**Chemistry 1a – 2011. Unit 2, Homework No. 2: Kinetic Gas Theory**

Date issued: Tuesday, October 11, 2011. This homework is due on or before October 19, 5:00 pm. Late homework assignments will not be graded. Solutions will be available one day after the due date.

1. Which is the greater speed, that of a bullet fired from a high-powered M-16 rifle (2180 mi/h) or the root-mean-square speed of H2 molecules at 25oC?

2. If 2.2 × 10-4 mol N2 (g) effuses through a tiny hole in 105 s, then how much H2 (g) would effuse through the same hole in 105 s?

3. A sample of Kr(g) escapes through a tiny hole in 87.3 s. The same amount of an unknown gas escapes in 42.9 s under identical conditions. What is the molar mass of the unknown gas?

4. Calculate the intermolecular collision frequency and the mean free path in a sample of He (g) with a volume of 5.0 L at 27 oC and 3.0 atm. Assume that the diameter of a He atom is 50. Pm.

5. A 2.650 g sample of a gaseous compound occupies 428 mL at 24.3 oC and 742 mmHg. The compound consists of 15.5% C, 23.0 % Cl, and 61.5 % F, by mass. What is the molecular formula of the gas?

6. Use the van der Waals equation to calculate the pressure exerted by 1.00 mol Cl2 (g) confined to a volume of 2.00 L at 273 K. The value of *a* = 6.49 L2atm mol-1, and that of *b* = 0.0562 L mol-1. Compare this value to the one obtained using the ideal gas equation. Repeat the calculations using CO2 (*a* = 3.66 L2atm mol-1, and that of *b* = 0.0427 L mol-1). Which of these gases show the greatest departure from ideal behavior? Explain.