Honors Chemistry Unit 7 – Gas Laws Notes

Kinetic Molecular Theory

1. List the five assumptions:

Assumption	Description	Extra Info
1		Basically means: the particles themselves have _____ _____ compared to the space between them!
2		Define elastic collision:
3		Gases are ALWAYS moving!
4		Gases behave like:
5		The _____ the temperature, the _____ the particles move.

2. Define Ideal Gas:

3. Contrast real and ideal gases:

Ideal Gases	Real Gases

4. Properties of Ideal Gases (what are they AND relate to the KMT)
    a. Expansion:

    b. Density:

    c. Fluidity

d. Compressibility:

e. Diffusion:

f. Effusion:

Pressure

1. Define Pressure:

2. How do we measure pressure? _____
3. Formula for pressure

4. Units of Pressure

5. Conversions:

6. Let's Try it!
    a. 4 atm to mmHg

    b. 567 mmHg to atm

    c. 200.5 kPa to atm

    d. 220.3 kPa to torr

Vapor Pressure

1. Define vapor pressure:

2. What happens to vapor pressure as temperature increases? Why?

3. When does liquid boil?

4. Define each:
    a. Volatile

    b. Nonvolatile

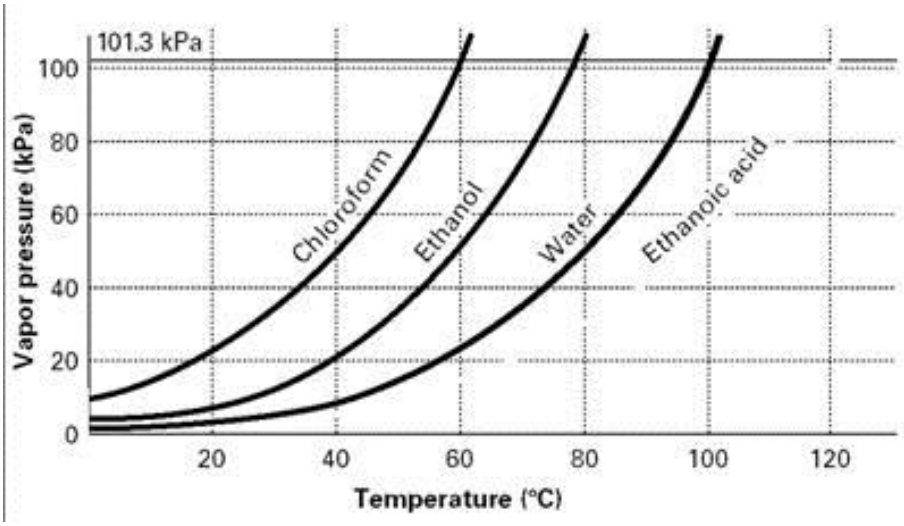
    c. Boiling/vaporization

    d. Evaporation

5. Vapor Pressure Curves
    a. Identify the normal boiling point for each substance

    b. Determine which substance is most and least volatile

    c. Determine which substance has the weakest forces of attraction and which has the strongest



Gas Laws

1. Define gas laws:

2. The behavior of gases are based on 4 factors:
    a. Pressure:

    b. Volume:

c. Number of Particles:

d. Temperature

3. Standard temperature and pressure (STP):

4. Absolute zero:

5. **Avogadro's Law:**
   a. At constant _____ and _____ equal _____ of gases contain the same number of _____.
   b. As amount of gas _____, volume _____.
   c. Relationship?
      Inverse or Direct
   d. Formula:

   e. Try it! A 12.2 L sample of gas at constant pressure and temperature contains 0.5 mol oxygen gas. If all of the oxygen gas is converted to ozone, what would be the new volume?

$$3O_2(g) \rightarrow 2O_3(g)$$

6. **Boyle's Law:**
   a. At constant _____, the _____ of a gas varies **inversely** with the _____.
   b. As volume _____, pressure _____.
   c. Formula:

   d. A sample of gas occupies 500. mL at 1.0 atm of pressure at constant temperature. If the pressure decreases to 0.50 atm, what will be the final volume?

   e. A sample of Neon gas occupies 0.220L at 0.860atm. What will be its volume at 29.2kPa?

