Petrology 2004
Exam #1

1. Explain what causes *interference colors*.

2. How do petrologists know the composition of the interior of the Earth?

3. Granitoids are the most abundant plutonic rock type in the Earth's crust. What is a granitoid and why is it the most abundant rock type?

4. Make sketches of each of the following. Label isogyres, optic axes, melatopes, etc. as appropriate.

uniaxial interference figure when the optic axis is not in the field of view	uniaxial optic axis interference figure
biaxial interference figure with two optic axes in the field of view	biaxial optic axis figure

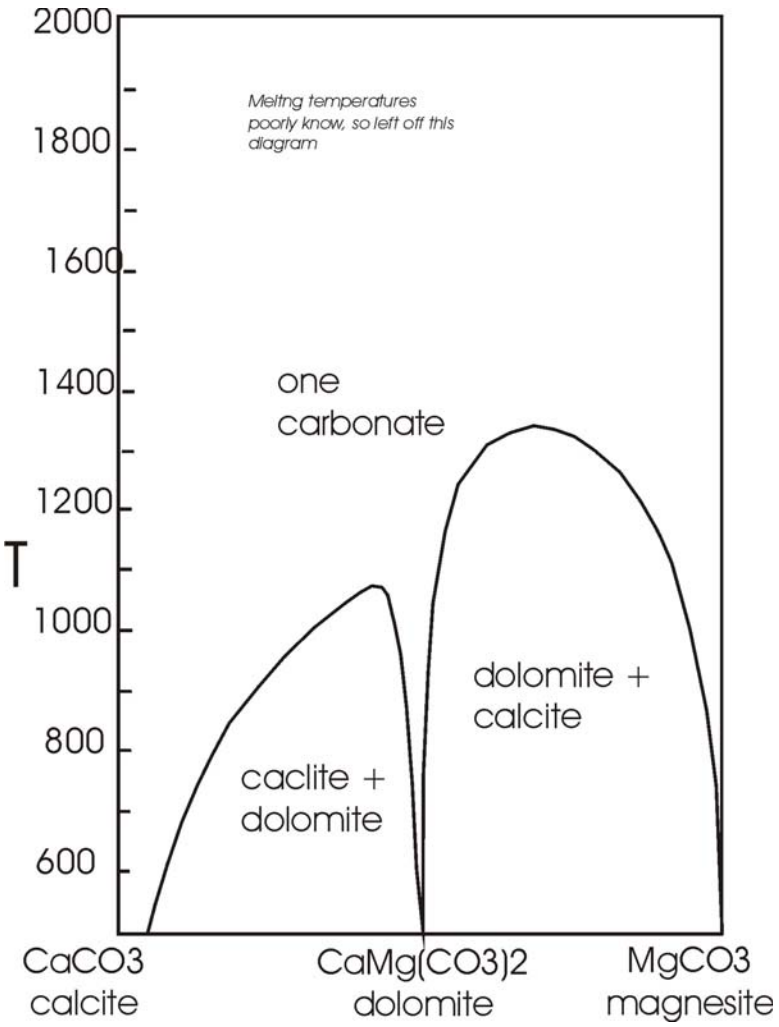
5. Define the following terms:

a. *groundmass*
b. *mafic*
c. *leucocratic*
d. *interstitial*
e. *vesicles*
f. *dike*
g. *sill*

h. *eutectic*
I. *kimberlite*
j. *lahar*

6. Explain how the *IUGS classification system* is used to name rocks. Why does it work or, at least, why is it useful? Discuss any problems or redundancies with this classification scheme.

5. What is *twinning* and how is it manifested in igneous minerals? What would it look like, how would you identify it, etc.? Why does it occur? Name two minerals that often exhibit twinning.

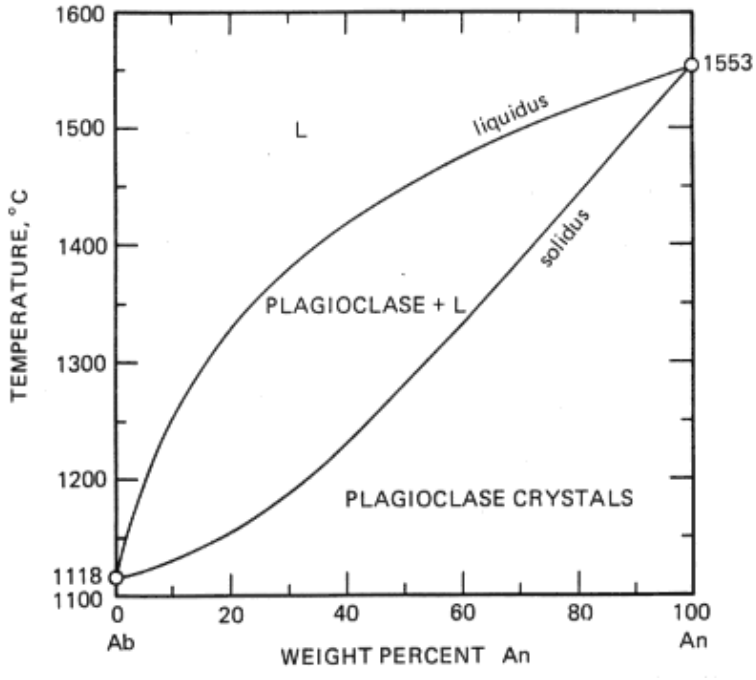


6. The diagram to the left shows subsolidus phase equilibria for carbonates with compositions between calcite and magnesite. The phase diagram contains two solvi.

a. Some *carbonatite* rocks contain two carbonates. One has composition near calcite and one has composition near dolomite. The compositions of the two carbonates can be used to determine the temperature at which the rock crystallized. Explain how this may be done using the phase diagram.

b. Which carbonate composition (calcite or dolomite) is most sensitive to changes in temperature?

8. Suppose you have a melt of composition A and it cools slowly to 800 degrees.
a. What minerals will be present in what proportions?
b. Make a drawing showing an appropriate texture (viewed in a thin section) for a rock that forms from magma A after it is completely cooled and crystallized. Explain/Justify.
c. Now answer the same questions for a melt of composition F. What minerals will be present in what proportions after it is all cooled?
d. Make a drawing showing an appropriate texture (in thin section) for a rock that forms from magma F. Explain/Justify.



9. For a melt of composition L:

a. As the melt cools, at what temperature will the first crystals form?

b. What will the composition of these first crystals be?

c. At what temperature will the ratio of crystals to melt be 1:1?

d. Suppose the crystals, at any time, settle out and the melt squirts off to intrude somewhere. Will the newly derived melt be richer or poorer in calcium than the original?

M & M Questions

10. When a mafic magma - such as a basalt - undergoes fractional crystallization, what happens to the concentration of SiO2 in the magma? And, what happens to the concentration of the alkalis in the magma?

11. What are Harker diagrams and what can they tell you? Suppose you studied a bunch of rocks from one area and plotted their compositions on Harker diagrams, and found the data produced smooth curves – what would you conclude? On the other hand, suppose the data did not produce smooth curves - what would you conclude then?

12. Your Harker diagrams involve major elements. Why, or why not, would they be useful for considering minor or trace elements (assuming you had the data)?

13. What was the source of Yellowstone's rhyolitic magma?

14. There are also many basalts in the Yellowstone region. How would you determine if they came from the same source as the rhyolites?