NAME Chemistry DATE 4/27 - 5/1 PERIOD A1, A2, B3

Unit 10: States of Matter

Central Concepts: *Gas particles move independently of each other and are far apart. The behavior of gas particles can be modeled by the kinetic molecular theory. In liquids and solids, unlike gases, particles are close to each other. The driving forces of chemical reactions are energy and entropy. The reorganization of atoms in chemical reactions results in the release or absorption of heat energy.*

Objectives:

1. Using the kinetic molecular theory, describe and contrast the properties of gases, liquids, and solids. Explain, at the molecular level, the behavior of matter as it undergoes phase transitions.
2. Describe the law of conservation of energy. Explain the difference between an endothermic process and an exothermic process.
3. Recognize that there is a natural tendency for systems to move in a direction of disorder or randomness (entropy).

DATE	Assignment	Pages	√
1. 4/27-28	10.1 The Kinetic Molecular Theory of Matter	1	
2. 4/29-5/2	Liquids + Solids unit 10 Part 1 IMF	1	
3. ↓	Liquids + Solids Ut. 10 Part 2 Phys. Prop. of Liq + Solids	1.5	
4. ↓	Changes of State Unit 10 Part 3	2.5	
5			
6 ★	Watch Crash Course Chemistry Videos		
7	on Liquids + Solids + Take Notes		
8	after Part 1		
9			
10			
11			
12			
13			
14			
15			
16			

Chapter 10 States of Matter

Read pages 329-332 in Blue MC text book (302-306 in orange MC)

pg. 311-314 online book

10.1 The Kinetic-Molecular Theory of Matter

- **We know that matter can exist on earth as solids, liquids, and gases, and while we cannot look at individual particles scientists are able to study large groups of these particles as they occur in solids, liquids and gases.**
- **In this chapter we will study the theory developed in the late 19th century to explain the motion of these particles → especially in gases.**

