Chemistry
Ms. Ye

Name _____
Date _____ Block _____

Intermolecular Forces Review

1. What are intermolecular forces?

2. Provide an explanation as to why the following phenomena occur:
   a. Water beads up on your windshield, but acetone doesn't. (Relate IMFs and Surface Tension)

   b. Water is less viscous than molasses (Relate IMFs and Viscosity)

   c. Molecular nitrogen boils at 77 K, while nitric oxide boils at 110 K. (Relate IMFs and Boiling Point)

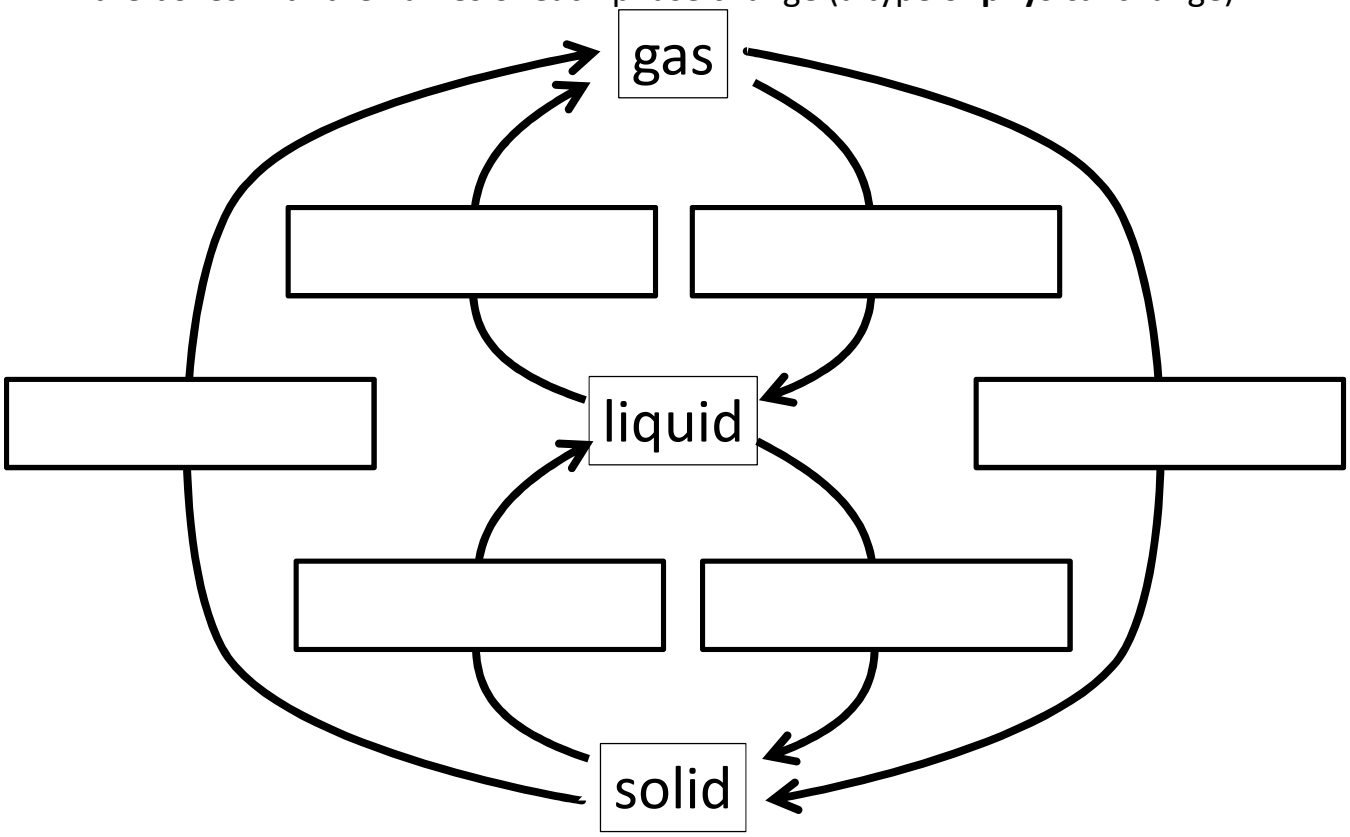
   d. A test tube was filled halfway with acetone and another was filled halfway with water. Both test tubes are left at room temperature. A few hours later, much of the acetone had evaporated while most of the water was still in the test tube. (Relate IMFs and Volatility).

