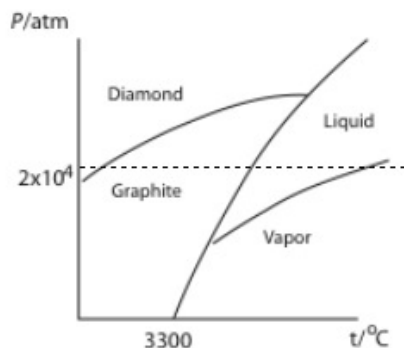


CHEM 3410: Physical Chemistry I — Fall 2008

Homework 7

Due in Class: October 28, 2008

- Below is a rough sketch of the phase diagram of carbon.
 - How many triple points are there, and what are the phases that can coexist at each triple point?
 - Which has a higher density, graphite or diamond?
 - Synthetic diamond can be made from graphite. Using the phase diagram, how would you go about making diamond?
 - For the pressure indicated with the dotted line, sketch a plot of \bar{G} versus T, including a line for each phase. Be sure to indicate the corresponding phase transformations as seen in the phase diagram.



- Dry ice has found its way into movies and spooky Halloween houses via fog machines. Its vapor pressure is 1 atm at -72.2°C and 2 atm at -69.1°C .
 - Calculate the ΔH of sublimation for dry ice.
 - Is $\Delta H_{\text{sublimation}}(\text{CO}_2)$ temperature dependent? If it is temperature dependent, what would you need to know to compute its temperature dependence?

(This seems to be an appropriate question as we approach Halloween next week.)
- The sublimation pressures of solid Cl_2 are 352 Pa at -112°C and 35 Pa at -126.5°C . The vapor pressures of liquid Cl_2 are 1590 Pa at -100°C and 7830 Pa at -80°C . Calculate:
 - $\Delta H_{\text{sublimation}}$
 - $\Delta H_{\text{vaporization}}$
 - ΔH_{fusion}
 - the triple point (Hint: The vapor pressure of the solid and liquid are equal at the triple point)
- Using the data provided below, calculate the enthalpy of vaporization of Cl_2 using a graphical method (least square fitting).

T (K)	P (atm)	T (K)	P (atm)
227.6	0.585	283.15	4.934
238.7	0.982	294.3	6.807
249.8	1.566	305.4	9.173
260.9	2.388	316.5	12.105
272.0	3.483	327.6	15.676