1. State the kinetic-molecular theory.

_____

_____

_____

2. Describe how it explains certain properties of matter.

_____

_____

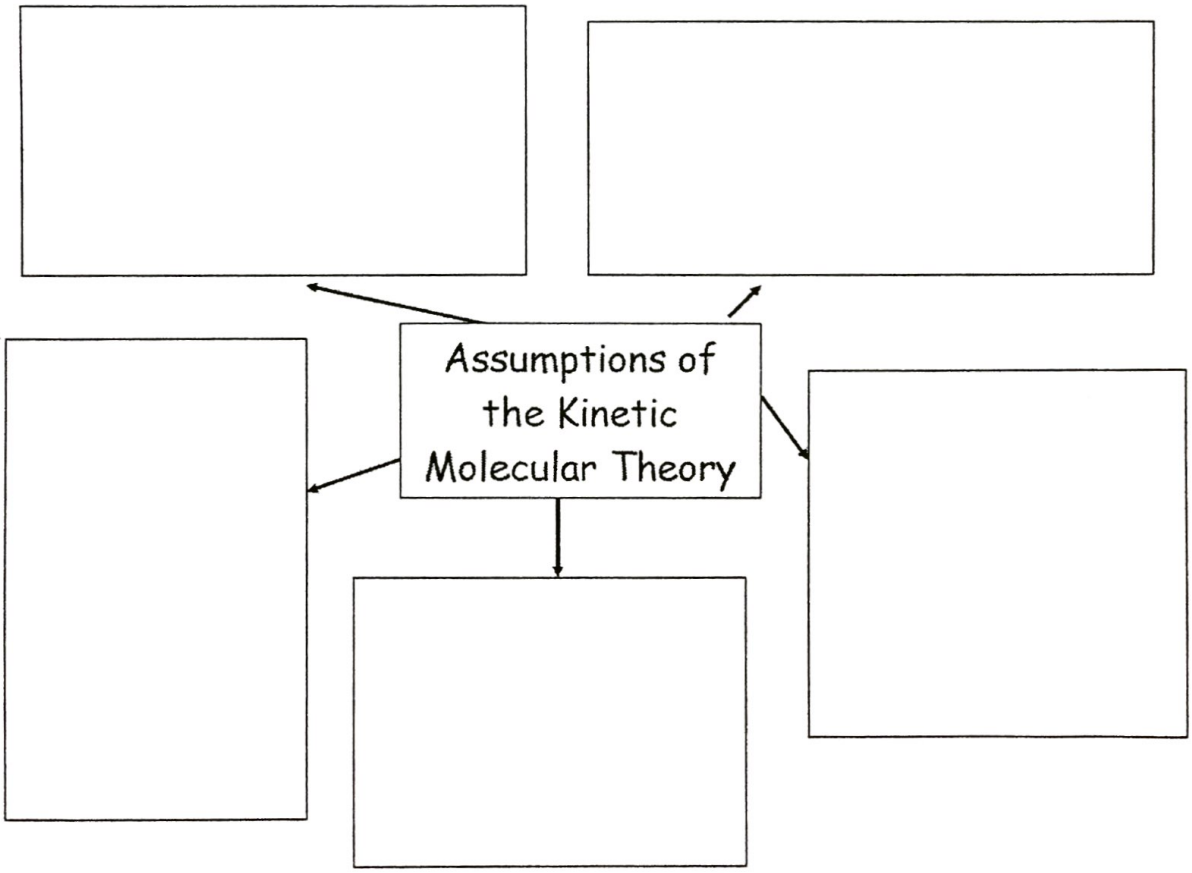
_____

3. What would an ideal gas be?

_____

_____

4. List the five assumptions of the kinetic theory of gases and describe each.



5. What is the formula to calculate the average kinetic energy of any moving particle?

What does the m stand for? _____ What does the v stand for? _____

6. If all gases at the same temperature have the same kinetic energy, how does the average speed of lighter gas particles, like hydrogen, compare to the average speed of heavier gas particles like CO_2 gas?

7. What happens to the kinetic energy of the particles if the temperature of the gas increases or decreases?

8. Describe each of the characteristic properties of gases: expansion, low density, fluidity, compressibility, and diffusion.

   expansion:

   low density:

   fluidity:

   compressibility:

   diffusion:

9. Differentiate between the terms *ideal* and *real gas.*

   When will many gases behave nearly ideally?

10. Describe the conditions under which a real gas is most likely to behave as ideally.

11. Which of the following gases would you expect to deviate the most from ideal behavior? **A) He B) O_2 C) H_2 D) H_2O E) N_2 F) HCl G) NH_3** _____

    Explain your choice(s):

Name _____ Period _____ Date _____

Liquids & Solids Unit 10 Part 1

- Go to http://msrobbinspnhs.weebly.com/ and Click on the Chemistry Notes Page.
- Scroll down to Unit 10 and download the IMF_Pres.ppt
- As you study the PowerPoint take notes below

Intermolecular Forces

A. Definition of IMF

B. Types of IMF

	London Dispersion Forces	Dipole-Dipole Forces	Hydrogen Bonding
Definition			
Diagrams			
Relative Strength			
Other Information			

