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UPSC
Comb. Geo-Scientist
(Mains)
Previous Year Paper
(Geology) Paper-III
25 June, 2023



GEOLOGY

PAPER—III

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 in **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)

1. Describe or answer the following in brief with diagram, wherever necessary :

5×10=50

- (a) Ore mineral assemblage in any five types of hydrothermal deposits
- (b) Degree of fill and density of fluid inclusions
- (c) Great mica belt of India
- (d) Types of marine mineral resources
- (e) Assay value, cut-off grade and ore grade
- (f) Distinguish between electromagnetic geophones and hydrophones.
- (g) State the reasons for the concentration of radioactive elements in the Earth's crust.
- (h) Geotechnical classification of rocks
- (i) Primary causes of the increase in greenhouse gases in the atmosphere
- (j) Differentiate between atmospheric rivers and megafloods.

SECTION—B

Attempt *any one* question

2. (a) What is the role of volatiles including H₂O, CO₂ and S in the formation of magmatic deposits? Explain with suitable examples. 15
- (b) Discuss the genesis of one major type of sediment-hosted syngenetic deposit and sediment-hosted epigenetic deposit. 15
3. (a) Explain with suitable examples the changes in style and habitat of ore mineralization of certain metals through geological time. 10
- (b) What are the distinct geological characteristics of porphyry copper deposits compared to other hydrothermal deposits? Briefly discuss the genesis of porphyry copper deposits. 10
- (c) Discuss the geological characteristics and genesis of orogenic gold deposits. 10

SECTION—C

Attempt *any one* question

4. (a) Describe the geological characteristics of the following mineral deposits in Western Dharwar Craton : 15
- (i) Chromite deposits
 - (ii) BIF-hosted iron ore deposits
 - (iii) Barite deposits

- (b) Describe the geological characteristics of the following mineral deposits in Bastar Craton : 15
- (i) Malanjkhand copper deposits
- (ii) Bastar-Koraput tin belt
- (iii) Gondite-type manganese deposits
5. (a) Describe briefly the different methods to conserve mineral resources. 10
- (b) What are the prospects and scope of National Mineral Policy? 10
- (c) Discuss the salient features of UNCLOS. 10

SECTION—D

Attempt *any one* question

6. (a) Explain the procedures followed in geochemical exploration in search of mineral deposits with suitable examples. 15
- (b) In a bauxite exploration program, nine vertical boreholes were drilled in rectangular grid pattern, along 3 N-S traverses each having 3 boreholes. The interval between boreholes along N-S and E-W are 200 m and 300 m respectively. The thickness (in m) and assay value (in wt% Al_2O_3) of ore in these boreholes are given in the table :

Traverse 1			Traverse 2			Traverse 3		
BH	Thickness	Assay	BH	Thickness	Assay	BH	Thickness	Assay
1	3.2	41.1	4	5.1	40.2	7	4.3	42.5
2	4.6	47.0	5	5.8	44.3	8	5.0	45.1
3	6.1	42.5	6	6.4	44.7	9	6.9	47.4

The density of ore is 2.35 g/cm^3 . Calculate the tonnage and average grade of ore by included area method. 15

7. (a) What are the most widely employed geophysical methods for mineral exploration? Highlight the significance of seismic method in petroleum exploration. 10
- (b) Discuss the air-borne surveys that are adopted for mineral exploration. 10

- (c) During an exploration program, a wolframite-bearing quartz vein having strike length of 150 m was delineated. Six trenches were made across the vein at equal interval of 30 m. The thickness (in m) and assay value (in wt% WO_3) of the vein in these trenches are given in the table :

Trench	Thickness	Assay
1	0.4	0.6
2	0.7	0.8
3	1.0	1.1
4	0.8	0.9
5	0.5	1.0
6	0.9	0.5

Calculate the average ore grade of the vein.

10

SECTION—E

Attempt *any one* question

8. (a) Describe the origin, source material, conditions of accumulation and formation of coal deposits with particular reference to Indian coal deposits. 15
- (b) Discuss the geotechnical investigations adopted for the construction of roads and railways in different types of terrains. 15
9. (a) Explain the geochemical methods of hydrocarbon exploration. 10
- (b) Explain the geochemical processes of formation of uranium minerals. 10
- (c) Give an account of types, functions and applications of coastal protection structures. 10

SECTION—F

Attempt *any one* question

10. (a) Describe the application of Remote Sensing and Geographic Information System (GIS) in environmental management. 15
- (b) Mention the problems caused by soil erosion and also describe how soil erosion rates are determined. 15
11. (a) Discuss the relationship between plate tectonics and volcanoes with suitable examples. 10
- (b) Discuss the causes and effects of earthquakes. 10
- (c) Describe in detail about the recession of Himalayan Glaciers. 10
