Changes of State Worksheet (B)

1. Does transferring energy to a system always increase the temperature?
   a. Explain your answer.
   b. Give an example.

2. Does transferring energy out of a system always decrease the temperature?
   a. Explain your answer.
   b. Give an example.

3. Pair up the phase changes that occur at the same temperature.

4. Compare and contrast evaporation and vaporization.
5. Rank the three phases (aka states of matter) in order of lowest energy to highest energy.

6. Why does water boil at a higher temperature in Annville, PA than in Denver, CO? [Hint: think elevation and kinetic molecular theory.]

7. What happens to the freezing and melting points of most substances when ...
   a. Pressure is increased?
   b. Pressure is decreased?

8. What is the major exception to this rule?

9. What happens to the boiling and condensation points of substances when ...
   a. Pressure is decreased?
   b. Pressure is increased?

10. Explain why pressure has this effect on the changes of state.

11. What is equilibrium?

12. Why is equilibrium a dynamic condition?
13. What happens to an open liquid-vapor system (no lid on the container) as the temperature increases?

14. Explain why this happens? [Hint: think kinetic molecular theory.]

15. What happens to a closed liquid-vapor system (lid on the container) as the temperature increases?

16. Explain why this happens? [Hint: think kinetic molecular theory.]

17. What information does a phase diagram tell us?

18. On a phase diagram what happens at ...
   a. The curve between liquid and gas?
   b. The curve between liquid and solid?
   c. The curve between solid and gas?
   d. The triple point?

*Use the phase diagrams from your notes to answer #19 and #20:*

19. If there was a new brand of pasta that had to be boiled in water at 110°C how could you do it?

20. At room conditions dry ice sublimes. How could you change the conditions to make dry ice melt to liquid carbon dioxide?
Use the specific heat values for ice, water and steam and the heat of vaporization and heat of fusion values for water found toward the end of your guided inquiry pack to answer the questions below.

21. Is more energy required to melt one gram of ice at 0°C or vaporize one gram of water at 100°C?

22. How do you know the answer?

23. How much energy is released when 150.0 grams of water freezes?

24. How much energy is released when 150.0 grams of water condenses?

25. How much energy is required to vaporize 75 grams of water?

26. How much energy is required to melt 855 grams of ice?

27. $1.000 \times 10^3$ kJ of energy is released when a piece of ice is formed. What is the mass of the ice?

28. $1.000 \times 10^3$ kJ of energy is released when steam condenses to liquid. What is the mass of the liquid?

29. What is the mass of ice that is melted by 755 J of heat melt a piece of ice?
30. What is the mass of water that is boiled by 2950 kJ of heat?

31. How much energy is required or released to ...
   a. Melt 15 g of ice at 0.0°C and heat the water to 22°C?
   b. Condense 15 g of steam at 100.0°C and cool the water to 22°C?
   c. Change 100.0 g of ice at 0.0°C to water at 98°C?
   d. Cool and freeze 5150 kg of water from 0.0°C to -44.00°C.

32. Describe all the changes of state water vapor would undergo when cooled from 110.0°C to -10.0°C at 1 atmosphere of pressure.