

RANCHI UNIVERSITY
GEOLOGY HONS./RESEARCH – SEMESTER IV
MAJOR COURSE – M3.6
ELEMENTS OF GEOCHEMISTRY AND IGNEOUS PETROLOGY

Full Marks: 75	Time: 3 Hours
SET – II	Theory Paper

Instructions:

- Group A is compulsory.
- Question No. 1 contains five objective/MCQ questions of 1 mark each.
- Question No. 2 and Question No. 3 are single questions of 5 marks each.
- In Group B, answer any **four** questions out of six. Each question carries 15 marks.
- All questions are based on the prescribed syllabus of Major Course M3.6.

GROUP – A

Q.1. Choose the correct answer. (5 × 1 = 5)

1. The partitioning of an element between two coexisting phases is commonly expressed by its:
A) Distribution/partition coefficient B) pH C) Ionic radius only D) Atomic number
2. Which process involves the bulk movement of dissolved material with a fluid?
A) Diffusion B) Advection C) Fractionation D) Crystallization
3. The discontinuous branch of Bowen's Reaction Series begins with:
A) Quartz B) Olivine C) Orthoclase D) Muscovite
4. A typical product of partial melting of peridotite at a mid-ocean ridge is:
A) Rhyolite B) MORB basalt C) Granite D) Komatiite only
5. Kimberlites are important geologically because they may carry:
A) Coal seams B) Diamonds from the deep mantle C) Evaporites D) Coral reefs

Q.2. (5 Marks) What is isotope fractionation? Distinguish between mass-dependent and radiogenic isotopic effects.

Q.3. (5 Marks) Explain the processes of fractional crystallization and assimilation in the evolution of magma.

GROUP – B

Answer any four questions. (4 × 15 = 60)

Q.4. (15 Marks) Describe states of matter and the atomic environment of elements. Explain the role of valence, ionic potential and crystal-chemical factors in geochemical behaviour.

Q.5. (15 Marks) Discuss element transport in geological systems with reference to advection, diffusion and chromatography. Explain the role of aqueous geochemistry, Eh and pH relations.

Q.6. (15 Marks) Explain the cosmic abundance of elements and the composition of the bulk silicate Earth. Discuss meteorites as evidence for understanding the origin and chemical evolution of the Earth.

Q.7. (15 Marks) Discuss magma generation in the crust and mantle. Explain decompression melting, flux melting and the role of tectonic setting in controlling magma composition.

Q.8. (15 Marks) Explain magmatism in different tectonic settings with special reference to MORB, OIB and island-arc/continental-arc magmatism. Compare their major geochemical characteristics.

Q.9. (15 Marks) Discuss the petrogenesis, textures and modes of occurrence of komatiites, granitoids, basalts, gabbros, alkaline rocks, kimberlites and lamproites.