

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) Draw a neat labelled sketch of a petrological microscope. Add a brief note on each part of the microscope. 8
- (b) Draw a labelled diagram of SiO_4 tetrahedra. Give the structural classification of silicate minerals. 8
- (c) What are the minimum symmetry requirements for the monoclinic system ? Draw stereographic projection corresponding to normal class of the system. Write names of two minerals that crystallize in this system. 8

- (d) Discuss briefly about indexing a crystal face. Calculate the Miller indices of a crystal face having Weiss Symbol of $1a, \infty b, \infty c$. 8
- (e) How would you distinguish between the following pairs of rocks petrographically : 8
- (i) Diorites and Anorthosites
- (ii) Carbonatites and Peridotites
- Q2.** (a) Give a brief account of primary sedimentary structures and discuss their significance. 15
- (b) What is Pleochroism ? Describe the method of determining pleochroism in hornblende. 10
- (c) Explain Bowen's reaction series. How do you explain corona structure with the help of this reaction series ? Explain what happens when a basaltic magma assimilates granitic country rock. 15
- Q3.** (a) What is Diagenesis ? Describe different processes of diagenesis with suitable examples and sketches. 10
- (b) What are Alkaline rocks ? Discuss the petrogenesis of alkaline rocks. Give two Indian occurrences. 15
- (c) Define Prograde and Retrograde Metamorphism. Discuss various mineral assemblages formed due to these processes involving basic igneous rocks. 15
- Q4.** (a) Define Contact Metamorphism. Explain the processes involved in the development of contact aureole. 10
- (b) Draw a neat labelled sketch of the Diopside-Anorthite system (1 atm, dry). Describe the crystallization behaviour of an initial melt having composition $Di_{80}An_{20}$. Give petrogenetic significance of this system. 15
- (c) Describe the crystal structure, types, mineralogy, composition, physical and optical properties of pyroxene group of minerals. 15

SECTION B

- Q5.** (a) How are ore deposits classified ? Give the salient features of Lindgren's classification. 8
- (b) Explain the processes involved in the formation of skarn deposits. 8
- (c) "Beach placers are vital for India's nuclear energy sector." — Justify the statement. 8
- (d) What is Co-ordination Number ? Describe with neat sketches different types of co-ordination found in minerals. 8
- (e) Define Enthalpy, Entropy and Gibb's free energy. What is the relationship among these thermodynamic parameters ? 8
- Q6.** (a) Discuss with neat sketches ore mineral textures formed by replacement and exsolution processes. 10
- (b) Give an account of the mineralogy, modes of occurrence and distribution of copper deposits of India. 15
- (c) Explain with neat sketches the causes of landslides. What are the preventative measures to mitigate landslides ? Add a short note on the landslide-prone areas of India. 15
- Q7.** (a) What is Channel sampling ? Explain the steps involved in channel sampling. 15
- (b) What are Meteorites ? Give a detailed account of the classification of meteorites. 10
- (c) What are the widely used electrical methods of prospecting ? Explain self-potential method to decipher mineral bodies. 15

- Q8. (a) Describe the following underground mining methods with suitable diagrams : 15**
- (i) Room and Pillar method
 - (ii) Cut and Fill stoping
 - (iii) Sub-level stoping
- (b) Discuss the sources of groundwater pollution. Add a detailed note on the remedial measures to prevent it. 10**
- (c) How are coals classified based on the fixed carbon content ? Add a detailed note on the distribution of coal deposits of India. 15**