Name _____ **Date** _____ **Grade** _____

Work Session 11: Gases

1. A gas has a volume of 24 L at 3.0 atmospheres. What will the volume at 2.0 atmospheres be (n and T constant)?

2. A gas has a pressure of 750 torr at 25°C. What will the pressure at -15°C be (V and n constant)?

3. A gas has a volume of 5.0 L when there are 0.15 moles of a gas present. What volume will be occupied when 0.55 moles are present (P and T constant)?

4. What is the volume of 25 grams of O_2 at 2.5 atmospheres and 25°C? Rework the problem using the equivalent pressure in torrs, and the value of R containing torrs as the pressure unit. You did get the same answer each time, didn't you?

5. A sample of gas in a 252 ml container weighs 0.755 g at 750. torr and 25.5°C. What is its molar mass?

6. What is the density of CH_4 at 23°C and 20.0 atmospheres? What is its density at STP? Solve the STP problem 2 ways: use the one mole occupies 22.4 L at STP relationship, and use the gas density equation.

7. A mixture of gases contains 5.00 grams of Ne, 5.00 grams of O_2, and 5.00 grams of CO_2. What is the mole fraction of each gas? What fraction of the total pressure of the gas mix is due to each gas? If the gases are in a 25.0 L container at 25°C, what is the total pressure?

8. For the reaction: $N_2(g) + 3\ H_2(g) \rightarrow 2NH_3(g)$
   a) If 2.5 liters of N_2 react with sufficient H_2, how many liters of NH_3 will form (P and T remain constant)?

   b) If the volume of N_2 given was measured at STP, how many grams of NH_3 would be produced?

9. Which gas, NH_3 or HCl, will diffuse faster? How many times faster?

10. It takes 12 hours for half of the He in a container to leak out. If the same container is refilled with Ne, how long will it take for half of the Ne to leak out?

11. Consider the gases CH_4, O_2, and CO_2, all at the same temperature. Arrange the gases in order of increasing average molecular speed. How does the average E_K of the gases compare? Draw the "fraction of the molecules vs molecular speed" curves for the three substance on the same grid.

12. Draw the "fraction of the molecules vs molecular speed" curves for O_2 at 300 K, 1000 K, and 2000 K on the same grid. Explain how it is possible that at 2000 K, some of the O_2 molecules are moving slower than some of the O_2 molecules at 300 K.

13. Explain how real gases differ from ideal gases. At what conditions do the variations become the biggest? At room conditions, if you know the condensation point for a series of gases, how will that allow you to predict which gases would vary most from being an ideal gas?