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UPSC CGS

**Previous Year Paper
Mains 2022 Paper
(Geology Paper - III)**



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 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)

1. Write short notes or answer the following :
 - 1.(a) Different steps in the formation of pegmatites. 5
 - 1.(b) Mention the essential properties of a mineral for being considered as refractory mineral and comment on fire-clay refractories. 5
 - 1.(c) Gold deposits in Hutti schist belt. 5
 - 1.(d) Mussoorie phosphorite deposit. 5
 - 1.(e) Different stages of geological study as per UNFC of mineral resources. 5
 - 1.(f) Geophysical techniques for detection of kimberlites. 5
 - 1.(g) Coal-bed methane. 5
 - 1.(h) Rotational and translational slides. 5
 - 1.(i) Probabilistic assessment of tsunami. 5
 - 1.(j) Causes and significance of coral bleaching. 5

SECTION 'B'

(Attempt any one question)

- 2.(a) Why was there less manganese ore deposition in the Archaean than that in the Proterozoic? Justify your answer in the light of changes in the atmospheric-hydrospheric conditions and ocean-water stratification. 15
- 2.(b) In a titanohematite ore mineral which mineral will migrate to weak planes of host mineral? Discuss about different types of open-space filling textures. 15
- 3.(a) List out the major geological problems related to Banded Iron Formations (BIF). Give a detailed account of Algoma-type BIF deposits. 10
- 3.(b) Discuss about the source rock, surface accumulation and required chemical reagents involved in bauxite deposition. Indicate the possible elimination process of the impurities produced thereby. 10
- 3.(c) "All stratified deposits are stratabound deposits, but not all the stratabound deposits are stratified deposits." — Justify. Discuss about the characteristics of Volcanic Hosted Massive Sulfide deposits. 10

SECTION 'C'

(Attempt any one question)

- 4.(a) Describe the geological characteristics of following mineral deposits in Singhbhum craton :
 - (i) Chromite deposits in Sukinda ultramafic complex
 - (ii) Copper deposits in Singhbhum shear zone
 - (iii) Lapsa Buru kyanite deposit15

- 4.(b) Write a detailed note on greisen and skarn deposits associated with Neoproterozoic granites of Aravalli craton. 15
- 5.(a) Write a note on chrysotile and barite deposits in Vempalle Formation of Cuddapah basin. 10
- 5.(b) Briefly describe the geological set up of diamond bearing kimberlites in Panna and Wajrakarur fields. 10
- 5.(c) Describe the "specified minerals" and "minor minerals" as per Mines and Minerals (Development and Regulation) Act, 1957. 10

SECTION 'D'

(Attempt any one question)

- 6.(a) Discuss the field evidences useful in identifying potential areas of mineralization during reconnaissance surveys, with suitable examples. 15
- 6.(b) In an underground copper mine, a vertical ore body is developed along two drives *A* and *B*, at RL 210 m and 180 m respectively. Five channel samples are collected from each drive at uniform interval of 6 m, such that the 1st and 5th channel are located 3 m after the beginning and 3 m before the end of each drive respectively. Thickness of ore body and assay value at the sample locations are given below. Density of the ore is 2.98 g/cm³.

Drive A (RL 210 m)			Drive B (RL 180 m)		
Sample No.	Thickness (m)	Assay (wt.% Cu)	Sample No.	Thickness (m)	Assay (wt.% Cu)
1	1.6	1.1	1	1.2	1.9
2	1.4	1.8	2	1.5	2.3
3	1.3	2.0	3	1.6	1.6
4	1.8	1.5	4	1.9	1.1
5	2.1	1.0	5	1.8	1.4

Calculate the tonnage and grade of the ore body in the block between drives *A* and *B*. 15

- 7.(a) How do geochemical anomalies develop around ore deposits during and after ore formation? 10
- 7.(b) A metallurgical plant processes 1500 ton of wolframite concentrate containing 65 wt.% WO_3 . Assuming complete recovery of metal, what is the quantity of tungsten (in ton) that can be produced from this ore concentrate? (Atomic weight of $W = 184$, $O = 16$). 10
- 7.(c) What are the corrections required in gravity values measured from field during mineral prospecting by gravity survey? 10

SECTION 'E'

(Attempt any **one** question)

- 8.(a) Discuss in detail about the secondary stratigraphic trap for oil accumulation. 15
- 8.(b) With the help of suitable sketches critically evaluate the tunneling conditions and hazards likely to be encountered in the folded and faulted terrains of Himalaya. 15
- 9.(a) Describe the geological characteristics of the following uranium deposits :
(i) sandstone-type uranium deposit at Domiasiat, Meghalaya; 5
(ii) unconformity-type deposits in Cuddapah basin. 5
- 9.(b) Evaluate the Rock Mass Rating (RMR) parameters which are used to assess the soundness of dam foundations. Give limitations and advantages of RMR system. 10
- 9.(c) Elaborate the criteria for selecting the durable dimension stones for a building. Compare the suitability of granite, marble and sandstone as dimension stones for humid regions. 10

SECTION 'F'

(Attempt any **one** question)

- 10.(a) Discuss the impacts of drought on the geoenvironment and the society. Suggest measures to build resilience against drought in India. 15
- 10.(b) Describe the integrated geological screening for locating a safe repository for the disposal of high level nuclear waste. Suggest possible terrains in India for such repository. 15
- 11.(a) Assess the geomorphological, geological and hydrological controls of water logging problem in the Alluvial plains of India. Suggest ways to ameliorate this problem. 10
- 11.(b) Why is ozone hole formed over Antarctica ? What is the present status of ozone hole replenishment ? 10
- 11.(c) What are the techniques available for the forecasting of volcanic activities ? How remote sensing can help in such prediction ? 10