

GEOLOGY

Paper – II

Time Allowed : **Three Hours**

Maximum Marks : **200**

Question Paper Specific Instructions

Please read each of the following instructions carefully before attempting questions :

There are **EIGHT** questions in all, out of which **FIVE** are to be attempted.

Questions no. **1** and **5** are compulsory. Out of the remaining **SIX** questions, **THREE** are to be attempted selecting at least **ONE** question from each of the two Sections A and B.

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.

All questions carry equal marks. The number of marks carried by a question/part is indicated against it.

Answers must be written in **ENGLISH** only.

Neat sketches may be drawn, wherever required.

SECTION A

- Q1.** (a) Classify the various 'silicate structures' with neat diagrams. 8
- (b) Explain 'Gibbs Phase Rule' and its applications in geothermobarometry. 8
- (c) Differentiate between the textures and mineral assemblages developed during regional metamorphism of pelitic sedimentary rock to amphibolite and granulite facies. 8
- (d) Compare the texture and mode of emplacement of gabbro, dolerite, basalt and komatiite. 8
- (e) Describe the changes that take place during transformation of sediments to sedimentary rocks. 8
- Q2.** (a) What are primary sedimentary structures ? Write a note on the significance of ripple marks in terms of sedimentary environment. 15
- (b) Explain the concept of metamorphic facies with suitable diagram and write a note on metamorphic facies related to contact metamorphism. 15
- (c) What is eutectic crystallization ? Show the behaviour of eutectic crystallization in the binary system, giving appropriate example. 10
- Q3.** (a) What are biaxial interference figures ? Explain how interference figures are obtained under conoscopic condition and add a note on types of biaxial interference figures. 15
- (b) Write an elaborate note with neat diagram on mineralogical composition and texture of common mafic and felsic igneous rocks. 15
- (c) Elaborate the classification scheme and petrographic characteristics of sandstone. 10
- Q4.** (a) Explain the symmetry configuration of 'Normal Class' of 'Orthorhombic System' and discuss the characteristic forms. 15
- (b) How are amphibole and pyroxene distinguished based on crystal structures and optical properties ? 10
- (c) Write mineral composition and texture of the following rocks — charnockite, phosphorite and limestone. 15

SECTION B

- Q5.** (a) How are early and late magmatic ore deposits distinguished ? Give your answer with suitable examples. 8
- (b) What are the salient features of 'National Mineral Policy' ? Discuss with special emphasis on 'Strategic Minerals'. 8
- (c) Write briefly about classification and geochemical distribution of the elements in the Earth's crust. 8
- (d) Write about the source, speciation and fixation of 'Arsenic Contamination' in groundwater, with special emphasis to the Indian context. 8
- (e) Assuming the specific gravity of 4.1 and average grade of 54.1% Fe, calculate the total tonnage of iron ore and metallic iron content in a 10 m thick and 50 m wide iron ore body with a strike length of 500 m. 8
- Q6.** (a) What is coalification process and how is it related to different ranks of coal ? 15
- (b) What are the different methods of sampling practised during mineral exploration and mining ? Give reasons for choice of sampling method followed in different types of ore deposits. 15
- (c) What is acid mine drainage ? Briefly explain its environmental consequences and controlling measures. 10
- Q7.** (a) Elaborate the process of origin, migration and trapping conditions for hydrocarbon. 15
- (b) Write the salient points of interpretation of electrical resistivity data and discuss suitability of the electrical resistivity method for groundwater exploration. 15
- (c) Give a brief account of mineral resources in 'Exclusive Economic Zone' (EEZ) of India. 10

- Q8.** (a) Write a note on geographical distribution, mineralogy, mode of occurrence and origin of lead-zinc (Pb – Zn) ore deposits in India. 15
- (b) Write a note on methods of radioactive waste disposal with special reference to geological parameters. 15
- (c) Distinguish between 'Chondrite' and 'Achondrite' and describe the 'Carbonaceous Chondrite'. 10