

GEOLOGY (Paper II)

Time Allowed : Three Hours

Maximum Marks : 300

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.

SECTION 'A'

1. Discuss the following with suitable diagrams:

10×6=60

 - (a) Types of twin laws applicable to feldspar and determination of Ab : An ratio
 - (b) Crystallization and differentiation of basaltic magma with reference to Bowen's reaction series
 - (c) Mineral assemblages for granulite facies of metamorphism of metabasites (using ACF and AKF diagrams)
 - (d) Classification of alkaline rocks, and age and duration of Deccan volcanism
 - (e) Types of sedimentary structures and their significance
 - (f) Significance of cerium and europium anomalies and La/Yb ratio in the interpretation of sedimentary environment
2. Write on the following with neat and labelled diagrams:

20×3=60

 - (a) Bragg's equation and X-ray diffraction techniques for mineral studies
 - (b) Elements of symmetry and crystallographic notations
 - (c) Optical indicatrix of uniaxial and biaxial minerals, and how it helps determining the optically positive and negative crystals
3.
 - (a) Discuss various types of textures found in volcanic rocks. Comment upon their petrogenetic significance.

20
 - (b) How and where is the magma generated? Illustrate with neatly labelled diagram, the plate tectonics and various magma generation sites on the Earth.

20
 - (c) What do you understand by migmatites? Discuss about the theories of granitization.

20
4.
 - (a) Define geothermometer and geobarometer with examples from metamorphic petrology.

15
 - (b) Explain for the confinement of glaucophane at high pressure and hornblende at high temperature metamorphism of basic rocks.

15
 - (c) Account for the appearance of garnet in greenschist facies metapelites.

15
 - (d) Write the mineral reactions that take place in pelitic rocks in amphibolite facies metamorphism.

15

SECTION 'B'

5. Write notes on the following:

10×6=60

- (a) Metallogenetic epochs and provinces
- (b) Role of pH during froth floatation of Cu-Pb-Zn sulphide ores
- (c) Mineralogy and genesis of uranium mineralization in India
- (d) Classification of meteorites and definition of equilibrated chondrite and achondrite
- (e) Biogeochemical and geobotanical prospecting of sulphide minerals
- (f) Self-potential and induced-potential methods of prospecting

6. (a) Discuss about source, origin and migration of petroleum. Comment upon various types of oil traps. **15**

(b) Describe the mineralogy, microstructure and the genetic processes involved in the formation of manganese nodules in the present-day ocean. **15**

(c) Discuss in brief the mode of occurrence and nature of chromite and PGE mineralization in the Bushveld igneous complex and in Sukinda chromite deposit. **15**

(d) Discuss about sampling techniques and various methods of ore-reserve estimation. **15**

7. (a) What are the processes of ore formation? Discuss in detail about hydrothermal and supergene sulphide enrichment processes, citing Indian examples. **30**

(b) Discuss about National Mineral Policy. **10**

(c) Discuss the conservation of mineral resources. **10**

(d) Discuss the ore textures and mineral paragenesis. **10**

8. Write notes on the following:

15×4=60

- (a) Geochemical differentiation of the Earth
- (b) Role of high field strength elements in the understanding of the petrogenetic processes
- (c) Sea-bed mineral resources and their mining
- (d) Radioactive waste disposal