

Mini-Lab: Kinetic Theory & Gas Laws

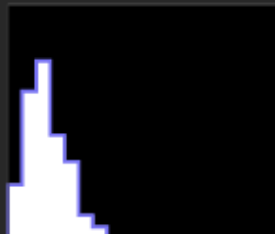
1. Run PhET Gas Properties and choose the third scenario – Energy.
2. Use the pump to put some heavy particles in the container – somewhere between 50 to 150 particles should be fine.
3. Activate all of the tools and “check boxes”.
4. Use the data: (a) determine the mass of each “heavy” atom. Is it close to that of a certain element? (b) determine the volume of the container and compare to the width – is it reasonable?
5. Experiment changing P , V , N , & T . Make a specific observation of each type of relationship between these variables. (*e.g.* doubling the pressure causes volume...)

Average Speed

463 m/s

Speed

Number of Particles

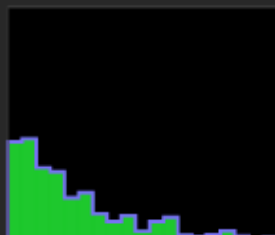


Speed



Kinetic Energy

Number of Particles



Kinetic Energy



300 K



14.5 atm

Width

Stopwatch

Particles

Collisions

Heavy

126

Light

0

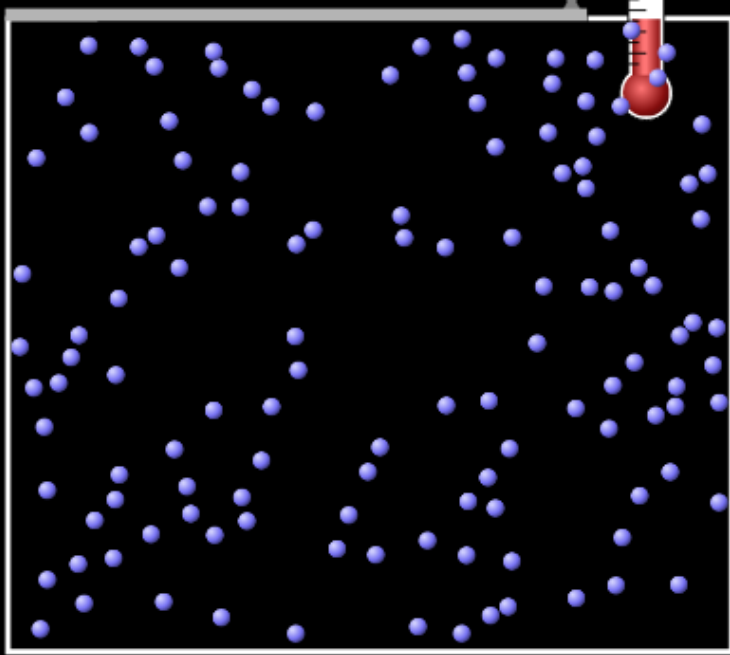
Injection Temperature

Match Container

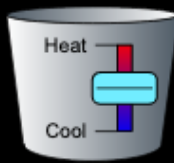
Set to:

300 K

50 1000



10.0 nm



1. Reset the simulation and experiment with the light particles and determine the simulated mass of these atoms.
2. Now try a mixture of light and heavy particles. Look closely at the simulated particles – try following one of each type as it randomly moves around.
3. Describe the resulting distributions of speeds shown in the histograms – which atoms are moving faster? Why? Are there any heavy particles that move as fast as the light particles? How about vice versa? How are the kinetic energy distributions different?
4. Try verifying $K = 3/2 kT$ and $PV = NkT$ with *either* type of particle and with a *mixture* of types.

Average Speed

- 450 m/s
- 1208 m/s

0.00 ps

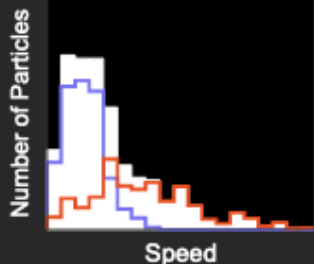


300 K

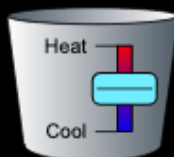
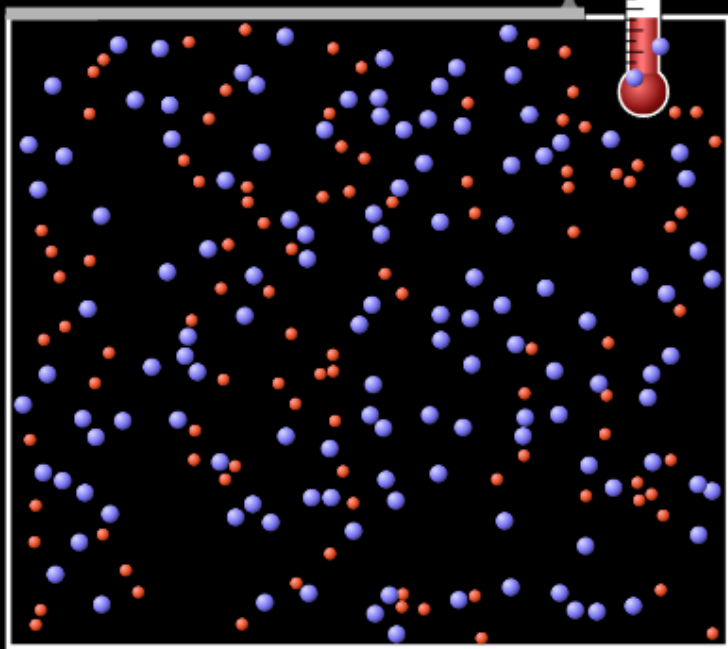
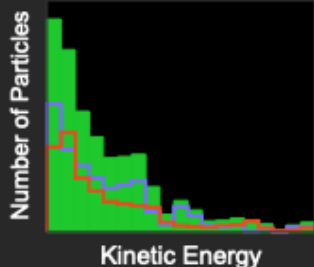
Width

Stopwatch

Speed



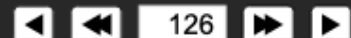
Kinetic Energy



Particles

Collisions

● Heavy



● Light



Injection Temperature

Match Container

Set to:

