Chapter 13-14 Cumulative Practice: Solids, Liquids, Gases

Chapter 13: KMT/Manometers/Partial Pressure/IMF/Liquids & Solids/Phase Changes/Phase Diagrams

1. List the **four** assumptions/characteristics made by the kinetic molecular theory (KMT) of gases:

   a. _____

   _____

   b. _____

   _____

   c. _____

   _____

   d. _____

   _____

2. What are the **four** factors that determine the physical behavior of gases?

3. The greater the temperature, the more _____ energy a gas will have.

4. A change in volume of a gas will change the amount of _____ and pressure of that gas.

5. The force per unit area is known as _____.

6. List all the possible numerical **values AND its units** that can be used to describe 1atm pressure.

Pressure Conversions:

a. 412 mmHg = _____ atm

b. 760. KPa = _____ mmHg

c. 14.7 atm = _____ kPa

d. 101.325 psi = _____kPa

e. 18.4 atm = _____ mmHg

f. 383 Torr = _____ kPa

Manometers:

1. In a ***closed end manometer***, the mercury level is 690. mm higher on the closed end than on the gas side. What is the pressure of the gas in **kPa?**

2. ***Open end manometer***: atmospheric pressure is 760. mmHg, and the mercury level is 120. mm higher on the open end than the gas end. What is the gas pressure in **ATM?**

3. ***Open end manometer***: atmospheric pressure is 101 kPa, and the level of mercury is 75.0 mm higher on the gas end. What is the gas pressure in **mmHg**?

Dalton's Law of Partial Pressure:

1. Define ***Dalton's Law of Partial Pressure*** →

2. The total pressure in a closed container of three mixed gases is 76.6 kPa. The partial pressure of hydrogen in the mixture is 25.3 kPa and the partial pressure of oxygen is 32.3 kPa. The third gas in the mixture is methane; what is its partial pressure?

3. Find the total pressure **(in atm)** for a mixture that contains five gases with partial pressure of 54.3 kPa, 53.2 kPa, 35.9 kPa, 45.3 kPa, and 48.5 kPa.

4. What is the partial pressure of oxygen **(in mm Hg)** in a mixture of helium and oxygen if the total pressure is 543 mm Hg and the partial pressure of helium is 309 kPa?

Intermolecular (Interparticle) Forces:

1. For the following substances, identify the type of substance as either ***ionic, polar covalent, non-polar covalent, metallic, or network solid.***
2. Determine the intermolecular (interparticle) force for each type of substance: ***H-bonding (H-B), dipole-dipole (D-D), ion-dipole (I-D), London Dispersion Force (LDF), Network Covalent (NC), or Metallic (M).***
3. Rank the relative melting point for each substance from ***highest (1)*** to ***lowest (6).***
4. Rank the relative boiling point for each substance from ***highest (1)*** to ***lowest (6).***
5. Determine the conductivity for each substance: Choose from ***High, NONE, In Solution/Molten Liquid***
6. Determine the solubility for each substance: Choose from ***YES, NO, or Slight***

	Substance	Type of Substance	Strongest Interparticle Force	Relative Melting Point	Relative Boiling Point	Conductivity	Solubility
1)	PCl_5						
2)	H_2O						
3)	Fe_2O_3						
4)	BF_3						
5)	C (diamond)						
6)	Al						

Phase Changes & Phase Diagrams:

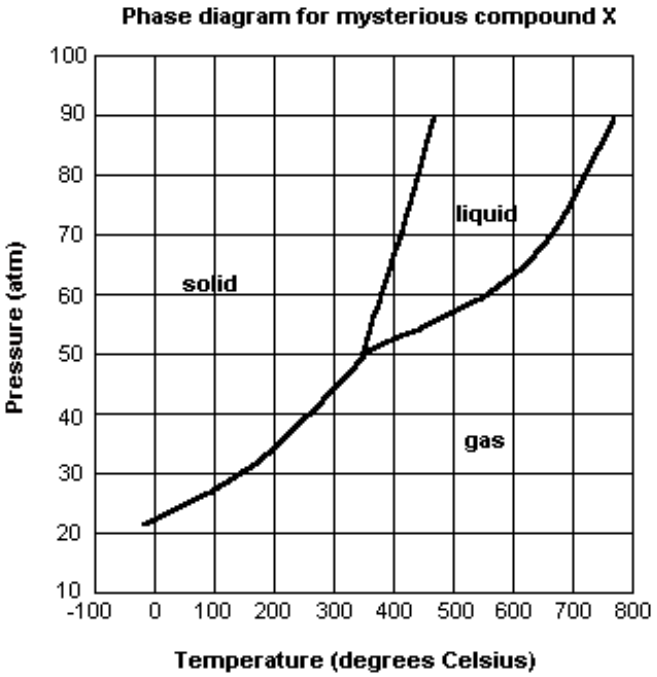
1. A phase change from a solid to a liquid is called _____.

2. The process by which a liquid changes to a gas is called _____.

3. Process by which a solid changes directly to a gas without becoming a liquid is called _____.

4. Temperature at which a liquid changes into a solid is called the _____ _____.
5. Process by which a gas becomes a liquid is called _____.
6. Process by which substance changes from gas to solid without first becoming a liquid is _____.
7. What does a ***phase diagram*** describe →
8. What is the ***triple point*** →
9. What is the ***critical point*** →

For each of the questions below, refer to the phase diagram for mysterious compound "X".



10. If you had a bottle containing compound "X " in your closet under STP, what phase would it most likely be in? Explain.
11. At what temperature and pressure will all three phases coexist?
12. 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? ***(Specify phase change.)***
13. If compound "X" is non-toxic, would you be able to drink it in the liquid form? Why or why not?
14. If I have a bottle of compound X at a pressure of 70 atm and temperature of 750^0 C, what will happen if I lower the temperature to 600^0 C? ***(Specify phase change.)***

Chapter 14: Gas Laws (5)/Avogadro's Law/Gas Stoichiometry/Real Vs Ideal Gases

1. Gases behave differently based on conditions of _____, _____, _____, and the _____ of a gas.

Boyle's Law Practice:

2. What is the formula for Boyle's Law?

3. Boyle's Law states that volume of a given amount of gas is _____ proportional with applied pressure.

4. What variable is kept constant in Boyle's Law? → _____

5. Air trapped in a cylinder fitted with a piston occupies 157.4 mL at 1.53 atm pressure. What is the new volume of air when the pressure is increased to 2.01 atm by applying force to the piston?

6. A balloon was inflated to a volume of 5.0 liters at a pressure of 0.90 atm. It rises to an altitude where its volume becomes 25.0 liters. What will be the new pressure?

7. A SCUBA diver inflates a balloon to 10.0 liters at the surface of the water, with air pressure of 1.0 atm, and takes it on a dive. At a depth of 100.0 feet the pressure increases to 4.0 atm. What was the new volume of the balloon?

Charles's Law Practice:

1. What is the formula for Charles's Law?

2. Charles's Law states that the volume of a gas is _____ proportional to the temperature.

3. What variable is kept constant in Charles's Law? → _____

4. What unit must be used for temperature in Charles's Law? → _____

5. The temperature inside my refrigerator is about 7°C. If I place a balloon in my fridge that initially has a temperature of 27°C and a volume of 0.95 liters, what will be the volume of the balloon when it is fully cooled by my refrigerator?

6. When 50.0 liters of oxygen at 20.0°C is compressed to 5.00 liters, what is the new temperature to maintain constant pressure?

7. A 50.0 mL soap bubble is blown in a 27.0°C room. It drifts out an open window and lands in a snow bank at 3.0°C. What is its new volume?

Gay-Lussac's Law Practice:

1. What is the formula for Gay-Lussac's Law?

2. Gay-Lussac's Law states that the pressure of a gas is _____ proportional to the temperature.

3. What variable is kept constant in Gay-Lussac's Law? → _____

4. What unit must be used for temperature in Gay-Lussac's Law? → _____

5. The pressure in an automobile tire is 1.38 atm at 25.0°C. What will be the pressure if the temperature warms up to 41.0°C?

6. A rigid plastic container holds 1.00 L methane gas at 670 torr pressure when the temperature is 25.0°C. How much more pressure will the gas exert if the temperature is raised to 48.5°C?

7. A sample of gas at 3.00×10^3 mmHg inside a steel tank is cooled from 500.0°C to 5.00°C. What is the final pressure of the gas in the steel tank

Combined Gas Law Practice:

1. What is the formula for Combined Gas Law?

2. Combined Gas Law states the relationship among what **three** variables? _____

3. What unit must be used for temperature in Combined Gas Law? → _____

4. A helium-filled balloon at sea level has a volume of 3.2 L at 1.32 atm and 39°C. If it is released and rises to an elevation at which the pressure is 1.01 atm and the temperature is 31°C, what will be the new volume of the balloon?

5. An unopened, cold 2.30 L bottle of soda contains 48.0 mL of gas confined at a pressure of 1.38 atm at a temperature of 5.6°C. If the bottle is dropped into a lake and sinks to a depth at which the pressure is 1.65 atm and the temperature is 2.39°C, what will be the volume of gas in the bottle?

6. A gas sample occupies 3.25 liters at 24.5°C and 1825 mmHg. Determine the temperature at which the gas will occupy a volume of 4.25 liters at 1750 mmHg.

Ideal Gas Law Practice:

1. What is the formula for Ideal Gas Law?
2. In the Ideal Gas Law, pressure can be expressed in what **three** units? → _____
3. The units for volume in the Ideal Gas Law must be _____.
4. The units for temperature in the Ideal Gas Law must be _____.
5. What does ***"n"*** represent in the formula? The ***"R"***? → _____
6. List the numerical values of "R" and its units that are used depending on which unit is used for pressure.
    a. atm = _____
    b. kPa = _____
    c. mmHg = _____
7. Calculate the volume that a 0.463 mol sample of a gas will occupy at 285 K and a pressure of 0.990 atm.
8. What is the pressure in atm of a 0.188 mol sample of helium gas at a temperature of 26.0°C if its volume is 0.701 L?
9. At what temperature would 2.10 moles of N_2 gas have a pressure of 1.25 atm and in a 25.0 L tank?

Gas Stoichiometry:

1. Ammonium sulfate, an important fertilizer, can be prepared by the reaction of ammonia gas and sulfuric acid to produce ammonium sulfate. Calculate the volume of ammonia (in Liters) needed at 20.0ºC and 25.0 atm to react with 150. kg of sulfuric acid (H_2SO_4).
2. Fritz Haber, a German scientist, discovered a way to synthesize ammonia gas (NH_3) by combining hydrogen and nitrogen gases at extremely high temperatures and pressures. If 10.0 kg of nitrogen combines with hydrogen at 550.ºC and 250. atm, what volume (L) of ammonia gas is produced?
3. Assume that 8.50 L of iodine gas (I_2) are produced, along with the production of potassium chloride, at STP, from the reaction of aqueous potassium iodide and chlorine gas, how many moles of iodine gas are produced?