

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

Full Marks: 75	Time: 3 Hours
SET – I	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. Which of the following is a compatible element during partial melting of mantle peridotite?
A) Rb B) Sr C) Ni D) Cs
2. The movement of solute particles from a region of higher concentration to lower concentration is called:
A) Advection B) Diffusion C) Precipitation D) Adsorption
3. The most abundant element by mass in the Earth's crust is:
A) Si B) Al C) O D) Fe
4. MORB is characteristically associated with:
A) Mid-ocean ridges B) Island arcs C) Continental shields D) Transform faults only
5. Komatiites are generally:
A) Felsic volcanic rocks B) Ultramafic volcanic rocks C) Alkaline plutonic rocks D) Carbonatites

Q.2. (5 Marks) Explain the concept of geochemical classification of elements with suitable examples.

Q.3. (5 Marks) Describe Bowen's Reaction Series and explain its significance in igneous petrology.

GROUP – B

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

Q.4. (15 Marks) Discuss the periodic table, chemical bonding, atomic environment and the geochemical classification of elements. Explain how these concepts control the distribution of elements in geological materials.

Q.5. (15 Marks) Explain radioactive isotopes, radiogenic isotopes and isotopic tracers. Discuss the basic principles and geological applications of radiogenic isotope geochronology.

Q.6. (15 Marks) Describe the formation and chemical differentiation of the Earth. Discuss the distribution of major elements in the solar system and Earth, and explain the concept of geochemical cycles and mass balance.

Q.7. (15 Marks) Explain heat flow and geothermal gradients in the Earth. Discuss the origin, nature and evolution of magma, including the processes of partial melting and magmatic differentiation.

Q.8. (15 Marks) Explain binary phase diagrams with reference to crystal–melt equilibrium. Discuss the significance of the Ab–An and Or–Ab systems in understanding crystallization of igneous magmas.

Q.9. (15 Marks) Discuss the petrogenesis of felsic and mafic igneous rocks. Add notes on granitoids, basalt, gabbro and alkaline rocks, and describe the geological significance of their textures and modes of occurrence.