

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. Write on/Answer each of the following in short with sketches, wherever necessary : 5×10=50**
- (a) Graphite deposits of India and the industrial uses of graphite. 5
 - (b) Primary and secondary dispersion halos and their significance in mineral exploration. 5
 - (c) Briefly explain the planning of a gravity survey for mineral exploration emphasising the needful corrections. 5
 - (d) Classification of placer deposits and geographic distribution of placer deposits in India. 5
 - (e) Thermometry of ores using fluid inclusions. 5
 - (f) Supergene sulfide and oxide mineralisation/enrichment with necessary chemical reactions. 5
 - (g) Briefly explain the Barmer-Sanchore basin emphasising the source rock and reservoir rock. 5
 - (h) Explain coal microlithotypes and macerals. 5
 - (i) List any five factors that determine the stability of a tunnel/dam. 5
 - (j) Describe different types of dams. Which type of dam is most widely constructed in India ? 5

SECTION B

(Attempt any one question)

- Q2.** (a) What are the elements of National Mineral Policy with a special emphasis on The Mines and Minerals (Development and Regulation) (MMDR) Act. 15
- (b) Discuss in detail the modes of occurrence, lithological, structural controls, origin and distribution of gold deposits of India. 15
- Q3.** (a) Classify and differentiate between mineral resources and reserves. Elaborate the conditions in which the resources can be converted to reserves. 10
- (b) What are the important primary and secondary ore minerals of manganese ? Write an account of classification of manganese deposits based on their host rock association and genesis and their distribution in India. 10
- (c) Give an account of the ores formed by contact metamorphism/skarn-type deposits with some examples. 10

SECTION C

(Attempt any one question)

- Q4.** (a) Give a note on the porphyry-type deposits and describe their mineralogical association, wall rock alterations and tectonic framework with neat sketches and examples. 15
- (b) Describe the sources and composition of hydrothermal fluids. Write a note on the classification of hydrothermal ore deposits and their textural features. 15
- Q5.** (a) Enumerate suitable geophysical methods for prospecting polymetallic Pb-Zn-Cu sulfide mineralisation with proper justification. 10
- (b) Write a note on the classification of magmatic ore deposits with special emphasis on various types of mineral deposits that are associated with ultramafic rocks/komatiites. 10
- (c) Discuss the relationship between ore genesis and plate tectonics. Illustrate with some important ore deposits in India with neat sketches. 10

SECTION D

(Attempt any one question)

- Q6.** (a) What are the different types of drilling techniques that are used in mineral exploration? Add a note on the advantages of core drilling. 15
- (b) Explain the terms : Prospecting and Exploration. Following a targeted identification and investigation, outline various stages and schemes of mineral exploration. 15

- Q7.** (a) Detailed assay results of copper mineralised zone intersected along a borehole are given in the following table. Considering the current cut-off grade of 1.5% Cu, three copper lodes have been identified, separated by two partings. Assuming strike length of 180 m, dip length of 60 m and bulk density of 285 g/cm³, calculate the tonnage of the ore body at 1.3% Cu cut-off. 10

Sample No.	Sample Length (in m)	Assay Value (in %)
1	3.00	1.60
2	2.80	0.56
3	2.30	1.82
4	1.86	0.69
5	3.50	1.66

- (b) Discuss the conventional and statistical resource/reserve estimation. Add a note on the merits and demerits of these methods. 10
- (c) Describe various types of sampling along with their objectives. Illustrate how the ore body geometry guides the pattern, interval. 10

SECTION E

(Attempt any one question)

- Q8.** (a) Describe the types of organic material which are precursors for the transformation into oil and gas and explain briefly the transformation process and evolution of various kerogen types. 15
- (b) Give an account of coalification process from biochemical stage to geochemical stage in the formation of different varieties of coal. 15
- Q9.** (a) Briefly discuss proximate and ultimate analysis of coal and add a note on fuel ratio. 10
- (b) Describe in detail the categories of petroliferous basins of India and their hydrocarbon potential. 10
- (c) Write a note on the genetic classification of uranium deposits. Give an account of the geological setting, structural control and mineralogical association of uranium deposits of Singhbhum shear zone. 10

SECTION F

(Attempt any one question)

- Q10.** (a) Explain the determination of compressive and shear strength of rocks in the laboratory conditions. Draw Mohr's circle to evaluate the stress analysis. 15
- (b) What is mass wasting ? Discuss the causes of mass movements. Write a note on geological, geomorphological, structural and geotechnical parameters in evaluating landslides. Differentiate between slide, slump, creep and mudflow. 15
- Q11.** (a) Explain the terms Rock Quality Designation and Modified Core Recovery. Add a note on the rock classification system based on RQD. In a drilling operation conducted in a terrain, the total core drilled is 6000 cm, total core recovered is 5300 cm and modified core recovery is 4800 cm. Calculate the Rock Quality Designation and comment on the status of the rock evaluation on the basis of RQD. 10
- (b) Differentiate between Reservoir Induced Seismicity (RIS) and a natural earthquake. Add a note on seismic zones of India. Give an example of an important RIS affected area in India. 10
- (c) What is the main purpose of testing the soils in terms of geotechnical engineering ? Discuss about soils in terms of their soil density, plastic index and hydraulic conductivity. 10