★ Check out the Animations online

C. Determining IMF - examples

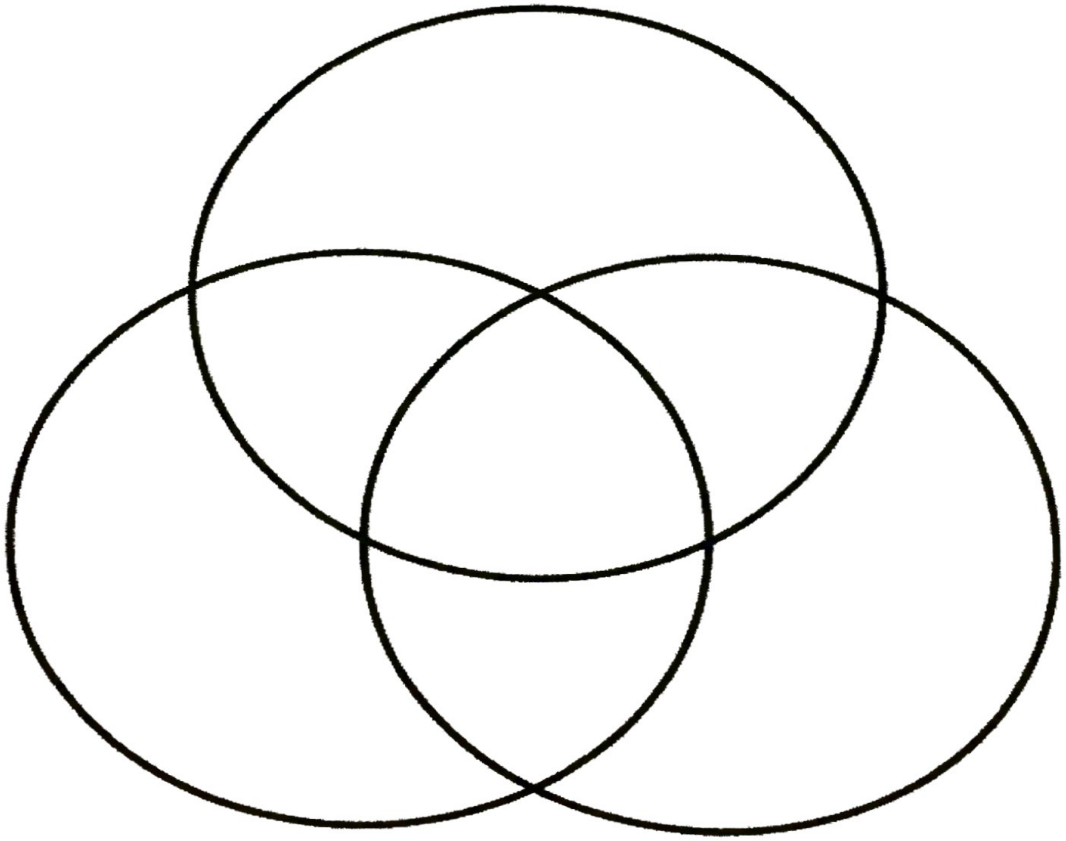
Identify the correct intermolecular force for each of the following descriptions.

1. Weak attraction between instantaneous dipoles. _____
2. Exists in all polar molecules. _____
3. Exists in all atoms and molecules. _____
4. The strongest intermolecular force. _____
5. Increases in strength as molar mass increases. _____

6. Indicate which intermolecular forces are present in the following substances by checking the appropriate boxes. You need to determine whether each molecule is **polar** or **nonpolar** first.

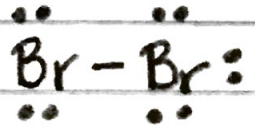
Substance	Dispersion Forces	Dipole-Dipole Forces	Hydrogen Bonding
Br_2			
PCl_3			
BF_3			
C_2H_5OH			

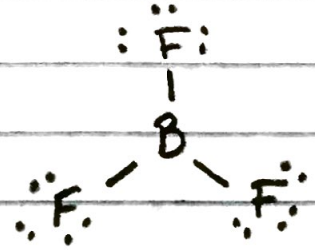
7. Compare and contrast the 3 intermolecular forces above. Which are stronger?

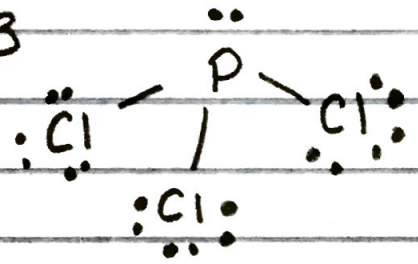


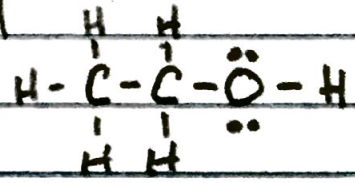
Liquids & Solids Unit 10 Part 1

#6 → Are the following molecules polar or nonpolar?

Br_2 

BF_3 

PCl_3 

C_2H_5OH 

Name _____ Period _____ Date _____

Liquids & Solids Unit 10 Part 2

- Go to http://msrobbinspnhs.weebly.com/ and Click on the Chemistry Notes Page.
- Scroll down to Unit 10 and download the **liquid-solids_prop_pres.ppt**
- As you study the PowerPoint take notes below

