

[This question paper contains 7 printed pages]

Your Roll No. :

Sl. No. of Q. Paper : **5800** **I**

Unique Paper Code : 2192011202

Name of the Paper : Igneous Petrology
(DSC-5)

Name of the Course : **B.Sc. Geology (NEP)**

Semester : II

Time : 3 Hours

Maximum Marks : 90

Instructions for Candidates :

- (a) Write your Roll No. on the top immediately on receipt of this question paper.
- (b) Attempt any **five** questions. Question No. **1** is compulsory. **All** questions carry equal marks.

1. Answer the following :

- (a) Magma that has undergone some sort of chemical differentiation during its ascent is called magma.
- (b) Felsic magma has viscosity as compared to mafic magma.

P.T.O.

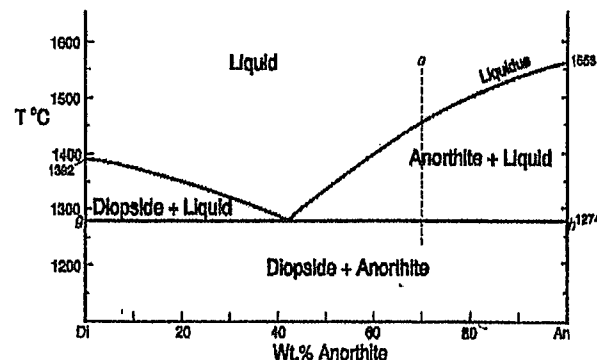
- (c) Decompression melting primarily occurs along which type of plate boundary?
- (d) A rock derived from the primary basaltic magma is characterized by:
 - (i) Occurrence of clinopyroxene and plagioclase
 - (ii) Absence of olivine and feldspathoid
 - (iii) Presence of orthoclase and quartz
 - (iv) Presence of feldspar and quartz
- (e) At the invariant point, the degree of freedom is
- (f) Consider the following statements regarding the association between magma series and plate tectonic settings and choose the correct option :
 - (i) Tholeiitic magmas are produced only at divergent plate boundaries
 - (ii) Calc-alkaline magmas are produced only at convergent plate boundaries
 - (iii) Alkaline magmas are produced at convergent and intra-plate boundaries

- (b) Draw the chondrite-normalised REE patterns for mid-ocean ridge basalt (MORB) and ocean island basalt (OIB).
- (c) How does melting occur at the subduction zone ?

5. Describe the following in detail : 5+9+4
- (a) Factors responsible for magma generation.
 - (b) Describe the various processes of magma differentiation.
 - (c) Processes of magma generation.
6. Describe the following in detail : 6+6+6
- (a) Compare and contrast tholeiitic and alkalic basalts
 - (b) Differences between island and continental arc magmatic suites
 - (c) Oceanic plateau and continental flood basalt provinces
7. Briefly describe the different physical properties of magma.
8. Answer the following :
- (a) Briefly describe the rare earth elements

- (iv) Tholeiitic magmas are produced only at convergent, divergent, and intra-plate boundaries
 - (A) ii and iv
 - (B) i, ii and iii
 - (C) ii, iii and iv
 - (D) i and iii
 - (g) In a binary system, liquidus is a divariant/univariant or invariant point.
 - (h) In a cooling magma, if the growth rate of a crystal exceeds its nucleation rate, which type of crystal will form?
 - (i) Alteration of plagioclase to produce an epidote mineral is called
2. With illustration, answer the following :
- (a) Perthite texture
 - (b) Graphic texture
 - (c) Ophitic texture
 - (d) Symplectite texture

3. Using the given binary diopside-anorthite (Di-An) phase diagram, answer the following questions.



- (a) During equilibrium crystallization, with the bulk composition of An_{70} .
- What is the degree of freedom when the bulk composition first hits the liquidus?
 - What is the composition of the crystal that will crystallize as the melt cools along the liquidus?
 - What is the composition of liquid and F (F = degree of freedom) at the eutectic point?
 - How much anorthite (An) will be present in the final solid?

- If the magma composition lies to the left of the eutectic, which mineral will crystallize first?
- What is the composition of the first melt in the case of equilibrium melting?
- What will be the composition of the final solid that goes to melt with the bulk composition of An_{70} in case of equilibrium melting?
- In the case of fractional melting, with the bulk composition of An_{70} , the residue will melt at?
- If fractional crystallization is efficient, what will the final rock composition be?

4. Answer the following :

- Components in a system
- Phases in a system
- Extensive variables and Intensive variables
- Stocks and Batholiths