**Kinetic Molecular Theory – Supplemental Worksheet**

1. What assumptions do we make when using the ideal gas laws? Are the assumptions always true?

2. Consider 2 gases, A and B, each in a 1.0 L container with both gases at the same temperature and pressure. The mass of gas A in the container is 0.25 g and the mass of gas B in the container is 0.51 g.
   A. Which gas sample has the most molecules present?
   B. Which gas sample has the largest average kinetic energy?
   C. Which gas sample has the fastest average velocity?
   D. How can the pressure in the 2 containers be equal to each other since the larger gas B molecules collide with the container walls more forcefully?

3. Calculate the average kinetic energies of $CH_4$ and $N_2$ molecules at 5°C and 112°C.

4. Calculate the root mean square for nitrogen (g) at 217°C, helium (g) at 75°C, and xenon (g) at 27°C.

5. A 100 L flask contains a mixture of methane and argon at 27°C. The mass of the argon present is 245 g and the mole fraction of methane in the mixture is 0.623. Calculate the total kinetic energy of the gaseous mixture.

6. True or False in regards to the Maxwell-Boltzmann distribution

A. The distributions are symmetrical
B. The more massive the particle the faster the velocities.
C. The lower the temperature the slower the average velocity.
D. Broader distributions are caused by higher temperatures and heavier particles.

7. Draw examples and explain effusion and diffusion.

Note for problems #8 & 9

Graham's law of effusion states that the rate is inversely proportional to the square root of the mass of its particles.

$$\frac{Rate\ of\ effusion\ for\ \ gas\ 1}{Rate\ of\ effusion\ for\ gas\ 2} = \frac{\sqrt{M_2}}{\sqrt{M_1}}$$

8. Freon-12 is used as a refrigerant in central home air conditioners. The rate of effusion of Freon-12 to Freon-11 ( molar mass = 137.4g/mol) is 1.07:1. The formula of Freon-12 is one of the following: $CF_4$, $CF_3Cl$, $CF_2Cl_2$, $CFCL_3$, or $CCl_4$. Which formula is correct for Freon-12?

9. The rate of effusion of a particular gas was measured to be 27.2 mL/min. Under the same conditions, the rate effusion of pure methane gas ($CH_4$) is 47.8mL/min. What is the molar mass of the unknown gas?