Physical Properties of Liquids and Solids

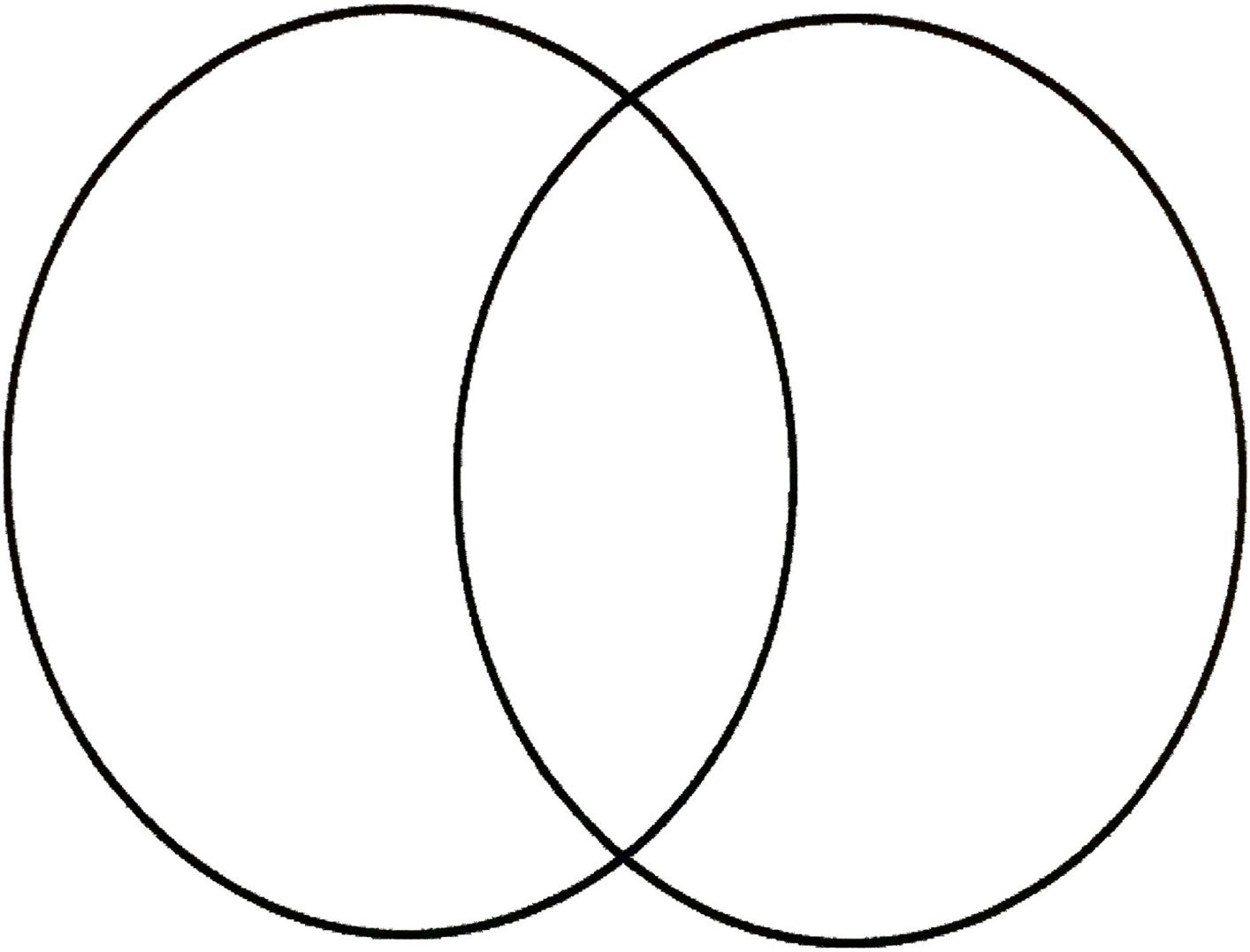
A. Liquids vs. Solids

	Liquids	Solids
IMF Strength		
Fluid		
Density		
Compressible		
Diffusion		

B. Liquid Properties with Diagrams (Also use pages 333 – 336 in the Blue Modern Chemistry Text from the Bench-top Computers' Desktop or at home)

C. Types of Solids with Diagrams (Also use pages 337 – 341 in the Blue Modern Chemistry Text from the Bench-top Computers' Desktop or at home)

8. Compare and contrast the properties of **liquids** and **solids**.



9. What property causes water to bead up on the hood of a freshly waxed car? _____

10. What property causes oil to travel up the wick of an oil lamp? _____

Identify the correct type of crystal for each of the following descriptions.

