

Metamorphic Petrology Questions

(Based mostly on material in Chapters 21-22, 24-28.)

1. Describe the basic types of reactions that can occur during metamorphism.
2. What are metamorphic zones, index minerals, and metamorphic isograds?
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? Draw a phase diagram and sketch the location of the reaction $A=B$. Label both sides of the reaction.
4. Suppose you have a magma of granitic composition. What kind of rock would form – and what would it look like-- if
 - a) the magma solidified deep underground
 - b) the magma solidified at some shallow depth underground
 - c) the magma began to solidify at a shallow depth, and then later erupted at the surface
 - d) the completely molten magma erupted at the surface
5. What do the following terms mean: phaneritic, aphanitic, fragmental, pyroclastic, porphyritic, phenocryst, felsic, mafic, ultramafic, leucocratic, silicic, basic.
6. What is a eutectic? What is a binary eutectic diagram? Make diagrams of real examples of each. How do we interpret such diagrams?
7. Define and give examples of: fractional crystallization, partial melting, solid solution, solvus, miscibility gap, exsolution, peritectic, perthite. Use phase diagrams to explain each of these.
8. Minerals at the top of Bowen's Reaction Series, and those at the bottom, almost never coexist in rocks. Why?
9. The mantle is a long way away, but we do sometimes have mantle samples to study. What are the four principle sources of mantle samples? What kinds of rocks are they? (List rock names and list minerals present.)
10. Volcanic rocks often display phenocrysts and groundmass. What do these two terms mean? Which, if either of them (phenocrysts or groundmass) are more likely to be glass? Explain your answer. Why is glass almost never found in plutonic igneous rocks?
11. Why do some volcanic rocks contain obsidian, and others do not? What is the composition of typical obsidian? Why?
12. Why do some volcanic rocks contain vesicles? How do they form?