   e. Butane is a gas at standard temperature and pressure while pentane is a liquid. (Relate IMFs and state of matter)

3. Explain how the demo worked by relating IMFs, vapor pressure, and boiling point.

Phase Changes Review

1. Fill in the boxes with the names of each phase change (a type of **physical** change)



2. Indicate which phase changes are exothermic and which are endothermic. Explain.

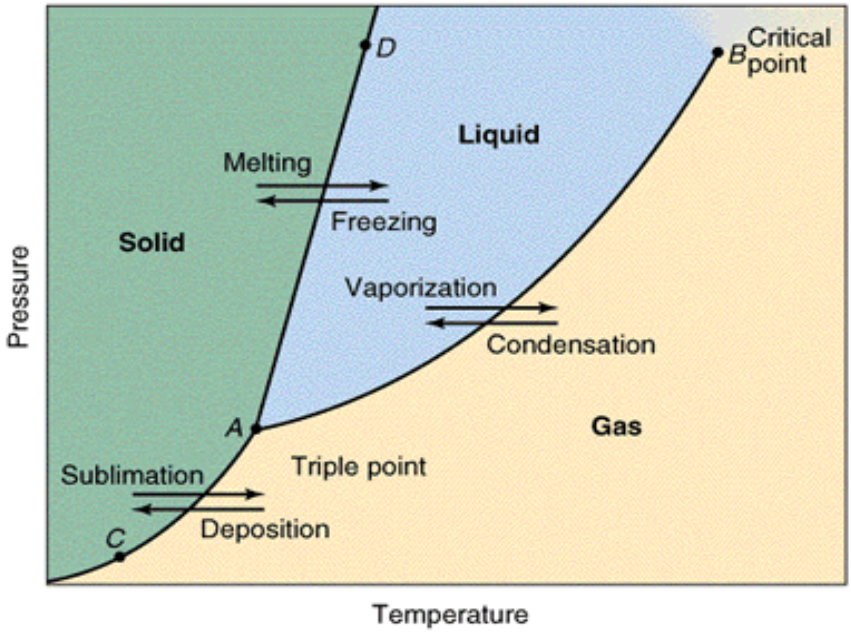
3. What are **intermolecular (attractive) forces**?

** For the **same chemical substance**, molecules in the _____ phase will have ***stronger*** intermolecular (attractive) forces between them than molecules in the _____ phase

**In order for a solid to change into a liquid (melt) or for a liquid to change into a gas (boil), the molecules must _____ holding them together.

Phase Diagram I.S.

A ***phase diagram*** is a graphical way to summarize the conditions under which equilibria exist between the different states of matter. It also allows us to predict the phase of a substance that is stable at any given temperature and pressure.



Part 1: Use the phase diagram above to answer the following questions.

1. What label is on the x-axis? What label is on the y-axis?

2. List the three phases of matter that are on the diagram.

3. At which point do ***all three*** phases on the diagram meet?

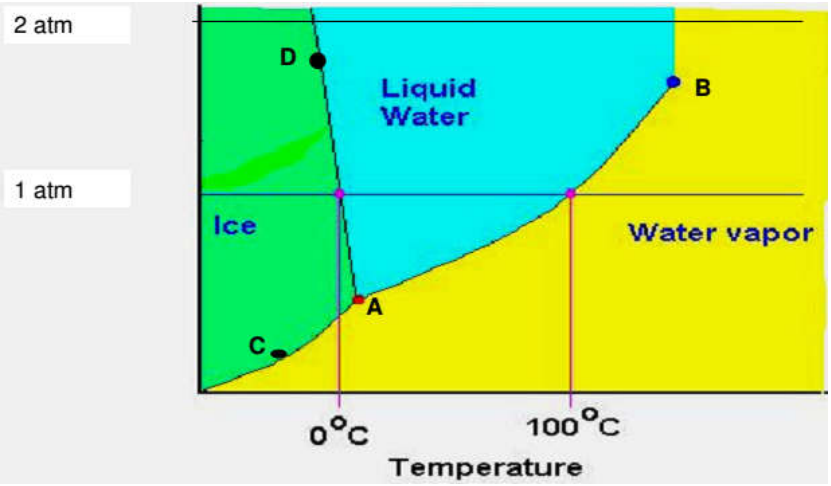
4. In your own words, define what you think the ***triple point*** is. Make sure to include the following terms in your response: solid, liquid, gas, pressure, temperature.