11. All atoms are covalently bonded together. _____

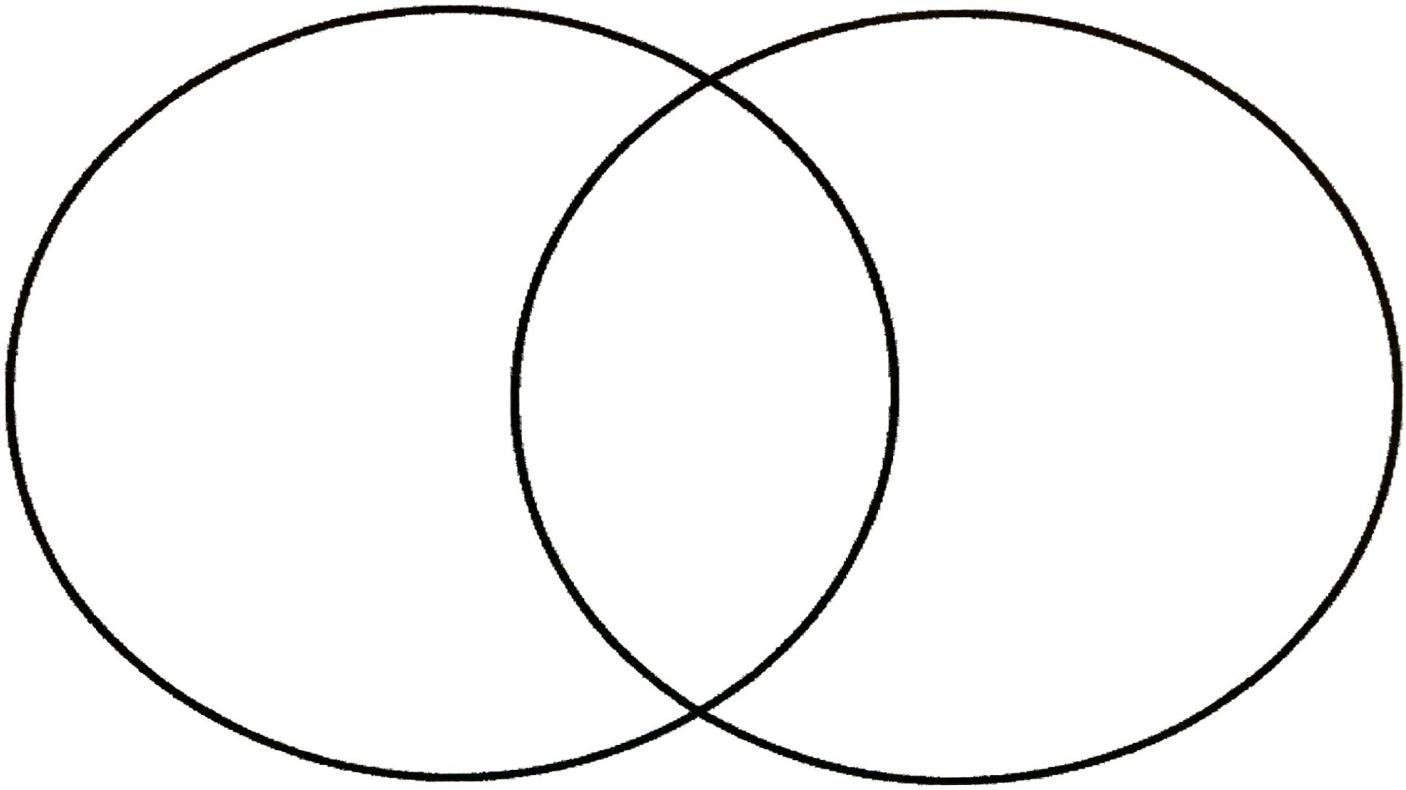
12. Molecules are held together by intermolecular forces. _____

13. Charged particles are arranged in a geometric pattern. _____

14. Atoms are surrounded by a sea of electrons. _____

15. Results in the highest melting point. _____

16. Compare and contrast crystalline and amorphous solids.

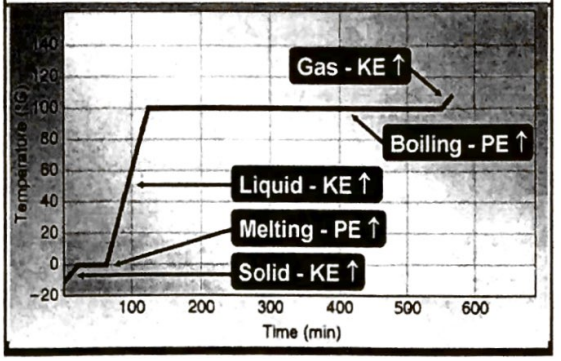


17. Give some examples of both types of solids

A. Phase Changes

- **Sublimation**
  - _____ → _____
  - v.p. of solid equals _____
- EX: dry ice, mothballs, solid air fresheners

