Unit 3.5
Kinetic Molecular Theory

1. A rigid 1.0 L cylinder contains 1.0 moles of O_2 gas at 25.0°C and another rigid 1.0 cylinder contains 1.0 moles of CH_4 gas at 25°C. Is the average speed of the O_2 gas particles greater than, less than or the same as the average speed of the CH_4 gas particles? Justify your answer.

2. According to kinetic molecular theory, does a gas molecule move slower after it bounces off of the wall of a container? Explain.

3. What assumption does the ideal gas law make about the volume of gas particles in a system? Explain.

4. According to kinetic molecular theory, when two gas particles that share the same molar mass collide, is the sum of their velocities after the collision less than, equal to or greater than the sum of their velocities before the collision? Justify your answer.

5. A gaseous system is kept at 25°C. A chemist slowly increases the temperature of the system until it reaches 50.0°C. Did the average kinetic energy of the gas particles in the system double when the chemist did this? Justify your answer.

6. Suppose you have two identical 1.0 L sealed containers. Both containers are kept at exactly 25°C. One vessel contains only neon gas at 1.5 atm and the other contains only xenon gas at 2.5 atm.

    (a) Is the average kinetic energy possessed by the neon atoms greater than, equal to or less than that of the xenon atoms? Explain.

    (b) What variable must be changed in order to decrease the average kinetic energy of the xenon atoms?

    (c) Does the vessel with the xenon gas contain more, fewer or the same number of gas particles as the vessel of neon gas? Explain.