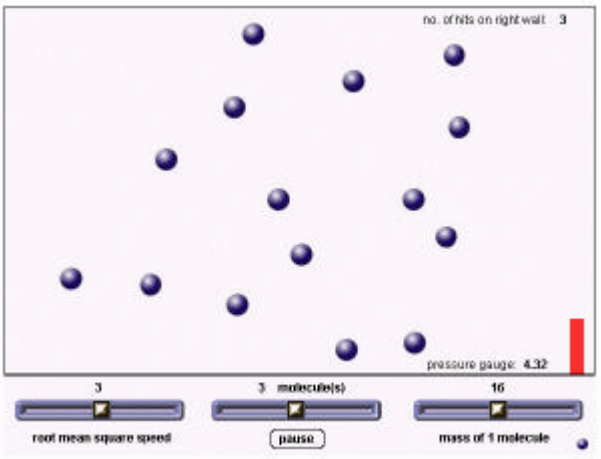
WORKSHEET : KINETIC THEORY



Tweak the variables, explore and have fun.

- Which basic assumptions of an ideal gas are illustrated here? If the collisions are elastic, and the molecules are identical, how is it reflected in the collisions?(It will be helpful to observe only 2 particles at low speeds.)
- See if you can get a pressure of 37.44 on the gauge. Is there only one solution?
- Determine how the pressure of a gas depends on the 3 parameters shown. It is helpful to keep the other 2 quantities fixed as you vary the one under investigation. Is it necessary to know the units?
- Why do you think the number of hits is recorded for *one* wall only? How is this number related to the pressure? When you increase the mass, and leave the other variables untouched, the pressure increases, though the frequency of hits remains the same. Is anything wrong here?
- Notice that the root mean square, which represents an average kind of speed, is used. How can we tell that it is an average kind of speed just by looking at their motions?
- From the ideal gas equation PV = μRT , and the relation between pressure and the root mean square speed that you have discovered from above, derive a relation between the temperature of the gas and its root mean square speed.
- The range of speeds is from 1 to 10, what range in temperatures do you think this represents?
- Write down the kinetic energy of a molecule. Suppose they all move with slightly different speeds, obtain an expression for the mean of the kinetic energies.
- Why do you think that the concept of root mean square speed is more significant than the mean speed?
- What do you think happens in the real world to make the molecules move faster?
- What is the difference between this and the real world?

Bugs? Comments?
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Notes:

$$c_{rms} = \sqrt{< c^2 >} = \sqrt{\frac{c_1^2 + c_2^2 + c_3^3 + \ldots\ldots c_N^2}{N}}$$

where N = no. of molecules