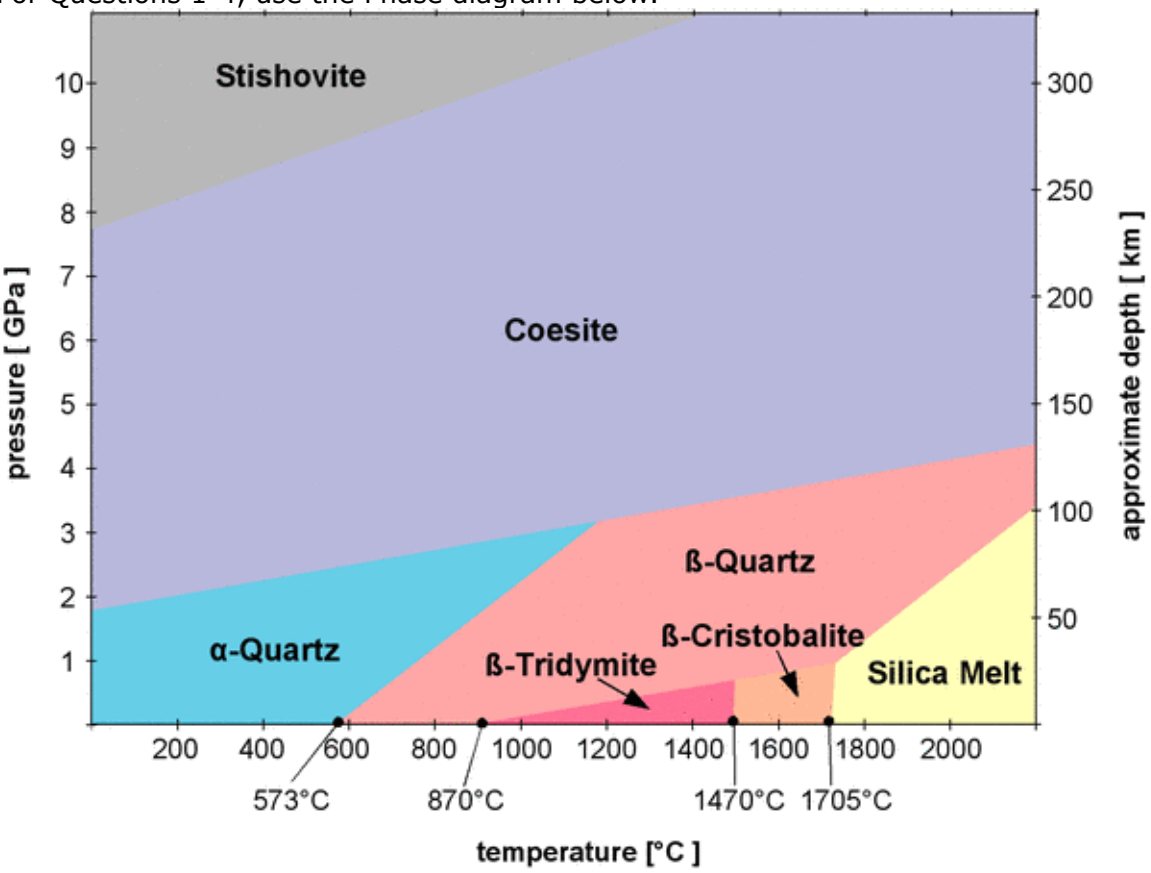
CH302 Spring 2009 Worksheet 2.

For Questions 1-4, use the Phase diagram below.



1. What is a good general definition of the term triple point? How many triple points are found int he phase diagram for quartz shown above?

2. How many phase boundaries are there in the phase diagram for quartz shown above? (Hint: two of them are found on the same line.)

3. Starting at 0.1 GPa and 200 °C and isobarically raising the temperature to 2000 °C, how many phase transitions would occur? What would the final phase be?

4. What is a critical point? How many are shown in the phase diagram above?

5. Write as many assumptions involved in the derivation of the Clausius-Clapeyron equation as you can.

6. Starting from the general Clausius-Clapeyron equation and performing algebraic rearrangements, express P_2 in terms of the other variables.

7. Starting from the general Clausius-Clapeyron equation and performing algebraic rearrangements, express T_2 in terms of the other variables.

8. When ranking different species in terms of their vapor pressures at a given temperature, what property has the most predictive value?

9. Explain the reason for the answer to number 8 in terms of enthalpy of vaporization ΔH_{vap}.

10. Regardless of the phase change in question, what can you always say about the sign of ΔH and ΔS relative to one another?

11. What are all of the endothermic phase transitions?

12. What general equation describes heat exchange for a system that **is not** at a phase transition? What do the terms mean? What are their typical units?

13. What general equation describes heat exchange for a system that **is** at a phase transition? What do the terms mean? What are their typical units?

14. What three general steps are involved in dissolving salts in water? Are they endothermic or exothermic steps? Why?

15. Of the three steps above, which one is most likely to have a nearly constant value regardless of the salt involved? Which one is most strongly influenced by the lattice energy of the salt?

16. Dissolution of all gases is an exothermic process. Why?

17. Some scientists have claimed that greenhouse gases such as CO_2 are not a threat to our environment because the world's oceans can absorb huge amounts of such gases. Based on your understanding of dissolution of gases in water and physical equilibria, why doesn't this argument make sense? (Hint: there are lots of good reasons, but one will do.)

18. The axiom "like dissolves like" is often used to describe miscibility. What does this axiom really mean?

19. List the four main types of intermolecular forces (IMF) that we've learned about so far in order from weakest to strongest. Which 3 are relevant when thinking about miscibility? Why?

20. How is the strength of IMF rated for the four types of IMF you listed in question 19?