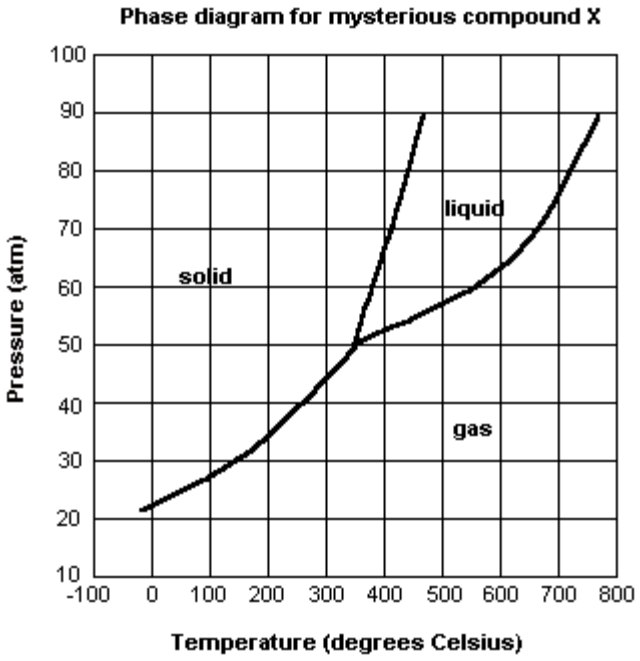
Phase Diagram Worksheet **NAME:**

For each of the questions on this worksheet, refer to the phase diagram for mysterious compound X.



1) What is the critical temperature of compound X? _____

2) If you were to have a bottle containing compound X in your closet, what phase would it most likely be in?

3) At what temperature and pressure will all three phases coexist in equilibrium?

4) If I have a bottle of compound X at a pressure of 45 atm and temperature of 100^0 C, what will happen if I raise the temperature to 400^0 C?

5) Why can't compound X be boiled at a temperature of 200^0 C?

6) If I wanted to, could I drink compound X?

	NMP	NBP	Triple Point		Critical Point	
N_2	-210.0 ^{0}C	-196 ^{0}C	-210.1 ^{0}C	0.127 atm	-147 ^{0}C	33 atm
CO_2		(NSP) -78.5^{0}C	-56 ^{0}C	5 atm	31 ^{0}C	73 atm
NH_3	-77.8 ^{0}C	-33 ^{0}C	-77.9 ^{0}C	0.006 atm	132 ^{0}C	112 atm
H_2O	0 ^{0}C	100 ^{0}C	0.01 ^{0}C	0.006 atm	347 ^{0}C	218 atm
I_2	113 ^{0}C	185 ^{0}C	113 ^{0}C	0.13 atm	512 ^{0}C	116 atm

1) I_2(s) is placed in an evacuated 50 mL cylinder at room temperature. At equilibrium 50 grams of solid is present. If 5 grams of the solid is removed and the system is allowed to reestablish equilibrium:
A. The pressure in the cylinder will be higher.
B. The pressure in the cylinder will be lower.
C. The pressure in the cylinder will remain the same.

2) If the volume of the cylinder is increased to 60 mL and the system is allowed to reestablish equilibrium:
A. The pressure in the cylinder will be higher.
B. The pressure in the cylinder will be lower.
C. The pressure in the cylinder will remain the same.

3) Sketch a phase diagram for N_2

4) Can you liquefy N_2 at room temperature ? Explain.

Sketch a phase diagram for CO_2

5) Can you make liquid CO_2 at room temperature ? Explain.

6) Does CO_2 have a normal boiling point ? Explain.

7)Sketch an approximate phase diagram for iodine. Label CLEARLY all of the important lines, curves, regions and points.

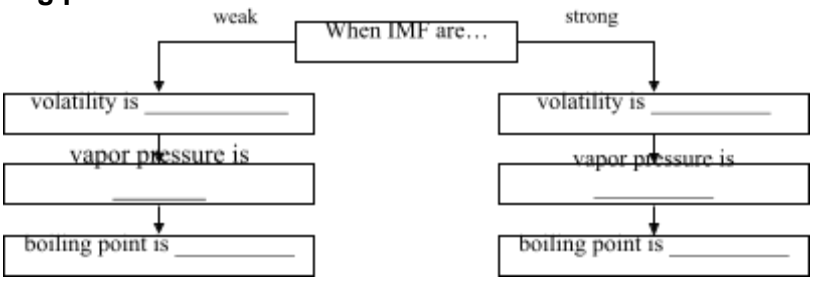
8)Can I_2 be liquefied at room temperature? 1. YES 2. NO (circle one)

This is because: (CHOOSE THE BEST ANSWER)

A. Room temperature is above the critical point of I_2.
B. Room temperature is above the triple point of I_2.
C. Room temperature is between the critical point and the triple point of I_2.
D. Room temperature is below the critical point of I_2.
E. Room temperature is below the triple point of I_2.

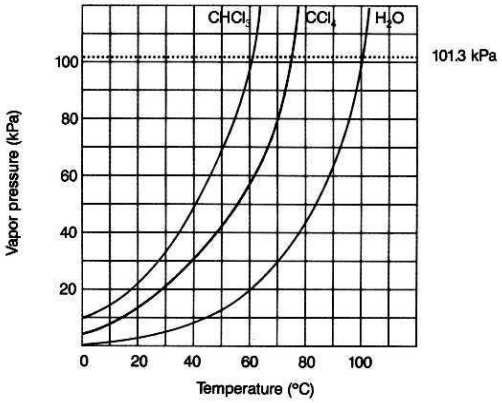
Part A – Intermolecular Forces

1. Fill in the diagram (with high or low) to show how intermolecular forces influence the **volatility**, **vapor pressure**, and **boiling point** of a substance.



Part B – Vapor Pressure Graphs

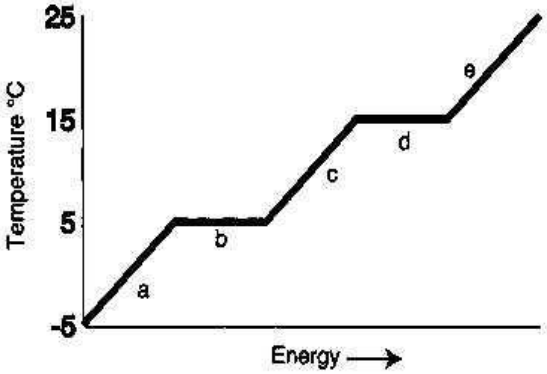
Use the graph below to answer the following questions.



2. What is the vapor pressure of $CHCl_3$ at 50°C? _____
3. What is the boiling point of H_2O when the external pressure is 30 kPa? _____
4. What is the normal boiling point of CCl_4? _____
5. Which substance has the weakest IMF? _____

Part C – Heating Curves.

Use the heating curve below to answer the following questions.



6. What is the melting point of the substance? _____
7. What is the boiling point of the substance? _____
8. Which letter represents heating of the solid? _____
9. Which letter represents heating of the vapor? _____
10. Which letter represents melting of the solid? _____
11. Which letter represents boiling of the liquid? _____

Part D – Phase Diagrams.

Use the phase diagram for water below to answer the following questions.

12. What is the state of water at 2 atm and 50° _____
13. What phase change will occur if the temperature is lowered from 80°C to -5°C at 1 atm? _____
14. You have ice at -10°C and 1 atm. What could you do in order cause the ice to sublime?