**Phet Simulation: Gas Properties** Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_<http://phet.colorado.edu/en/simulation/gas-properties>

First, pump some heavy species gas into the tank. Keep an eye on the “Gas in Chamber” reading for the Heavy Species (number of gas molecules). Pump until you have about 200 molecules (this number does not have to be exact at all). Under the Tools & Options, click Measurement Tools and select Energy histograms. In the newly opened Particle Statistics window, click more details to see more graphs.

1. Use Heat Control under the chamber to add heat to the gas. Watch how the motion of the particles and the histograms change as the temperature increases. Draw the rough shapes of the number of particles as a function of speed graphs for a lower temperature and a higher temperature in the same box below. If you heat the gas too much, the lid on the top of the chamber will open. If this happens before you are done with this part, just click Reset and start over.   
   It can be a good idea to   
   use two different colors number of particles  
   to plot your graphs - one  
   for each temperature.

Higher temperature = \_\_\_\_\_\_\_, Color \_\_\_\_\_\_\_\_\_

Lower temperature = \_\_\_\_\_\_\_, Color \_\_\_\_\_\_\_\_\_

speed

List important differences you notices between the 2 temperatures:

1. Now remove a lot of heat from the gas and watch how the motion of the particles and the histograms change as the temperature decreases. Get the temperature down to 0K (it’s actually almost 0K not exactly 0K). Briefly describe your observation:
2. Now add heat to the gas and observe the molecules. Heat it up to about 300K. You should notice that it took a while for the temperature to go from 0K to a few Kelvins, but once the temperature gets to more than a few Kelvins, the gas heats up a lot faster. (The same also happens when you cool the gas down from a few Kelvins to 0K.) Why does that happen?

**(MORE ON THE NEXT PAGE!)**

1. 4.1. So far, we have only made observations under zero gravity. Now let’s slowly increase Gravity. Pay attention to the molecules, the histograms, the thermometer, and the pressure gauge. Record your observation.
   1. Now repeat the above in #4 for a much lower starting temperature:

First decrease Gravity to zero and lower the temperature to 2K or lower. Then slowly increase Gravity. Pay attention to the molecules, the histograms, the thermometer, and the pressure gauge. Record your observation.

Explain your observations in 4.1. and 4.2.

5. Now click Reset. (Gravity is off again.) Add the same number of Heavy Species and Light Species molecules into the chamber (say, about 200 molecules for each kind). (You have to add the two species separately.) Compare the histograms for the heavy and the light species. Draw the rough shapes of the number of particles as a function of speed graphs for heavy and light species.

number of number of   
 particles particles   
 (heavy) (light)

speed speed

Identify the difference(s) between the 2 graphs.

Explain why there is/are such difference(s).