CHEM 101 *Dr. Al-Saadi*

Work Sheet # 6

(Kinetic Molecular Theory and Real Gases)

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1) (a) Do all molecules in a 1-mol sample of $CH_4(g)$ have the same average kinetic energy at 273 K?

(b) Do all molecules in a 1-mol sample of N_2 have the same velocity at 500 K?

2) Calculate the average kinetic energies of CH_4 and N2 molecules at 273 K and 546 K. Also calculate the root mean square velocities of CH_4 and N2 molecules at 273 K and 546 K

3) A 100.-L flask contains a mixture of methane and argon at 25°C. The mass of argon present in 228 g and the mole fraction of methane in the mixture is 0.650. Calculate the total kinetic energy of the gaseous mixture?

4) Consider two 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 0.34 g and the mass of gas B in the other container is 0.48 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 two containers be equal to each other since the larger gas B molecules collide with the container walls more forcefully?

5) Freon-12 is used as a refrigerant in air conditioners. The rate of effusion of Freon-12 to Freon-11 (molar mass = 137.4 g/mol) is 1.07:1. The formula of Freon-12 is:

(a) CF_4.
(b) CF_3Cl.
(c) CF_2Cl_2.
(d) $CFCl_3$.
(e) CCl_4.

6) It took 4.5 minutes for 1.0 L helium to effuse through a porous barrier. How long will it take for 1.0 L of Cl_2 gas to effuse under the same condition?

7) Calculate the partial pressure of helium in dry air assuming that the total atmospheric pressure is 1.0 atm. The mole fraction of helium in atmosphere is 5.24×10^{-6}. Assuming the temperature is 25°C, calculate the number of He atoms in one cubic centimeter.