

# 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 **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 (QCA) 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 (QCA) Booklet must be clearly struck off.*

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



## SECTION A

### (Compulsory Section)

- Q1. Write short notes on the following with neat, labelled diagrams, wherever necessary : 5×10=50**
- (a) Pauling's rule and coordination principle 5
  - (b) Isochromes, melatopes (or melatope eyes) and isogyres 5
  - (c) Partition coefficient or distribution coefficient and application of trace elements in petrogenesis 5
  - (d) Petrogenetic implication of Samarium-Neodymium isotopic compositions 5
  - (e) Myrmekite 5
  - (f) IUGS classification of ultramafic rocks 5
  - (g) Anatexis 5
  - (h) P-T-t path for Granulite facies 5
  - (i) Mantle plumes and their source 5
  - (j) Magnetic field reversals 5



## SECTION B

Attempt any **one** question.

- Q2.** (a) Explain symmetry elements and orientation of crystallographic axes of 2/m crystal class with the help of suitable diagrams. 10
- (b) Arrange various lattice types (with their symbols) that are compatible with the 32 point groups. Draw a diagram of a face-centered orthorhombic lattice and compare it to body-centered isometric lattice. 10
- (c) How would you determine indices of a crystal face with the help of stereographic projection? 10
- Q3.** (a) How is enantiotropy distinct from monotropy? Comment upon application of atomic substitution in geological thermometry. 10
- (b) What do you understand by twin? How many types of twins are found in Feldspar? Add a note on symmetry law. (Give suitable diagrams) 10
- (c) Discuss the structure and chemical composition of clinopyroxenes. How would you distinguish augite from hypersthene under the microscope? 10



## SECTION C

Attempt any **one** question.

- Q4.** (a) What are the textural, mineralogical and chemical compositional attributes of chondrites? Add a note on the significance of chondrites. 10
- (b) Discuss stability of Uraninite and aqueous uranium complexes with the help of Eh-pH diagram. 10
- (c) Discuss evolution of atmosphere. Add a note on atmospheric gains and losses during geological time. 10
- Q5.** (a) Discuss Rb – Sr isotopic evolution of continental crustal rocks. 10
- (b) Explain concordia and discordia using U-Th-Pb systems. 10
- (c) Explain K-electron capture in case of K-Ar system. 10



## SECTION D

Attempt any **one** question.

- Q6.** (a) Discuss various forms and structures of Igneous rocks. Comment upon role of viscosity in their formation. 15
- (b) Discuss partial melting of the mantle and generation of basaltic melt. 15
- Q7.** (a) Discuss Ternary system with solid solution citing an example of Ab-An-Or system. Comment upon cotectic curves. 10
- (b) Explain magma generation associated with various plate tectonic settings. 10
- (c) Discuss unmixing and exsolution with an example of perthite and antiperthite. 10



## SECTION E

Attempt any **one** question.

- Q8.** (a) Discuss various facies associated with Dynamothermal metamorphism of pelitic sediments. 15
- (b) What is the influence of Tectonics on metamorphic P-T-t paths ? Describe such paths for the rocks in subduction related environment. 15
- Q9.** (a) What is Charnockite ? Give its mineralogy, chemical composition and origin. Comment upon spatial distribution of Charnockites in India. 10
- (b) Define Metamorphic facies. Discuss Metamorphic facies on the basis of increasing rock pressure. 10
- (c) Give an account of Metamorphic mineral assemblages associated with Delhi – Aravalli belt. 10



## SECTION F

Attempt any **one** question.

- Q10.** (a) With a suitable sketch, explain the seismic discontinuities and corresponding compositional changes in the Earth. 15
- (b) What is Wilson Cycle ? Bring out its relation to the formation of supercontinents. 15
- Q11.** (a) Explain the Himalayan orogeny. 10
- (b) What do you understand by heat flow in the Earth's crust ? Discuss the production of heat in the Earth's crust. 10
- (c) Explain the dynamics of sea-floor spreading. Discuss the topographic features formed at spreading sites. 10



