भू-विज्ञान परीक्षा 2012
Geologist Examination

D-HMF-M-HFB

GEOLOGY

Paper – II

Time Allowed : Three Hours | *Maximum Marks : 200*

INSTRUCTIONS

Candidates should attempt SIX questions in all including Question No. 1, which is compulsory, from Part I and attempt ONE question each from Sections A, B, C, D and E from Part II.

The number of marks carried by each question is indicated at the end of the question.

Answers must be written only in ENGLISH.

Symbols and abbreviations are as usual.

Neat sketches are to be drawn to illustrate answers, wherever required.

All parts/sub-parts of a question being attempted must be completed before moving on to the next question.

PART I

1. Write brief explanatory notes on the following : *5×10=50*

   (a) Extinction angle

   (b) Diagenesis

   (c) Pigeonite

   (d) Stony meteorites

   (e) Ripple marks

   (f) AFM triangular projection from muscovite

   (g) Carbonatites

   (h) Silica saturation in igneous rocks

   (i) Paired metamorphic belts

   (j) Interference colours

PART II

SECTION A

2. Describe Twinning in minerals. Explain the following twin laws with neat sketches. *6+6×4=30*

   (i) Carlsbad twins

   (ii) Baveno twins

   (iii) Polysynthetic twins

   (iv) Manebach twins

3. Attempt the following with precise answers : *5×6=30*

   (a) How does a pyroxenoid differ from a pyroxene ?

   (b) What are the major end member components of garnet ?

   (c) Explain why sections cut perpendicular to c-crystallographic axis in tetragonal system show isotropism.

   (d) Compare the optical properties of the mineral pair of Biotite and Tourmaline (giving at least two diagnostic optical properties).

   (e) Explain isomorphism and polymorphism with two examples each.

   (f) Compare the optical properties of the mineral pair of Staurolite and Olivine (giving at least two diagnostic optical properties).

SECTION B

4. Attempt the following with precise answers : *6×5=30*

(a) Identify the nature of metamorphic reactions using end-member names. Explain with reason which of them are best suited as geobarometer and as geothermometer.

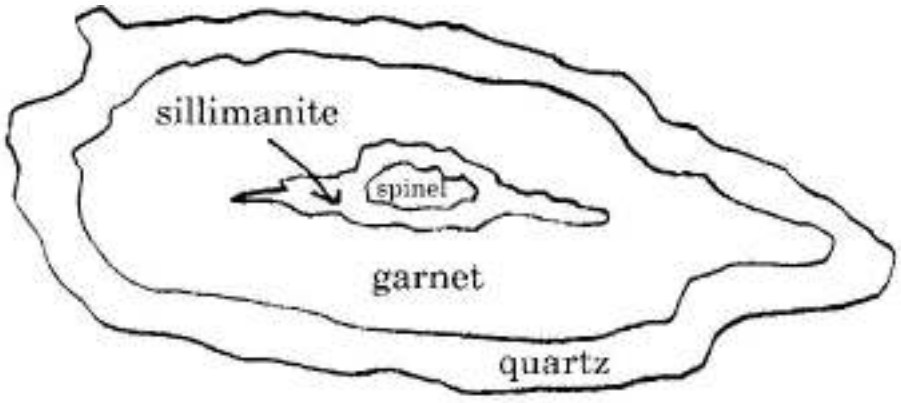
$$3\ CaAl_2Si_2O_8 \rightarrow Ca_3Al_2Si_3O_{12} + 2Al_2SiO_5 + SiO_2$$

$$Fe_3Al_2Si_3O_{12} + 3\ CaMgSi_2O_6 \rightarrow Mg_3Al_2Si_3O_{12} + 3\ CaFeSi_2O_6$$

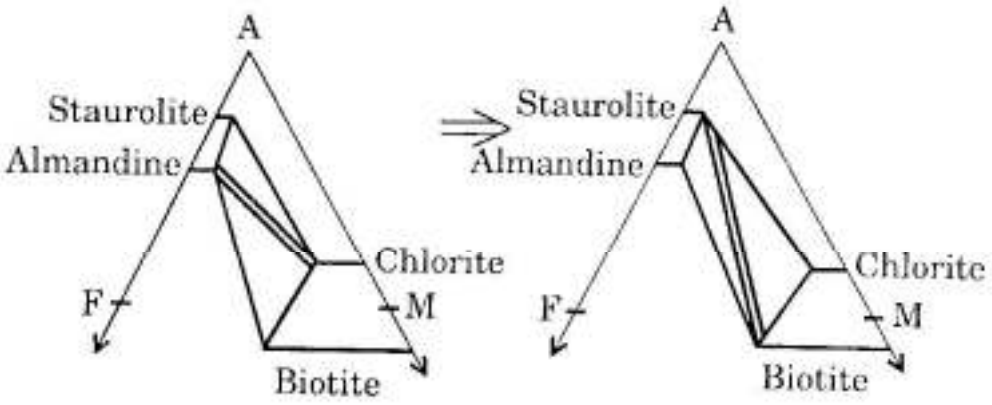
(b) Differentiate between symplectitic and myrmekitic intergrowth.

(c) What are the mineralogical differences between an alkaline basalt and a tholeiitic basalt ?

(d) Identify the texture and infer the possible metamorphic reaction :



(e) Deduce the possible metamorphic reaction and mention the facies/zone to which it belongs :



5. (a) Describe the textural features, mode of occurrence and petrogenetic aspects of kimberlites with suitable examples. *24*

(b) Diagrammatically show the various forms of intrusive igneous bodies. *6*

SECTION C

6. (a) Enumerate the role of grain size parameters in terrigenous clastic sediments. *20*

   (b) Describe the various sedimentary processes that produce clastic rocks. *10*

7. Write explanatory notes on the following : *5×6=30*

   (a) Tillites and their significance

   (b) Cementing material in sedimentary rocks

   (c) Heavy mineral application in provenance

   (d) Paleocurrent analysis

   (e) Turbidites and their significance

   (f) Micrite and Sparite

SECTION D

8. (a) Describe the fundamental law governing the decay of radioactive elements. *20*

   (b) What are Rare Earth Elements (REE) and High Field Strength Elements (HFSE) and what is their importance in geochemistry ? *10*

9. Write explanatory notes on the following : *5×6=30*

   (a) Eh-pH diagram

   (b) Pathfinder elements in geochemical exploration

   (c) Lithosphere and lithospheric plates

   (d) Goldschmidt rules of trace elements distribution

   (e) Carbonaceous chondrites

   (f) Chemical composition and mineralogy of the Earth's mantle

SECTION E

10. (a) Explain the groundwater problems encountered in mining work. Comment on the over-exploitation of groundwater in India. *20*

(b) Bring out the various causes of natural hazards of floods in Indian plains. *10*

11. Attempt the following with precise answers : *5×6=30*

(a) Discuss the precursor events that might signal the occurrence of an earthquake.

(b) Explain causes of natural hazards of landslides. Mention measures to mitigate their impacts.

(c) Risks of coastal erosion.

(d) Deforestation and sustainable development.

(e) Soil degradation with application to fertilizers.

(f) Discuss the open cast coal mining hazards.