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UPSC CGS Exam

Mains Geology Paper III

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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)

Q1. Describe the following in brief with diagrams, wherever necessary :

- | | | |
|-----|--|---|
| (a) | Effect of Great Oxidation Event on certain ore forming processes | 5 |
| (b) | Exsolution and replacement intergrowth textures in ore minerals | 5 |
| (c) | Mangampeta barite deposit | 5 |
| (d) | Byproducts from base metal deposits of India | 5 |
| (e) | Core-logging and information deciphered from core-samples | 5 |
| (f) | Significant and non-significant geochemical anomalies | 5 |
| (g) | Engineering properties of rocks for civil engineering applications | 5 |
| (h) | Migration of oil | 5 |
| (i) | Environmental significance of mangroves | 5 |
| (j) | Earth's Radiation Budget and factors affecting its heat balance | 5 |

SECTION B

Attempt any **one** question.

- Q2.** (a) Explain how metals are transported by hydrothermal fluids and what are the causes of ore deposition in various types of hydrothermal deposits. 15
- (b) Discuss the genesis of lateritic bauxite deposits, highlighting the important parameters which control their formation. Write a note on the geology of East Coast Bauxite deposits of India. 15
- Q3.** (a) A quartz grain has a cubic aqueous biphasic inclusion containing a liquid and a spherical vapour bubble. The sides of cubic inclusion are 2 microns and the diameter of vapour bubble is 2 microns. Calculate the degree of fill of the fluid inclusion. 10
- (b) What are the geological settings in which chrysotile deposits are formed? Explain the process of chrysotile mineralization in these settings. 10
- (c) Explain how the temperature of mineralization can be constrained based on the fractionation of S isotopes in an ore mineral assemblage. 10

SECTION C

Attempt any **one** question.

- Q4.** (a) Explain the process of formation of muscovite and rare metal deposits in granitic pegmatites. Discuss on the geology of important muscovite deposits in the Indian Shield. 15
- (b) Describe the geological characteristics of the following mineral deposits of Aravalli Craton and arrange them in chronological order :
Khetri copper belt, Tosham tin and Jhamarkotra phosphorite. 15
- Q5.** (a) Discuss the geological characteristics and genesis of Agucha Zn-Pb deposit. 10
- (b) Write a note on the geology of BIF hosted iron-ore deposits in Western Dharwar Craton. 10
- (c) Describe various methods by which mineral resources can be conserved. 10

SECTION D

Attempt any **one** question.

- Q6.** (a) What are ore guides ? Explain the mineralogical and physiographic guides and discuss their significance in mineral exploration. 15
- (b) Why is soil geochemical survey the most commonly employed technique in mineral exploration ? Describe the method of geochemical survey in residual soils. 15
- Q7.** (a) The sample width and assay values for copper and zinc are obtained in a sulphide ore prospect and are given below. Calculate the average sample width and the average grade for copper and zinc. 10

Sample No.	Sample width (in meters)	Assay value of Cu (in %)	Assay value of Zn (in %)
1	5.5	3.0	2.5
2	7.2	4.0	1.6
3	6.4	6.2	2.2
4	4.0	3.2	0.9
5	5.5	5.3	2.5

- (b) What is channel sampling ? Explain the steps involved in channel sampling. Add a note on the biases which should be avoided during sampling. 10
- (c) Discuss the application of seismic method of prospecting with a note on its limitations. 10

SECTION E

Attempt any **one** question.

- Q8.** (a) Critically discuss the different geological investigations required in dam sites. 15
- (b) What factors are responsible for coastal erosion ? Explain the method of constructing coastal protection structures. 15
- Q9.** (a) Discuss the characteristics of source and reservoir rock for hydrocarbons. 10
- (b) Describe the geology of dolostone hosted uranium deposits in Cuddapah Basin. 10
- (c) Give an account of tectonic controls in the formation of Gondwana coals. 10

SECTION F

Attempt any **one** question.

- Q10.** (a) What are Milankovitch cycles ? Discuss and illustrate diagrammatically as to how global climate variations are correlated with Milankovitch cycles. 15
- (b) Describe geochemical cycle of carbon and discuss how an increase of CO₂ in the atmosphere causes ocean acidification. 15
- Q11.** (a) Elaborate the various causes and consequences of landslides. 10
- (b) Which are the important glaciers of the Himalayas ? Discuss the magnitude and significance of any two of these glaciers in the context of the environment. 10
- (c) Discuss critically the environmental impacts of urbanization. 10



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