CHE 111 - Homework - Ch 10b

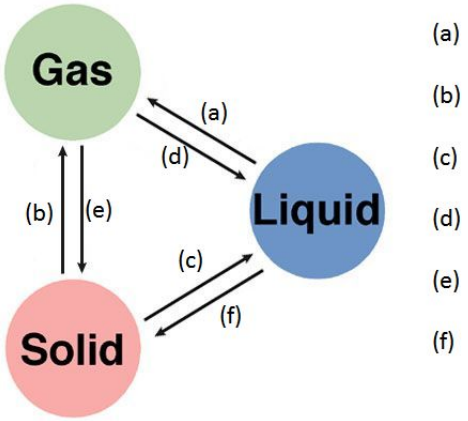
OER 10.3 **Vaporization/Condensation and Vapor Pressure** Score: _____/50

Name: _____ Date: _____

[10 pt] 1. On a separate sheet of paper sketch the heating curve of water or sketch it in the space to the right. Place heat added on the x-axis and Temperature (℃) on the y-axis. Label the following items:

1(a) Boiling point
1(b) Melting point
1(c) Where water is a solid
1(d) Where water is a liquid
1(e) Where water is a gas
1(f) Where solid and liquid can coexist
1(g) Where liquid and gas can coexist
1(h) Correctly label the y-axis with the values for the freezing point and boiling point of water.

[5 pt] 2. Label each of the phase changes below.



(a)
(b)
(c)
(d)
(e)
(f)

[5 pt] 3. What phase transition is best described by the following statements:

(a) An open bottle of perfume. 3(a) _____

(b) A cold rainy day suddenly turns into sleet then into snow. 3(b) _____

(c) On a hot day, the sides of your beer can have water droplets form on it. 3(c) _____

(d) Ice cubes left in the freezer long enough eventually disappear. 3(d) _____

(e) Your snowman melts on a warm day. 3(e) _____

(f) On a cold snowy day your windows frost over. 3(f) _____

[3 pt] 4. Which state of water has the most energy (s)olid, (l)iquid, or (g)as. Explain.

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[4 pt] 5. What is happening to the energy/heat being applied when (a) heating a substance and the temperature increasing and (b) heating a substance and the state changes?

[2 pt] 6. What is the mathematical formula for heating a substance (changing its temperature)? Be sure to define each variable, and include the typical units for it.

[2 pt] 7. What is the mathematical formula describing a phase transition? Be sure to define each variable, and include the typical units for it.

[3 pt] 8. What is the specific heat of titanium (in J/g·℃) if it takes 89.7 J to raise the temperature of a 22.0 g block by 5.20℃.

[5 pt] 9. What is the enthalpy change (in kJ) when 725.0 g of ice at 0.0℃ is converted to steam at 100.℃. Show work to support your answer.

[5 pt] 10. How much energy (in kJ) is released when 15.3 grams of steam at 115 ℃ is condensed to give liquid water at 75.0℃? The molar heat capacity for the vapor is 33.6 J/(mol·K), other needed values can be found in the book. (Hint: Sketching the heating curve for water might prove useful.)

[6 pt] 11. Iodine has a melting point of 113.5 ℃ and a boiling point of 184.4 ℃. What, if any phase change occurs under the following conditions at 1.0 atm of pressure? (Hint: Sketching the heating curve for Iodine might prove useful.)

(a) Heat is added to a solid sample at 386.5 K while the temperature remains constant. Explain. 11(a) _____

(b) The temperature of a sample is lowered from 452 K to 389 K. Explain. 11(b) _____

(c) The temperature of a sample is raised from 300 K to 500 K. Explain. 11(c) _____

12. Extra Credit: Graph a molar heating curve for sodium similar to that shown for water in Figure 11.36. Begin with solid sodium at 0℃ and raise the temperature to 1000℃. Attach any work on a seperate sheet of paper and the graph to the back of the homework. Be sure to scale the graph appropriately. Label on the graph the states (s,l,g), melting point, boiling point, and where the phase transitions occur. Some needed values are:

Melting point = 98℃
Boiling point = 883 ℃
ΔH_{vap} = 89.6 kJ/mol
ΔH_{fus} = 12.64 kJ/mol

Heat Capacity (s) = 28.4 J/(K·mol)
Heat Capacity (l) = 32.3 J/(K·mol)
Heat Capacity (g) = 55.0 J/(K·mol)

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