5. Look at the arrows labeled with a specific phase change (i.e. melting, freezing, vaporization, etc.). In general, describe how a phase change is represented on this graph.

6. The line extending from the triple point to the critical point stops. What do you think this mean in terms of phase change?

7. In your own words, define what you think the critical point is.

Part 2: Phase Diagram of Water



1. Identify the following points on the graph:

A

C

B

D

2. If the line AD represents the melting/freezing line for water,
   a. What would the AB line represent?

   b. What would the AC line represent?

3. Even though a phase change could occur along any of the solid lines, the two points labeled at 0°C and 100°C are known as the "normal melting point" and "normal boiling point", respectively. **Based on the pressure that these occur at**, what do you think is meant by **"normal"** melting or boiling point?

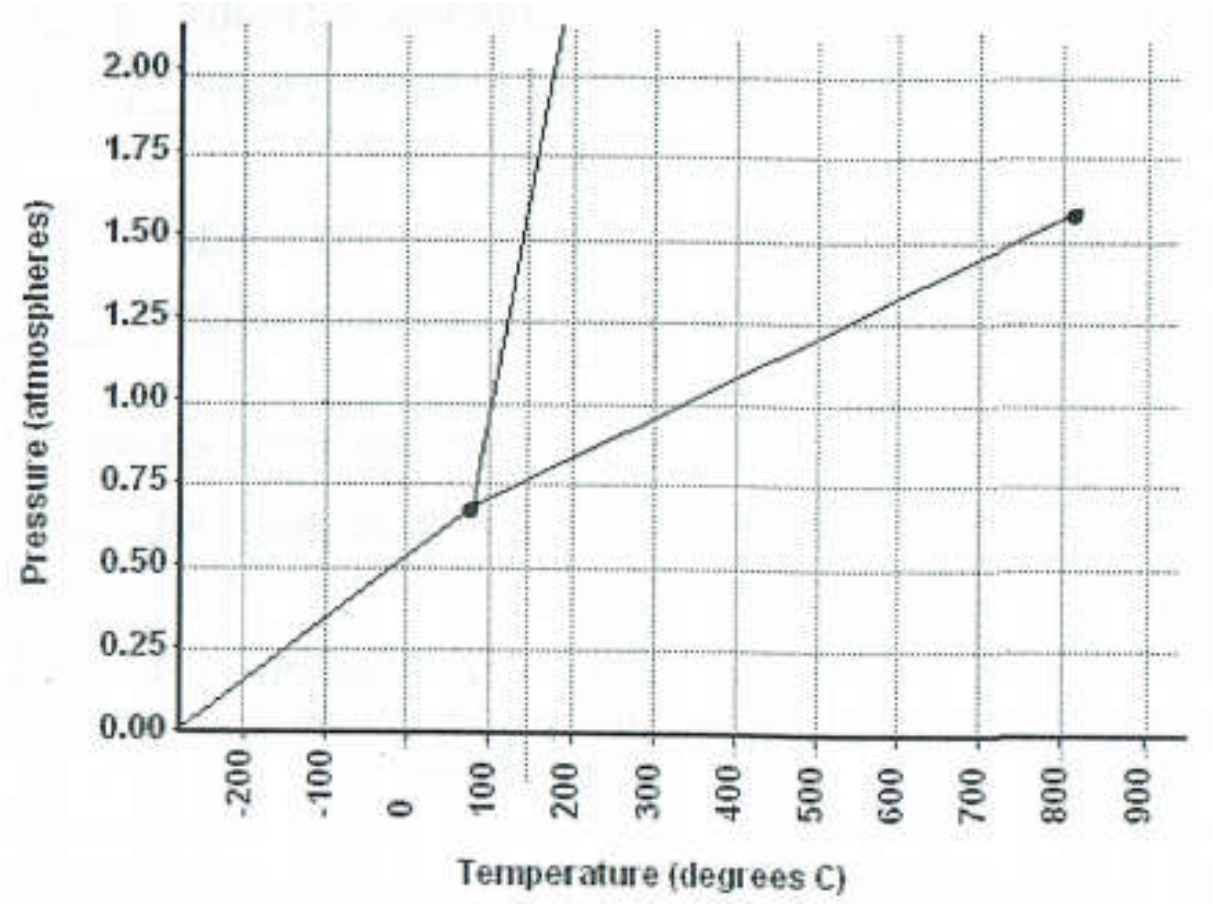
4. Given the phase diagram above, what phase would water be in if it had the following properties:
   a. 50 °C and 0.5 atm