B. Heating Curves



B. Heating Curves

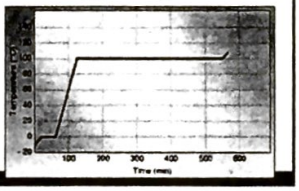
- **Temperature Change**
  - _____
  - depends on _____
- **Heat Capacity**
  - energy required to raise the temp of 1 gram of a substance by 1°C
  - _____

B. Heating Curves

- **Phase Change**
  - _____
  - _____
- **Heat of Fusion** (ΔH_{fus})
  - energy required to melt 1 gram of a substance at its m.p.

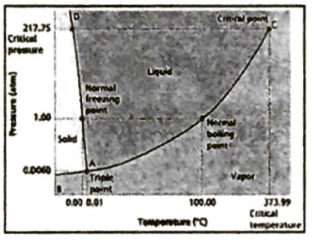
B. Heating Curves

- **Heat of Vaporization** (ΔH_{vap})
  - _____
  - usually larger than ΔH_{fus}...why?
- EX: sweating, steam burns, the drinking bird



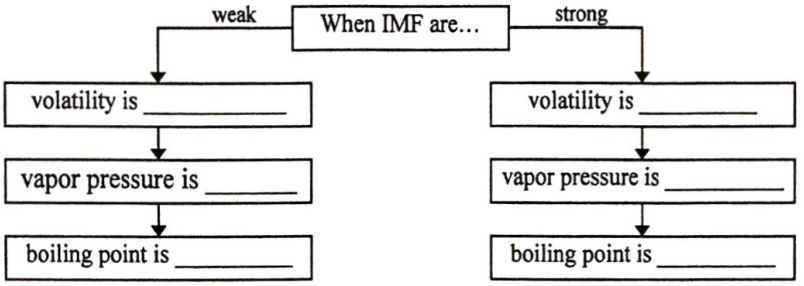
C. Phase Diagrams

- Show the phases of a substance at different temperatures and pressures.

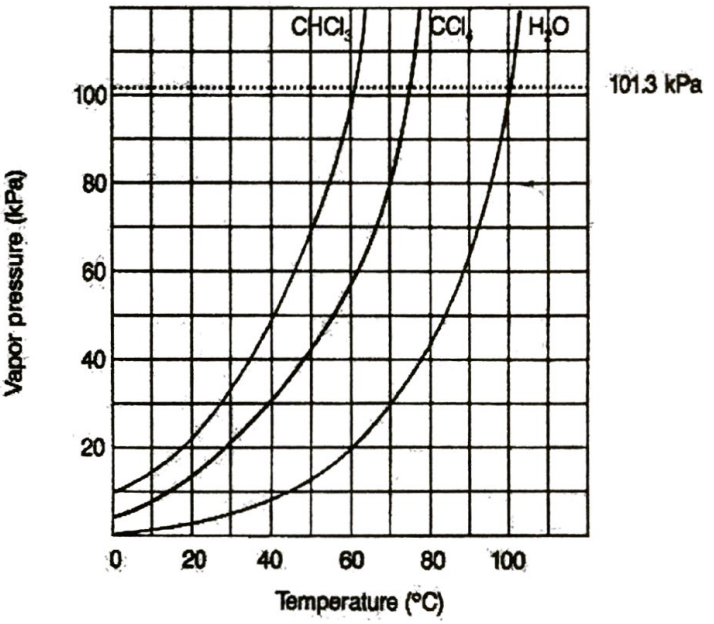


PART A – INTERMOLECULAR FORCES

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.

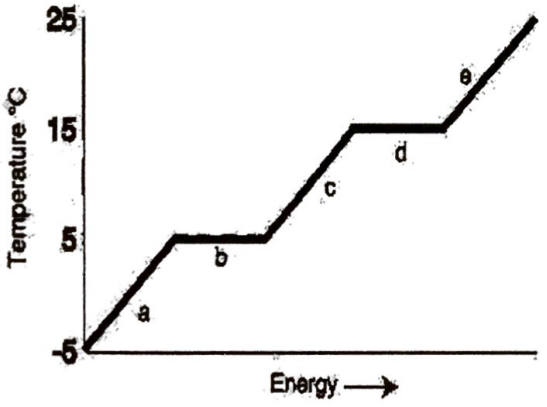


PART B – VAPOR PRESSURE GRAPHS Use the graph below to answer the following questions.



