M. Sc. (Applied Geology) Examination, 2022

(1st Year, 2nd Semester)

Igneous Petrology

Paper – CORE/TH/06

Time : Two hours Full Marks : 40

(Use a separate Answer script for each Part)

PART – I

Answer question **no. 1** and **any 2** questions from the rest.

1. What is the most acceptable mineralogical composition of the primitive mantle? What is pyrolite? How can two chemically identical upper mantle rocks have different mineralogy? Why plagioclase-lherzolite xenoliths are so rare in kimberlites? Write short notes on: (a) oscillatory zoning in plagioclase, (b) occurrences of thin magnetite rim around the amphiboles in andesite.

   $\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+\frac{1}{2}+1+1=4$

2. Write the processes of melting of (a) oceanic crust of the subducting lithosphere, and (b) the mantle wedge with the rationale on the genesis of diverse types of magmas in a convergent tectonic setting. 8

3. Explain the processes of generation of tholeiitic and alkaline basalts of the ocean floor from a chemically homogeneous mantle. “Mid-ocean ridge basalt is suspected of being a primary magma” – Explain with diagrams. 6+2=8

4. How do you explain the occurrence of chemically nonuniform (depleted and fertile) mantle? Explain the results of partial melting experiments on depleted and fertile lherzolites generating tholeiitic and alkaline basalts. 4+4=8

PART – II

Answer ***any four*** questions : 4×5=20

1. What are the major differences between Archean anorthosite plutons and Proterozoic massif-type anorthosite complex? Why are large massif-type anorthosites absent during Archean time? 3+2=5

2. How do you explain the different $^{87}Sr/^{86}Sr$ ratios of two coeval granitic rocks derived from the same source? Write with appropriate diagram. Why do all anorthosites show a pronounced positive Eu anomaly in chondrite-normalized REE plots? 4+1=5

3. How do you explain the formation of coarse-grained pegmatite and fine-grained aplites closely associated with the granite plutons? Write with appropriate diagram. 5

4. A porphyritic granite contains a large megacrysts of k-feldspar. Discuss the characteristic features of the rock to be of magmatic origin based on textural evidence. 5

5. Define dyke swarms. How do the ring dykes and cone sheets form? 2+3

6. Why do hornblende and biotite crystallize only from more evolved melts? Why does anorthoclase confine to volcanic rocks only? 3+2