Name(s) _____

Worksheet: Molecules in Motion

http://chemconnections.org/Java/molecules/index.html

This workshop uses a computer simulation of gas behavior that follows kinetic molecular theory. In this simulation two containers of gas molecules are adjacent to each other. No heat is transferred between the two containers (That is, the containers do not change temperature during the simulation). You can vary the temperature, the mass of the gas molecules, and the number of gas molecules for each container. Once set, these variables will remain constant for the container. Only the pressure will change.

1. Start with the following conditions in each container.

	Red Particles	*Blue Particles*
Temperature(K)	273	273
Mass (amu)	40	40
Number of particles	80	80

a) Is the pressure the same in the two containers? If not, which is higher?

b) Change the amu of the red particles to 160 amu. Leave the others the same. How did the pressure in the red container change?

c) What happened to the velocity of the red particles?

d) What would be the effect on the kinetic energy of the red particles?

e) Explain how this relates to the pressure change of the container.

f) Consider two containers of gas, one containing carbon dioxide molecules and the other containing helium atoms, each has the same number of particles, the same temperature, and the same size containers. What would these conditions and the results above predict about the relative pressure within the two containers? Test your prediction with the model.

2. Set the two containers to the following conditions:

	Red Particles	*Blue Particles*
Temperature(K)	273	273
Mass (amu)	40	40
Number of particles	40	80

   a. Compare the pressure in the two containers. Explain the pressure result using kinetic molecular theory.

   b. Write a mathematical equation relating the number of molecules (moles) to pressure at constant temperature and volume. Briefly explain in plain words the meaning of the equation.

3. Set the two containers to the following conditions:

	Red Particles	*Blue Particles*
Temperature(K)	273	546
Mass (amu)	40	40
Number of particles	80	80

   a. Compare the pressure in the two containers. Explain the pressure result using kinetic molecular theory.

   b. Write a mathematical equation relating kinetic energy of the particles to their temperature.

4. Write a mathematical equation relating the velocity of particles to their mass at constant temperature. Briefly explain in plain words the meaning of the equation.

5. Calculate the root mean square velocity for a carbon dioxide molecule at 273 K. The thermodynamic constant R = 8.31451 J/K mol. Show your calculation.