7. **Charles' Law**:
    a. At a constant _____, the temperature of a gas varies **directly** with the _____.
    b. As volume _____, temperature _____.
    c. **YOU MUST USE _____ TEMPERATURE!**
    d. Formula:

    e. Try it! At constant pressure, 2.75 L of a gas is at 20.0˚C. If the temperature changes so that the gas occupies 1.87 L, what is the final temperature?

    f. A gas at 40.0˚C occupies a volume of 2.32L. If the temperature is increased to 75.0˚C, what will the new volume be if the pressure is constant?

8. **Gay-Lussac's Law**
    a. At constant _____, the _____ of a gas varies **directly** with the _____.
    b. As temperature _____, pressure _____.
    c. Formula:

    d. Try it! A gas at 1.8 atm and 23.0˚C increases to 2.5 atm. Assuming the volume does not change, what is the new temperature?

    e. If the pressure in a car tire is 1.88 atm at 25˚C, what will be the new pressure if the temperature warms to 37˚C?

9. **Combined Gas Law**
    a. Formula:

b. Try it! A gas at 110kPa and 30.0°C fills a flexible container with an initial volume of 2.00L. If the temperature is raised to 80.0°C and the pressure is increased to 440kPa, what is the new volume?

c. A gas at 0.974 atm and 25.0°C occupies a volume of 27.5 mL. What volume will the gas occupy at STP conditions?

10. **Ideal Gas Law**
    a. Formula AND what each letter stands for:

    b. Try it! What is the pressure in atm of a 0.108 mol sample of the gas at temperature of 20.0°C if its volume is 0.505L?

11. **Modifying the Ideal Gas Law**
    a. Modified formula for molar mass (M):

    b. Modified formula for density (D):

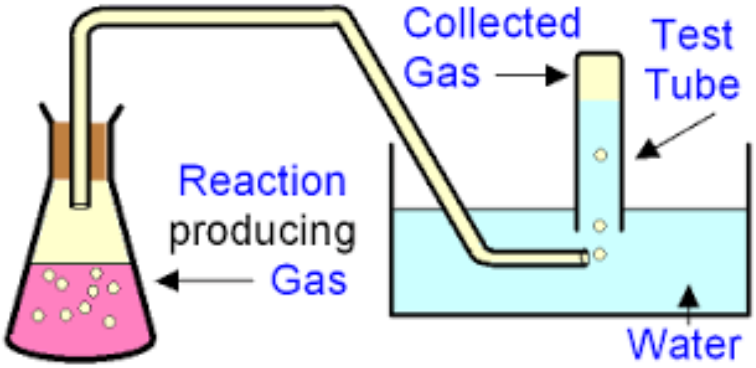
    c. Let's try it! A 273 mL container contains 0.750 g of a gas at 97.2 torr and 61.0˚C. What is the molar mass of the gas?

    d. What is the density of a gas with a molar mass of 58.0 g/mol at 25.0˚C and 102 kPa?

12. **Dalton's Law of Partial Pressure**
    a. Define partial pressure:

    b. The _____ of a mixture of gases is equal to the _____ of the partial pressures of each component in the mixture.
    c. Formula:

    d. Try it! If 3 moles of carbon dioxide has a partial pressure of 4.5 atm and the total pressure is 8.7 atm, what is the partial pressure of the other gases?
    e. Collecting gas over water



    f. Formula:

    g. Try it! Hydrogen gas is collected over water at 25°C. The atmospheric pressure is 765 mm Hg. The water vapor pressure at 25°C is 23.8 mm Hg. What is the pressure of the gas?

13. **Graham's Law of Effusion or Diffusion**
    a. The rate of diffusion (or effusion) is _____ related to the square root of its _____.
    b. The _____ the mass, the _____ the gas diffuses or effuses.
    c. Formula:

    d. Try it! Determine the relative rate of diffusion for krypton and bromine.

    e. A molecule of oxygen gas has an average speed of 12.3 m/s at a given temp and pressure. What is the average speed of hydrogen molecules at the same conditions?