B. SC. GEOLOGICAL SCIENCE EXAMINATION, 2025

(2nd Year, 1st Semester)

IGNEOUS PETROLOGY

PAPER : SC/GEOL/UG/CORE/MAJOR/TH/21

Time : *Two Hours* *Full Marks* : 40

Use a separate answer script for each Part

Part–I (20 marks)

Answer **all** questions.

1. *(a)* Among the following mantle xenoliths which one is more primitive in terms of mineralogy and petrology : 1
Dunite, Lherzolite, Harzburgite, Eclogite
[CO1, CO2, CO3, CO4, CO5]

(b) What is geothermal gradient? Draw and explain the variation of geothermal gradient for Shield, Oceanic Plate and Mid-Ocean Ridge. 3
[CO1, CO2, CO3, CO4, CO5]

(c) Based on tectonic setting, what are the distinct environments in which magmas may be generated? 2
[CO1, CO2, CO3, CO4, CO5]

2. *(a)* How can mantle be melted? 4
[CO1, CO2, CO3, CO4, CO5]

(b) Discuss the origin of the adcumulate and orthocumulate textures in cumulate rocks. 2

[CO1, CO2, CO3, CO4, CO5]

3. *(a)* What is congruent melting? Explain with a suitable phase diagram. 4

[CO1, CO2, CO3, CO4, CO5]

(b) What is incongruent melting? Explain with a suitable phase diagram. 4

[CO1, CO2, CO3, CO4, CO5]

Part–II (20 marks)

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

1. Explain with a diagram the relationship between the nucleation rate and growth of crystals as a function of temperature. What is a porphyritic texture? 4+1=5 **[CO1]**

2. Describe the different types of contact relationships between igneous plutons and country rocks using appropriate diagrams. What are dyke swarms? 4+1=5 **[CO1]**

3. Explain the pyroclastic classification of igneous rocks with the help of a diagram. How do volcanic bombs differ from volcanic blocks? 3+2=5 **[CO4]**

4. Describe any two processes of magmatic differentiation using appropriate diagrams. What is the volcanic equivalent of granite? 4+1=5 **[CO5]**

5. Discuss the significance of the Harker variation diagram in igneous petrology. How do primary magmas differ from evolved magmas? 3+2=5 **[CO3]**

6. Explain equilibrium melting, fractional crystallization and partial melting of a bulk composition in a binary eutectic system. How do peritectic points differ from eutectic points? 3+2=5 **[CO2]**

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