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Mains Geology Paper II

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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 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 Booklet must be clearly struck off.

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

SECTION A
(Compulsory Section)

- Q1. Describe the following in brief with diagrams and suitable examples, wherever necessary :** **5×10=50**
- | | | |
|-----|--|---|
| (a) | Difference between solid solution and exsolution in minerals | 5 |
| (b) | Optic axial plane of biaxial minerals | 5 |
| (c) | Dynamic melting in mantle | 5 |
| (d) | Carbon-14 dating | 5 |
| (e) | Spinifex texture | 5 |
| (f) | Total alkali-silica diagram | 5 |
| (g) | Ultrahigh Pressure Metamorphism | 5 |
| (h) | Porphyroblasts | 5 |
| (i) | Apparent Polar Wandering | 5 |
| (j) | Geometric fit of continents | 5 |

SECTION B

Attempt any **one** question.

- Q2.** (a) Describe the symmetry elements and forms of Normal class of Tetragonal crystal system. 15
- (b) Illustrate with neat sketches the interference figures obtained at different orientation of uniaxial minerals. How is the optic sign of uniaxial minerals determined using interference figure? 15
- Q3.** (a) What are Miller Indices? Discuss crystal notation using these indices. Illustrate your answer with suitable sketches and examples. 10
- (b) What are the differences between pyroxene and amphibole group of minerals? 10
- (c) Describe the crystal structure, physical properties and chemical composition of mica group of minerals. 10

SECTION C

Attempt any **one** question.

- Q4.** (a) Describe Goldschmidt's classification of elements. Give suitable examples for each group. 15
- (b) Describe the Rb-Sr method of dating of rocks giving special emphasis on the assumptions used, advantages, disadvantages and the utility of this dating technique. 15
- Q5.** (a) What are Rare Earth Elements (REE) ? How does concentration of REE change during magmatic fractionation ? Draw chondrite-normalized REE patterns of calcic-plagioclase and garnet. 10
- (b) Give a brief account of Fick's Law of Diffusion and Rayleigh Fractionation Law. 10
- (c) Discuss the mass fractionation of stable isotopes of oxygen and comment on their significance in geological studies. 10

SECTION D

Attempt any **one** question.

- Q6.** (a) Draw a neat, labelled diagram of the Nepheline-Kalsilite-Silica system (1 atm; dry). Describe the course of crystallization within this system taking two initial melt compositions, one lying within the silica-oversaturated part and other within the silica-undersaturated part. Briefly state the petrogenetic significance of this system. 15
- (b) Give a concise account on the petrogenesis of different types of granites. 15
- Q7.** (a) What is perthite ? Give labelled sketches of different types of perthite. Explain genesis of perthite with the help of suitable phase diagram. 10
- (b) What is magmatic differentiation ? Explain briefly crystal settling and liquid immiscibility. Illustrate your answer with suitable sketches. 10
- (c) What is a Large Igneous Province (LIP) ? Write briefly on Large Igneous Provinces of India. 10

SECTION E

Attempt any **one** question.

- Q8.** (a) Discuss the types of skarn and their mineral assemblage. Explain the reactions by which skarn minerals are formed. 15
- (b) Write a detailed note on different types of charnockites and their origin. Add a note on incipient charnockite. 15
- Q9.** (a) Write a note on the stability of aluminosilicate polymorphs and their occurrence in metamorphic rocks. 10
- (b) Describe the effect of progressive regional metamorphism on mafic rocks. 10
- (c) Write a short note on geothermobarometers applicable to metamorphic rocks with suitable examples. 10

SECTION F

Attempt any **one** question.

- Q10.** (a) Explain the conservative plate margins. Discuss the characteristics of continental and oceanic transforms. Illustrate your answer with suitable sketches and examples. 15
- (b) What is a Supercontinent ? Explain Supercontinent cycle and its role in climate change and sea level changes. 15
- Q11.** (a) Give a brief account of different types of remanent magnetism in rocks. 10
- (b) Explain briefly the mechanism of continental rifting. 10
- (c) Write a short note on heat flow distribution in oceanic and continental crust. 10



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