Name _____

PhET Simulation: Gas Properties

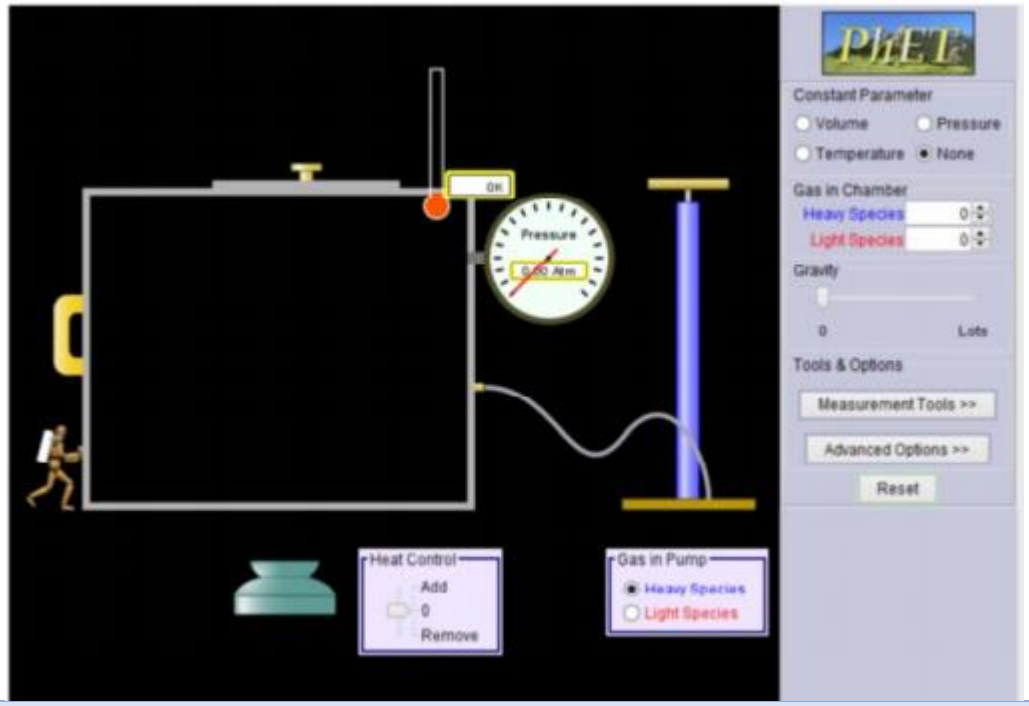
Complete the text boxes below.

Postulate 1

Gases are very small molecules and their size is insignificant compared to the space around them.

When you open the simulation, you should not see any gases in the box. If you do, click Reset. Your goal in this section is to determine what postulate 1 means.

1. Set your beginning parameters as shown below.



2. Lift the tire pump all the way up and give it one pump down.

3. Looking at what is happening inside the box, explain what would happen to a person in the box who was trying to walk from left to right.

4. Now consider postulate 1, Gases are very small molecules and their size is insignificant compared to the space around them. Does this make sense given your description of what would happen to the person? Explain.

5. If you had to design the simulation so that postulate 1 would be very easy to see, what would you change? (Hint: Why is it that we as humans can walk outside and not feel the constant bombardment of gaseous oxygen and nitrogen molecules from air, hitting our bodies?)

Postulate 2

Gas molecules move in straight lines at different speeds.

1. Continue to use the same gas molecules in the box as you did for postulate 1. (In other words, don't add any more gas molecules yet, or changes any parameters.)
2. Look at the motion of the particles. Are they moving in straight lines and do they appear to be moving a different speed? Why do you think gas particles move at different speeds?

3. Reset the simulation. Move the tire pump handle very, very, little. Your goal is to try and get only gas particle in the box. Watch the motion of this gas particle. Does its speed change as it hits the walls of the container?

4. Just for fun, increase or lower the temperature and see if this makes the gas particles curve. Try to predict what is going to happen prior to changing the temperature. To change the temperature, move the slider on the heat control up or down.

5. Now add one more gas molecule. If you are lucky, they will hit each other. When they collide, can you tell if there is a difference in speed? Do they continue to move in straight lines?

Postulate 3

The intermolecular force between gas molecules is negligible, except at the moment they collide.

1. First off, remember that an intermolecular force is something that attracts molecules to one another.

2. Put at between 10 and 20 gas molecules into your box.

3. Follow the motion of just one gas molecule for the moment. At any point in time, except when it is hitting another molecule or the walls of the container, does it appear to be attracted to other molecules? Describe why or why not. Be specific in your description**.**

4. I think you will see that this postulate is very much related to postulate 2, in that the straight-line travel of gas particles does happen, because molecules are not attracted to one another.

Postulate 4

When gas molecules collide, their collisions are elastic.

1. What does elastic mean? Many of us think of the elastic waist band on our pants, sweat pants, or those crazy stretch pants that athletes often wear. Answer the following question….What makes something elastic?

2. Now let's approach this from a different angle, what would happen if you were wearing elastic pants and they stopped being elastic?

3. Now that we know what happens when something isn't elastic, let's relate it to the gas molecules bouncing around on our computer screen. What would happen if the collisions were not elastic?

4. In the kinetic molecular theory, unlike with a bungee cord drop, these collisions are elastic and transfer 100% energy. The overall energy stays constant, but each particle can change and have different energies after each collision.

5. For fun, see if you can vary the volume, temperature, or pressure and make the collisions inelastic.

Postulate 5

The average kinetic energy is directly related to the absolute temperature.

1. Put 30 or more molecules in the box
2. Increase the heat by moving the heat control slide to add. What happens to speed of the molecules?
3. Click on measurement tools
4. Click on energy histograms.
5. Observe the top graph which shows the kinetic energy of the particles. Describe what happens to the energy. What is meant by average kinetic energy as you look at this graph?
6. Now cool the particles. Does the average kinetic energy increase or decrease?
7. Grab the handle on the left side of the box and push it slowly to the right. Here, you are decreasing the volume. What happens if you decrease the volume too far?