) measured in these boreholes are given below. The specific gravity of ore is 2.60 :

Borehole	Thickness (m)	Assay (wt% Al_2O_3)
1	11.3	38.6
2	14.8	42.3
3	9.3	40.5
4	6.8	43.6
5	17.4	41.2
6	16.6	42.8
7	8.4	36.2
8	10.6	39.5
9	13.2	42.1

Calculate the tonnage and grade of the ore body by extended area method. 15

- (b) Describe the classification of meteorites. How are meteorites useful in understanding the interior of the earth? 15
- (c) Describe the factors that determine the coordination number of a cation in a crystal structure. Illustrate with examples from rock-forming minerals. 10
