

GEOLOGY **(Paper II)**

Time Allowed : Three Hours

Maximum Marks : 250

QUESTION PAPER SPECIFIC INSTRUCTIONS

(Please read each of the following instructions carefully before attempting questions)

There are EIGHT questions divided in two Sections.

Candidate has to attempt FIVE questions in all.

Question Nos. 1 and 5 are compulsory and out of the remaining, any THREE are to be attempted choosing at least ONE question from each Section.

The number of marks carried by a question/part is indicated against it.

Wherever any assumptions are made for answering a question, they must be clearly indicated.

Word limit in questions, wherever specified, should be adhered to.

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.

SECTION 'A'

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| 1. | (a) | Discuss the structures of inosilicates with neat sketches and mineralogical examples. | 10 |
| | (b) | Explain the phenomenon of twinning and discuss the twinning in feldspars with neat sketches. | 10 |
| | (c) | What is a peritectic? Discuss an appropriate reaction that represents a peritectic. | 10 |
| | (d) | Explain how granulite facies rocks can be texturally and mineralogically differentiated from amphibolite facies rocks. | 10 |
| | (e) | Ripple marks are common in sandstones and siltstones. Why are they rare in conglomerates and shales? | 10 |
| 2. | (a) | With neat sketches describe the symmetry elements and forms of the normal class of the isometric system. Name three minerals belonging to this class. | 20 |
| | (b) | Discuss the classification and chemistry of clay minerals. | 20 |
| | (c) | While quartz is completely absent in the mantle, why is it the most common mineral on the continents? | 10 |
| 3. | (a) | What are the different discontinuities within the earth picked up by seismic waves? What are the petrological explanations for each of these discontinuities? | 20 |
| | (b) | What do the following two series signify and what is the difference between the two? (i) Chlorite → Biotite → Garnet → Staurolite → Kyanite → Sillimanite (ii) Shale → Slate → Phyllite → Schist → Gneiss. | 10 |
| | (c) | What is a Komatiite? What is the reason for the spinifex texture shown by Komatiites? From your answer discuss the possible reason why Komatiites are found mostly in the Archean. | 20 |
| 4. | (a) | Explain the process of lithification and diagenesis with special reference to limestones. | 20 |
| | (b) | Discuss the evolution and characteristic features of the major sedimentary basins of India. | 20 |
| | (c) | Considering the Bowen's reaction series, discuss how an igneous rock will be affected during retrogressive transformation. | 10 |

SECTION 'B'

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| 5. | (a) | Explain the difference between syngenetic and epigenetic deposits with neat sketches and suitable examples. | 10 |
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- (b) What are the placer minerals produced from beach sands in India? Describe the properties and uses of any two of these minerals. **10**
- (c) Briefly describe the principles and applications of self-potential and induced polarization methods of electrical prospecting. **10**
- (d) What are the chemical parameters which determine the coordination number of a cation in crystal structure? Illustrate with examples of cations in 3-fold and 4-fold coordination in rock forming minerals. **10**
- (e) What are the sources of marine pollution and their effect on marine eco-system? **10**
6. (a) Which one of the two minerals, magnetite and hematite, contains more iron? Illustrate by calculating iron concentration (in wt. %) of magnetite and hematite. Atomic weight of Fe = 56, O = 16. **10**
- (b) Explain the process of formation of magmatic sulphide deposit. What is the characteristic mineral assemblage of magmatic sulphide deposit? **15**
- (c) Write a note on air-borne magnetic survey and its advantage over ground based magnetic survey. **10**
- (d) What are the methods of underground mining of mineral deposits? Add a note on impact of underground mining on ground surface and environment. **15**
7. (a) Give a list of the major petroliferous basins of India. Describe the geology and hydrocarbon occurrence of Bombay High oilfield. **15**
- (b) Describe different categories of ore reserves and their application in the Indian context. **10**
- (c) Describe the methods of geochemical prospecting and the geological conditions in which these methods are adopted. **15**
- (d) Explain how substitution of one element by another takes place in minerals. Write a note on solid solution with example from silicate minerals. **10**
8. (a) Describe the iron ore basins in Singhbhum craton and the characteristics of associated iron ore deposits. **15**
- (b) What are the gravity separation methods of ore beneficiation? Describe the process of heavy media separation of coal. **15**
- (c) What is polymorphism in minerals? Explain with suitable examples from rock forming minerals and ore minerals. **10**
- (d) Describe different types of radioactive wastes. Write a note on the methods of disposal of radioactive wastes. **10**