OER 10.2-10.3

CHE 112 - Homework - Ch 10c
Phase Changes and Heating Curves

Score: _____/70

Name: _____ Date: _____

[6 pt] 1. Define Vaporization and Condensation. Sketch a picture illustrating your definition. What properties (3) is the rate of vaporization dependent on (include whether it is Directly or Inversely proportional).

[5 pt] 2. Write the mathematical equation describing the amount of energy required to vaporize a substance. Include the typical units of each variable. Is vaporization an Endothermic or Exothermic reaction? How much energy (in kJ) would it take to vaporize 250 g of Acetone (C_3H_6O) at its normal boiling point? (Hint: Example 10.8 contains a value you need).

[4 pt] 3. Explain why as the temperature increases the rate of vaporization increases. Include a sketch in your explanation.

[4 pt] 4. Explain how a solution can evaporate (go from the liquid state to the gas state) when the temperature is below the boiling point of the liquid, and the atmospheric pressure is 760 mmHg. (For example, on a sunny day a puddle of water will evaporate even though the temperature is well below the boiling point of water.) A sketch might be useful too, so give me one!

CHE 112 - Homework - Ch 10c

[5 pt] 5. Define Vapor Pressure. Sketch a picture illustrating your definition. What properties (2) is Vapor Pressure independent of? What properties (2) is Vapor Pressure dependent on (2)

[6 pt] 6. What is meant by the term 'dynamic equilibrium' when used in the context of liquid/vapor equilibrium. What part is 'dynamic' and what part is 'equilibrium'? Sketch a picture illustrating this concept.

[5 pt] 7. Order the following molecules from lowest vapor pressure to highest vapor pressure (ex A < B < C etc). (Hint: Drawing Lewis structures may help you decide.) Explain
(a) CH_4 (b) CH_3Cl (c) H_2O (d) CH_3OH

[2 pt] 8. If water is placed in (A) a 100 mL sealed flask and in (B) a 250 mL sealed flask which will have the highest vapor pressure. Explain.

[2 pt] 9. If in the above example more water is added to flask (B), which flask will have the highest vapor pressure? Explain.

CHE 112 - Homework - Ch 10c

[3 pt] 10. Define the boiling point in terms of the Vapor Pressure and Atmospheric Pressure. What are the relationships (direct/inversely proportional too) between Boiling Point, Vapor Pressure, Atmospheric Pressure, and Elevation.

[2 pt] 11. The temperature of a beaker of boiling water on a hot-plate reads 100℃. What can one conclude is the pressure of the atmosphere (in Torr or mm Hg). Explain.

[2 pt] 12. The temperature of a beaker of boiling ethanol on a hot-plate reads 60℃. What can one conclude is the pressure of the atmosphere (in Torr or mm Hg). Explain.

[2 pt] 13. Suggest a method where water could be made to boil at 50℃. Explain.

[2 pt] 14. A mixture of solution A and solution B is placed in a closed container. The boiling point of solution A is 70℃ and solution B is 23℃. Which substance will have the largest number of molecules in the vapor above the liquid at 20℃. Explain.

CHE 112 - Homework - Ch 10c

[5 pt] 15. What is ΔH_{vap} for $SiCl_4$ (in kJ/mol) if the vapor pressure is 100 mmHg at 5.4℃ and the normal boiling point is 56.8℃?

[5 pt] 16. Using the value of ΔH_{vap} from the previous problem, what is the vapor pressure of $SiCl_4$ (in mm Hg) at 20.0℃.

[10 pt] 17. The following data table gives the vapor pressure of mercury at various temperatures.
(a) Complete the table.
(b) Graph (using Excel) a graph of T vs P_{vap}. Include a curve-fit, equation and R^2 value on the graph.
(c) Graph (using Excel) a graph of 1/T vs ln(P_{vap}). Include a curve-fit, equation and R^2 value on the graph. (d) Using the second graph calculate ΔH_{vap} (in kJ/mol).
(e) Attach the properly labeled graphs to the back of the homework. (Use Excel, and drawn graphs will receive ZERO points).

Temp (K)	**P_{vap} (mmHg)**	**1/T**	**ln (P_{vap})**
500.	39.3		
520.	68.5		
540.	114.4		
560.	191.6		
580.	286.4		
600.	432.3		