

This question paper contains 4 printed pages]

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S. No. of Question Paper : 6168

Unique Paper Code : 219305

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Name of the Paper : Metamorphic Petrology (GEHT-303)

Name of the Course : B.Sc. (Hons.) Geology

Semester : III

Duration : 3 Hours

Maximum Marks : 75

(Write your Roll No. on the top immediately on receipt of this question paper.)

Question No. 1 is compulsory. Attempt any four

more questions from the remaining.

1. Answer the following :

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- (a) Metamorphic transformation dominantly occurs in.....
- (b) The protolith of amphibolites is .....
- (c) Fabric refers to the way.....in a rock are arranged.
- (d) Foliation is formed by the.....arrangement of..... minerals.
- (e) If elements do not enter or leave a rock during recrystallization, then the chemical system is described as.....
- (f) Marble is a metamorphic rock composed of coarse-grained.....
- (g) Given a specific geothermal gradient, low metamorphic grade rocks occur at.....

P.T.O.

- (h) Slates are characterized by a tendency to break into even-parallel sheets due to the parallel alignment of the flat crystal faces of (choose the correct answer) :
- (i) garnet and kyanite
  - (ii) sillimanite and biotite
  - (iii) chlorite and muscovite
  - (iv) quartz and epidote
  - (v) none of the above
- (i) In general, metamorphic grade is dependent upon the :
- (i) fluid pressure
  - (ii) isotherm
  - (iii) geotherm
  - (iv) none of the above
- (j) Non-foliated rocks found in contact metamorphic aureoles are called :
- (i) granofels
  - (ii) hornfels
  - (iii) lithofels
  - (iv) none of the above
- (k) Metamorphic rocks are classified primarily according to :
- (i) mineral assemblage
  - (ii) chemical composition
  - (iii) environment of deposition
  - (iv) hardness

(l) A metamorphic rock that has undergone partial melting to produce a hybrid metamorphic igneous rock is called :

- (i) gneiss
- (ii) hornfels
- (iii) migmatite
- (iv) schist

(m) A geothermometer is :

- (i) a device that measures temperature in deep drill holes
- (ii) a device that measures current rock temperatures at the surface
- (iii) a mineral assemblage that can reveal the equilibrium temperature

(n) Within a 50 km traverse you walk from a shale into a slate into a phyllite. You are walking in the direction to.....

- (i) increasing metamorphic grade
- (ii) decreasing metamorphic grade
- (iii) increasing degree of contact metamorphism

2. Describe, with suitable examples, different types of reactions that occur during metamorphic transformations. 15

3. Consider two minerals that are polymorphs. Mineral A has higher molar volume and higher molar entropy than mineral B. Which of the two minerals is stable at high pressure ? Which is stable at high temperature ? What type of reaction is represented by transformation of mineral A to B ? Draw a phase diagram and sketch the location of the reaction  $A = B$ . Label both sides of the reaction. 15

4. Discuss the textures you would expect in :
- (a) Regional metamorphism
  - (b) Contact metamorphism. 7.5×2=15
5. Explain the concepts of metamorphic facies and with the help of diagram explain the characteristics of various metamorphic facies. Discuss this in terms of the metamorphic series. 15
6. Write notes on : 7.5×2=15
- (a) AFM diagrams
  - (b) Cataclastic metamorphism.
7. What does A, C and F represent in ACF diagrams ? Which bulk composition metamorphic rock is generally represented in these diagrams ? Describe the method of plotting a mineral and the bulk composition of a rock in ACF diagram. 15
8. Discuss the role of fluids in metamorphism. 15