

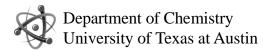
Kinetic Molecular Theory – Supplemental Worksheet

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.

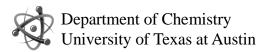
7. Draw examples and explain effusion and diffusion.

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: CF₄, CF₃Cl, CF₂Cl₂, CFCL₃, or CCl₄. 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?