

Mid Term Take Home

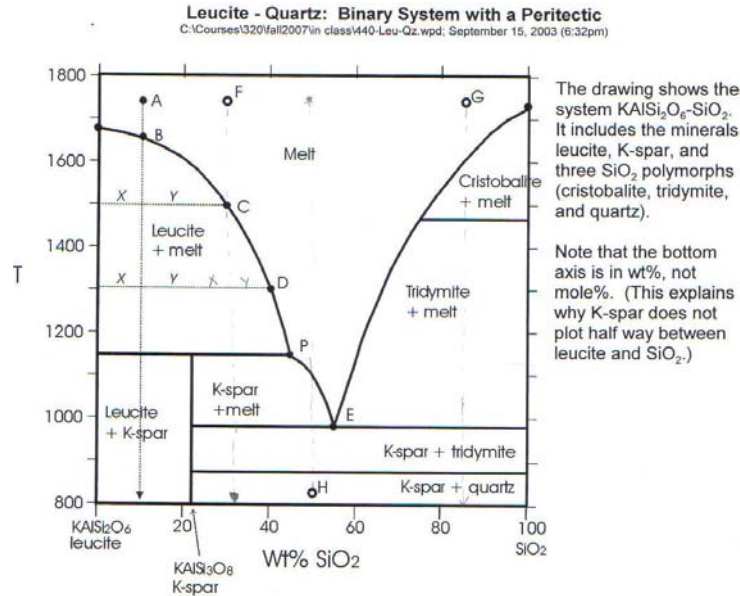
Mostly on Basalts

(Some of these questions are tough, and some have no absolutely correct answers. So, figure out your best answers and justify them well for full credit.)

1. Contrast and compare the range of SiO_2 wt% values that are typical for basalt, andesite, and rhyolite. I would argue that the differences are not all that great. SiO_2 is the most abundant oxide in all three. So, why are their mineralogies so different?
2. Explain the difference between a rock's mode and its norm. When and why would you use one or the other to name a rock.
3. There are many ways to classify basalts, but the simplest, and standard way, is into three types: quartz tholeiites, olivine tholeiites, and alkali basalts. What are the differences between them? What are compositional differences? What differences in mineralogy? Where are each of the three typically found?
4. What minerals are typical phenocrysts in basalts? Why? Why these minerals and not others? What other minerals are generally present?
5. Why is the volcanism at mid-ocean ridges nearly exclusively volcanic? Why not lots of other kinds of volcanic rocks?
6. Some basalts show a "quench texture" when viewed in thin section. What does this mean, and how does such a texture form. Make a drawing showing what such a texture might look like.
7. Some basalts show a "cotectic texture." What does this mean? Make a drawing, labeling specific minerals, to show what this might look like.
8. Some rocks - maybe basalt, but I am not sure - show peritectic textures. What does this mean? Make a drawing, labeling specific minerals, to show what this might look like.
9. According to Smith and Perfit (one of your lab handouts), "Mid-ocean ridge magmas typically undergo less modification and differentiation from their original primary melt composition than magmas erupted in continental settings or at oceanic islands." What does this mean? How are magmas "modified" and "differentiated?" Why would MORBs be less modified and differentiated than other magmas?
10. Explain the 5 different hypotheses regarding the origination of MORB's. Be sure to describe the similarities (if there are any) and differences with respect to each of the

proposed hypotheses'.

11. In the following diagram explain what is happening at each of the following points. Be sure you have detailed descriptions. The points are: A, B, D, P, E and H.



12. It says, in the book, "Petrographically MORBs show some variability. They are texturally diverse, ranging from locally holohyaline to aphanitic-porphyrific, with spherulitic, intergranular, intersertal, subophitic, and ophitic textures represented." Translate this into English and define all terms. Rewrite it using simple words that any non-geologist can understand. (I am going to run your answers past a religion professor and they should understand what you say.)

13. Figures 6.7 and 6.8 in the book show two different kinds of chemical plots for basalts. 6.7 is a Harker diagram, 6.8 is a rare earth element diagram. What do they describe? Explain how/why such diagrams are useful when studying igneous rocks. Be very specific about the use of rare earth diagrams!

14. Using figure 6.5 in the book, if you analyzed a sample containing 1% TiO_2 , 65 ppm Zr, 26 ppm Y and 250 ppm Sr, what type of tectonic environment could this have formed in? Explain both your analysis and conclusion.

15. Mid ocean ridges, typically, have a valley at their very center, with higher ridges running parallel. Then, moving away from the ridge, elevation drops down. Why? Explain how MORs form this topography. And, what about the volcanism? Does it all occur at the very center, or does it extend some distance away from the MOR? How far away?