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.

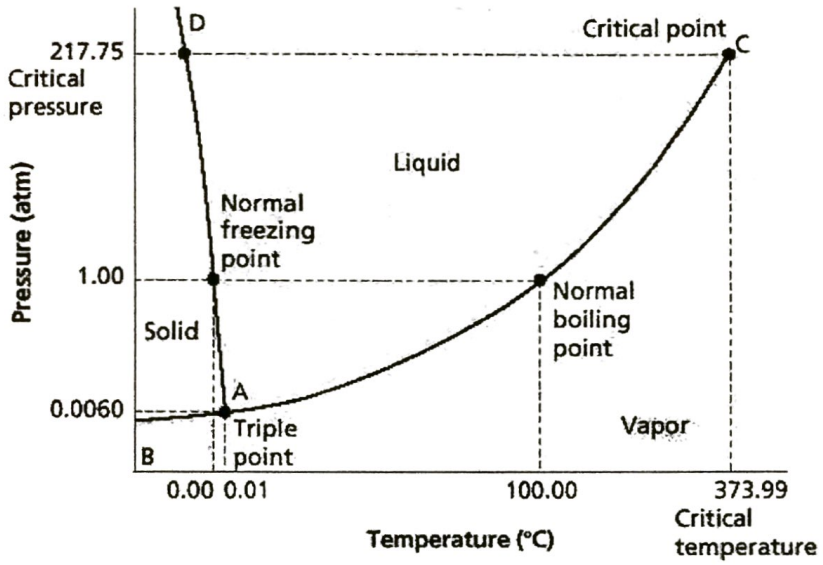
12. What is the state of water at 2 atm and 50° _____

13. What phase change will occur if the temperature is lowered from 80°C to -5°C at 1 atm?_____

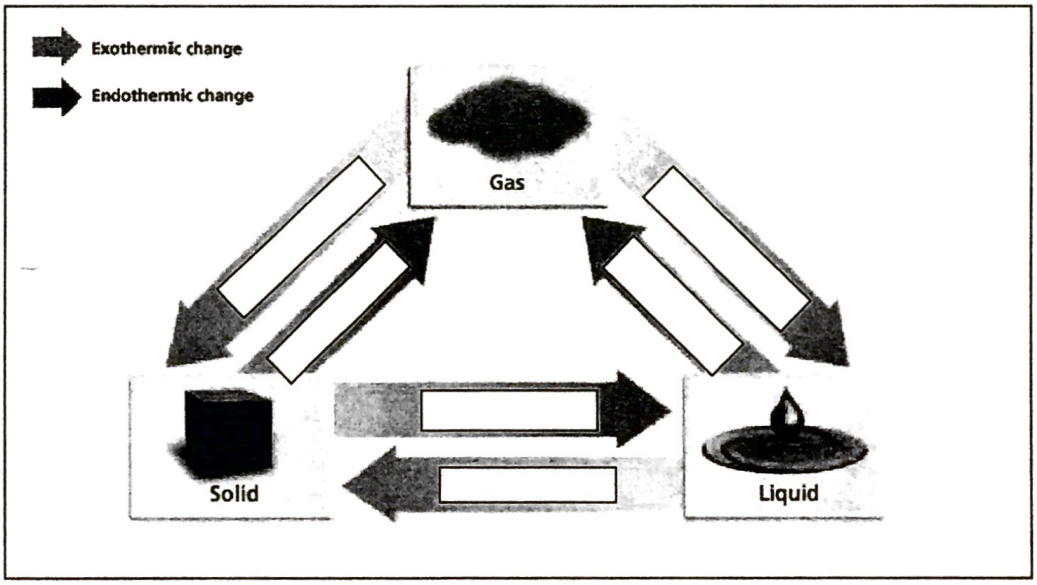
14. You have ice at -10°C and 1 atm. What could you do in order cause the ice to sublime?

_____

15. How could you lower the boiling point of water? _____



16. Describe each phase change on the correct arrow in the diagram below:



17. Go to page 348 in your blue Modern Chemistry book and answer question #7