

COMBINED GEO-SCIENTIST (MAIN) EXAM-2022

GVP-B-GLY

**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.*

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**SECTION A**  
**(Compulsory Section)**

- Q1. Describe the following in brief with diagrams and suitable examples, wherever necessary : 5×10=50**
- |     |                                     |   |
|-----|-------------------------------------|---|
| (a) | Optical Indicatrix                  | 5 |
| (b) | Bravais Lattices                    | 5 |
| (c) | Chondrites and Achondrites          | 5 |
| (d) | Potassium-Argon Isotopic System     | 5 |
| (e) | MORBs and Continental Flood Basalts | 5 |
| (f) | Cumulate Textures                   | 5 |
| (g) | Ultra High Temperature Metamorphism | 5 |
| (h) | Geothermobarometry                  | 5 |
| (i) | Triple Junctions                    | 5 |
| (j) | Continent-Continent Collisions      | 5 |

**SECTION B**

Attempt any **one** question.

- Q2.** (a) Describe the symmetry elements, various forms and stereogram of the normal class of orthorhombic crystal system. Give any four mineral examples which crystallise in this system. 15
- (b) Describe Pauling's rules and discuss their role in understanding the stability of silicate structures. 15
- Q3.** (a) What is sign of elongation in minerals ? Explain how the sign of elongation is determined. 10
- (b) Describe the crystal structure, general formula and paragenesis of olivine group of minerals. 10
- (c) Distinguish between the aluminosilicates (sillimanite, andalusite and kyanite) in terms of their physical and optical properties. 10

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## SECTION C

Attempt any **one** question.

- Q4.** (a) Describe the geochemistry of hydrosphere, with emphasis on the processes influencing the seawater composition. 15
- (b) Write an account on the utility of trace elements in igneous petrogenesis. 15
- Q5.** (a) What is “closure temperature” of minerals ? Discuss its importance in geochronology. 10
- (b) Explain the principle of monazite chemical dating technique and its applications. 10
- (c) Give a brief account on the utility of conventional stable isotopes (O, C and S) in understanding Earth system processes. 10

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## SECTION D

Attempt any **one** question.

- Q6.** (a) What is the texture of a lamprophyre ? Discuss the classification of lamprophyres and their petrogenetic significance. 15
- (b) Draw a neat labelled diagram of forsterite-silica system and explain its petrological significance. 15
- Q7.** (a) Explain as to why the felsic magmas have higher viscosity than that of the basic magmas. 10
- (b) Discuss various types of Komatiites. Comment on the restriction of Komatiites to the Archaean shields. 10
- (c) Explain assimilation, mixing and mingling in the evolution of magmatic systems. 10

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## SECTION E

Attempt any **one** question.

- Q8.** (a) What are metapelitic rocks ? Describe the various mineral assemblages formed during the progressive regional metamorphism of pelitic rocks. 15
- (b) Discuss enthalpy, entropy and Gibbs' free energy. Derive the expression of Gibbs' free energy as a function of temperature and pressure. 15
- Q9.** (a) Describe the blueschist facies metamorphism and its tectonic significance. 10
- (b) Discuss P-T-t path and its significance in metamorphic petrogenesis. 10
- (c) Discuss with neat sketches various textures formed in the regional orogenic metamorphism. 10



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## SECTION F

Attempt any **one** question.

- Q10.** (a) Discuss with a neat sketch the various phase transitions in the Earth's mantle. 15
- (b) What are hotspots ? Describe the role of hotspots in continental break-ups in the Earth's history. 15
- Q11.** (a) What is paleomagnetism ? Discuss its significance in understanding the continental drift. 10
- (b) Distinguish between passive and active continental margins, with suitable examples. 10
- (c) Discuss various intra-plate earthquakes in the Indian shield and their geotectonic significance. 10



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