   b. -50°C and 0.5 atm

   c. 125 °C and 1.0 atm

Part 3: Practice

1. Use the phase diagram to answer the following questions:



a. What is the normal freezing point of this substance?

b. What is the normal boiling point of this substance?

c. What is the normal melting point of this substance?

d. At what temperature and pressure does the triple point occur for this substance?

e. What is the phase (solid, liquid, gas) of this substance at 2.0 atm and 100˚C?

f. What is the phase of this substance at 0.75 atm and 100˚C?

g. What is the phase of this substance at 0.5 atm and 100˚C?

h. What is the phase of this substance at 1.5 atm and 50˚C?

i. What is the phase of this substance at 1.5 atm and 200˚C?

j. What is the phase of this substance at 1.5 atm and 800˚C?

k. If I had a quantity of this substance at a pressure of 1.25 atm and a temperature of 300°C and lowered the pressure to 0.25 atm, what phase changes would occur?

l. If I had a quantity of this substance at an initial pressure of 1.25 atm and a temperature of 0˚C and then lowered the pressure to 0.25 atm, what phase changes would occur?

m. If I had a quantity of this substance at a pressure of 1.00 atm and a temperature of 200°C and lowered the temperature to 0°C, what phase change(s) would occur?

n. If this substance was at a pressure of 2.0 atm, at what temperature would it melt?

o. If this substance was at a pressure of 2.0 atm, at what temperature would it boil?

p. If this substance was at a pressure of 0.75 atm, at what temperature would it melt?

q. If this substance was at a pressure of 0.75 atm, at what temperature would it boil?

Demo: Properties of Solids

Procedure	Yes	No
1. Obtain a piece of metal and place the two wires on the metal. Does the bulb light up?		
2. Place the metal into one of the cups of water. Does the metal dissolve in the water?		
3. Clean and dry the metal strip so that it may be used in the future.		
4. Obtain a cup with solid ionic salt and place the two wires into the solid salt. Does the bulb light up?		
5. Obtain a cup with water and place the two wires into the water. Does the bulb light up?		
6. Pour ½ of the ionic salt into the cup with water and stir. Does the salt dissolved in water?		
7. Place the two wires into the cup containing the dissolved ionic salt. Does the bulb light up?		
8. Pour the salt solution down the drain and replace the water in the cup.		
9. Obtain a cup with solid covalent molecule (sugar) and place the two wires into the solid sugar. Does the bulb light up?		
10. Obtain a cup with water and place the two wires into the water. Does the bulb light up?		
11. Pour ½ of the covalent molecule (sugar) into the cup with water and stir. Does the sugar dissolved in water?		
12. Place the two wires into the cup containing the dissolved sugar. Does the bulb light up?		
13. Pour the sugar solution down the drain and replace the water in the cup.		

Summary Table: Types of Solids

	Ionic Compounds	Covalent (Molecular) Compounds	Metals
Made up of…			
Electrons are….			
Physical Properties:	• _____ melting point & boiling point • Solids _____ conduct electricity • When dissolved in water: _____ conduct electricity	• _____ melting point & boiling point • Solids _____ conduct electricity • When dissolved in water: _____ conduct electricity	• _____ melting point & boiling point • Solids _____ conduct electricity

Note:

Metals are found to the _____ of the "staircase" on the periodic table

Nonmetals are found to the _____ of the "staircase" on the periodic table