(b) 'Both the amphiboles 'Hornblende' and 'Glaucophane' contain Na in their structure, still they form at distinctly different metamorphic geothermal gradient in metabasic rocks'–discuss why ?

(c) Discuss the criteria of identifying following mineral grains in a schistose rock, which are texturally 'pretectonic' in origin :

(i) Plagioclase (ii) Quartz (iii) Garnet porphyroblast, and (d) Biotite. $4^1/_2+4^1/_2+3^1/_23=12^1/_2$

—— X ——

Ex/UG/Sc./CORE/GEOL/TH/08/2019

BACHELOR OF SCIENCE EXAMINATION, 2019

(2nd Year, 2nd Semester)

GEOLOGICAL SCIENCES

Metamorphic Petrology

Paper : CORE : 8

Time : Two hours Full Marks : 50

Answer Q1, Q2 or Q3, Q4 and Q5 or Q6

1. (a) What marks the entry to 'granulite facies' in rocks of mafic and felsic compositions ? "A fluid-dominated metamorphism can trigger the changes from amphibolite facies to granulite facies". Justify the statement with an Indian example. Presuming that the following reaction marks the transition to granulite facies :

Biotite + quartz → Orthopyroxene + alkali feldspar + H2O

(b) What will be the slope the reaction (positive or negative) in the isobaric T-XCO2 diagram ?Justify your answer.

(c) Do you expect the assemblage garnet + plagioclase in low pressure granulite ? Justify your answer with the help of an ACF diagram. 1+7+3+4=15

2. (a) X, Y and Z are polymorphs. Draw a qualitative P-T phase diagram assuming (i) Z has the maximum density among the three polymorphs and (ii) Y has the maximum volume and (Z) absent reaction has a negative slope.

   (b) How do you explain the occurrence of large talc deposits in metamorphosed siliceous dolomite ?

   (c) "During the change of state of any matter, temperature remains constant" – accept or reject the statement with justification. 4+3+3=10

OR

3. (a) What is burial metamorphism ?

   (b) "Changes from talc- to tremilite schist can occur under isothermal condition" – accept or reject the statement with reason.

   (c) "The assemblage with garnet + clinopyroxene is not expected in amphibolite facies in the metamorphosed mafic rocks" – accepts or reject the statement with the help of ACF diagram. 2+4+4=10

4. (a) Compare the mineralogical evolution of 'Low-Al-Pelite' (LAP) and 'High-Al-Pelite' (HAP) bulk compositions in the Greenschist facies conditions of Barrovian metamorphism with suitable mineral reactions. Plot the reactions in appropriate triangular diagram.

   (b) 'Formation of recrystallized mosaic and coarsening of grain size is a normal consequence of metamorphism' – explain with reasons.

   (c) 'Complete retrogression of peak metamorphic assemblage is not possible in nature' – discuss why ?

$6^1/_2+3^1/_2+2^1/_2=12^1/_2$

5. (a) 'Though staurolite is more aluminous compared to chloritoid, still the later mineral never appears in LAP while the earlier mineral is characteristic of both LAP and HAP bulk at suitable metamorphic conditions'- Explain why ?

   (b) Write short notes on :

   (i) Cold Eclogite and its tectonic significance

   (ii) Drawbacks of isograd mapping

   (c) Explain the texture developed in a garnetiferous mica schist where metamorphism (M1) overlasts deformation (D1), but a second phase of deformation (D2) affects the rock subsequently. Draw neat sketch/s in support of your answer. $4^1/_2+4^1/_2+3^1/_2=12^1/_2$

OR

6. (a) 'The staurolite-in isograd in Mn-rich LAP bulk is encountered at higher temperature, as compared to Mn-poor LAP bulk' at identical P-Fluid conditions of metamorphism' evaluate the statement with reasons.