Chemistry 236 -- Quiz 4

October 1, 2003 — Triple Point: Phase Equilibrium

Pledge and signature:

Note: If you want your paper returned folded (*i.e.*, score concealed), please print your name on the back.

1. (2) Liquid chloroform ($CHCl_3$) is placed in a closed container equipped with a piston at the top to alter the pressure and/or volume. Initially 10 mL of liquid chloroform is in equilibrium with its vapor at 25°C, and the vapor occupies 100 mL. With T held constant, the piston is dropped, decreasing the volume by 50 mL. After the system is allowed to come to equilibrium again, which of the following will <u>not</u> have changed?

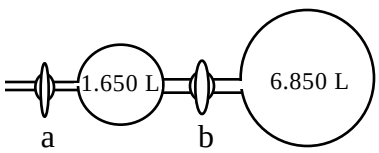
   a. V_{gas} b. V_{liq} c. P d. None of these will have changed.
   e. All of these will have changed.

2. (2) The normal boiling point of chloroform ($CHCl_3$) is 61.2°C. At a pressure of 1.1 atm, the boiling point is expected to be

   a. < 61.2°C b. > 61.2°C c. 61.2°C d. 60.1°C e. none of these

3. (2) Bob and Carol record sublimation and vapor P data for a substance near its triple point and obtain ΔH_{sub} = 35.1 kJ/mol and ΔH_{vap} = 29.1 kJ/mol. Ted and Alice do the same experiment on the same substance and obtain ΔH_{sub} = 31.5 kJ/mol and ΔH_{vap} = 36.2 kJ/mol. Which of these sets of results must certainly be wrong, at least in part; and how do you know this?

4. (3) The apparatus pictured to the right is used to conduct the following experiment. After complete evacuation of both chambers, valve **b** is closed, and a sample of $CO_2(g)$ is introduced through valve **a**. When the pressure in the 1.650-L reservoir reaches 4.500 atm, valve **a** is closed. If valve **b** is now opened, allowing gas to flow into the 6.850-L reservoir, the final pressure of CO_2 in the apparatus (assuming no temperature change) will be



   a. 0.8735 atm b. 0.9226 atm c. 1.084 atm d. 1.428 atm e. none of these

5. (3) The normal boiling point of water is 100.0°C, and ΔH_{vap} = 40.66 kJ/mol at that T. Taking ΔH_{vap} to be constant from 100°C to 125°C, estimate the vapor pressure of water at 125°C.

   a. 0.82 atm b. 2.3 atm c. 8.2 atm d. 9.8 atm
   e. Since water boils at 100°C, it cannot have a vapor pressure at 125°C.