**CHEMISTRY B NAME**

 **PERIOD\_\_\_\_\_**

**LIQUID AND SOLID TAKE-HOME ASSIGNMENT**

Answer the following questions dealing with liquids and solids. You must answer these questions using proper terminology and concepts such as those listed below. You will find an explanation of these in your text on pages 388-392. Your assignment is to construct a concept map of these terms before you attempt to answer these questions. The text will not give you the answers, just ideas on how to answer them. You may work alone or in groups.

 terms and concepts for the concept map

 1. vapor pressure 2. vapor pressure equilibrium

 3. volatile or volatility 4. phase diagram

 5. triple point 6. sublimation

 7. boiling point 8. freezing point

1. attractive forces

1. Most space shuttle launches occur within a three hour window. This means that once the final countdown has begun, they can only have three hours of delays due to weather, mechanical problems or whatever, before the mission will be “scrubbed”. If “scrubbed”, it will take another 16-24 hours before another window of launch can be used. The reason for such a long delay could be due to many factors. But, one physical factor is the propellant (liquid oxygen and liquid hydrogen) in the large central tank. It must be "recharged" after each delay.

a. Why do shuttles have only a three-hour window for launch? What happens in these three hours that make it so they have to stop the launch if it goes longer than this?

 b. Discuss the consequences if the shuttle were to sit on the launch pad for longer than three hours.

­2. How would you make dry ice?

3. Describe how it would be possible to have a container with ice, water and water vapor all at the same time and where the amounts (masses) of each phase does not change (the mass of water=mass of ice=mass of water vapor all the time).

4. Consider two large tanks, each having a volume of 500,000 gallons. One tank has acetone (b.p.=35'C) in it, the other, kerosene (b.p.= 75'C). Both tanks are exactly 60% full. (b.p. stands for boilling point)

 a. Which tank has the highest vapor pressure and why?

b. Remove half of the liquid from the acetone tank. Which has the highest vapor pressure and why?

5. Lyophilization is a process that removes water from a frozen sample by sublimation (freeze drying). Samples are usually flash frozen (very quickly with very cold temperatures) to ]accomplish this. Dry ice and methanol can be used to achieve this (temps. of -50'C). The following data was obtained by monitoring the temperatures of the methanol in a flask with periodic additions of dry ice. Notice that the temperatures are all below zero.

 time (min) temperature ('C) time (min) temperature('C)

 0 -45 19 -40

 1 -43 20 -39

 2 -41 21 -38

 3 -41 22 -37

 4 -42 23 -36

 5 -43 24 -35

 6 -42 25 -36

 7 -41 26 -37

 8 -40 27 -38

 9 -39 28 -37

 10 -38 29 -36

 11 -38 30 -35

 12 -39 31 -32

 13 -40 32 -31

 14 -41 33 -25

 15 -42 34 -20

 16 -43 35 -15

 17 -42 36 -10

 18 -41

a. Graph the data on a separate piece of paper.

1. At what times was dry ice added to the flask? Indicate on the graph when it was added.
2. Explain why the temperature dropped from the 3rd minute to the 5th minute (use the ideas of the kinetic theory to answer this question).

d. Which piece of dry ice was the largest?