

Petrology  
Fall 2002  
Exam #2

1. Define and explain how magma differentiation occurs. *If you looked up differentiation in the index of the book and you would get to page 91 where there is a very clear answer.*
2. In what three main tectonic settings are basalts found? *Again, use the book index and you will find the answers are subduction zones, MOR (rifts), and hot spots (intraplate).*
3. In many plutonic rocks, we find alkali feldspars that are termed perthite. What is perthite? How/why does perthite form. In volcanic rocks we rarely find perthite. Why? *Perthite is a compound intergrowth of two minerals. Perthite forms because at high T a single intermediate feldspar forms. When T lowers, the feldspar unmixes into two distinct feldspars - one Na rich and one K rich. See page 73 in the book.*
4. Generally when we consider metamorphism, we think about prograde metamorphism. There are, however, many examples of retrograde metamorphism in nature. What is the difference? Why are rocks that experience prograde metamorphism more likely to reach thermodynamic equilibrium than those that experience retrograde metamorphism? *The definition of prograde and retrograde are in the book, but the reason why prograde equilibration is more likely may not be there. But, I told you in lecture. And, I told you in lab. And, I told you in mineralogy.*
5. Granites and related rocks including granodiorites are very common in the cores of mountain ranges such as the Sierra Nevada. They are, in most places, significantly more common than other intermediate or mafic plutonic rocks such as diorite or gabbro. Why? What makes granite special? Why is it so exceptionally common?
6. When a mafic rock is metamorphosed it generally progresses from the zeolite facies to the greenschist facies, the amphibolite and then the granulite facies. What mineralogical changes occur as the rock moves from one facies to the next. Note that the names of the facies are based on the type of metabasic rock that forms.
7. Around the edges of continents, we often find what is referred to as paired metamorphic belts. These are composed of a belt of high-grade metamorphic rocks running parallel to a belt of blueschist facies metamorphic rocks. Explain this.
8. When carbonate rocks are metamorphosed, the result is often a series of calcium silicates, calcium-magnesium silicates and magnesium silicates. Explain this. Why are other kinds of silicates not so common in marbles?
9. The ratio of CO<sub>2</sub> to H<sub>2</sub>O in metamorphic fluids has a major effect on metamorphism of carbonate rocks, but a much lesser effect on metamorphism of pelitic or granitic rocks. Why?