

**Intermolecular Forces and Properties**  
**3.5 Kinetic Molecular Theory**  
**Worksheet**

- 1) A ridged 1.0 L cylinder contains 1.0 moles of  $O_2$  gas at  $25.0^\circ C$  and another ridged 1.0 L cylinder contains 1.0 moles of  $CH_4$  gas at  $25.0^\circ C$ . 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) According to kinetic molecular theory, when two gas particles that have different molar masses collide, is the sum of their velocities after the collision always going to be the same? Justify your answer.
- 6) A gaseous system is kept at  $25.0^\circ C$ . A chemist slowly increase the temperature of the system until it reaches  $50.0^\circ C$ . Did the average kinetic energy of the gas particles in the system double when he did this. Justify your answer.
- 7) Suppose you have two identical 1.0 L sealed containers. Both containers are kept at exactly  $25^\circ C$ . 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 contains more, fewer, or the same number of gas particles as the vessel of neon gas? Explain.
- 8) Suppose you have two identical 2.0 L cylinders. Both cylinders are kept at exactly  $25^\circ C$ . One cylinder contains 0.250 moles of helium, and the other contains 0.250 moles of krypton. The volumes of these cylinders can change.
  - a. Explain why these two gases do not share the same velocity under these conditions.
  - b. What variable must change in order to increase the average velocity of the molecules in either cylinder? Explain.