Phet- Gas Particle Behavior Instruction Page

Part 1: learning the simulation

1. Start on the “Intro Screen”
2. Play around with the simulation to figure out what all can be clicked and what might happen when you select different things.
3. Answer the questions on your answer sheet.

Part 2: Gas Particles Simulation

4. Put 50 particles of Heavy (blue) into the container ROOM TEMPERATURE (27^{o}C).
5. Describe the speed, motion, and collisions of the particles in your data table.
6. Count the wall collisions by hitting the green play button on the “Wall Collision” box in the top left. It will run for 10 picoseconds. Record this value in your data table next to ROOM TEMPERATURE.
7. Repeat two more times, then average your three trials together and put your answer in the box labeled “average wall collisions.”
8. Record the pressure reading in atmospheres (atm), located in the gauge in the top right.

9. Using the same pump of air from above, Add heat to the box of air by dragging the marker up towards “Heat,” until the temperature reaches between 190 and 200^{o}C.
10. Count the wall collisions by hitting the green play button on the “Wall Collision” box in the top left. It will run for 10 picoseconds. Record this value in your data table next to INCREASE TEMPERATURE.
11. Repeat two more times, then average your three trials together and put your answer in the box labeled “average wall collisions.”
12. Describe the speed, motion, and collisions of the particles in your data table next to INCREASE TEMPERATURE.
13. Record the pressure reading in atmospheres (atm), located in the gauge in the top right.

14. Repeat the same procedure as above, but for (-190 to -200^{o}C) as your DECREASED TEMPERATURE and -273^{o}C as your ABSOLUTE ZERO.

15. Repeat steps 4-14, but for light particles instead of heavy particles.

Name _____ Date _____ Hr ___

Phet- Gas Particle Behavior Answer Page

Part 1: learning the simulation questions:

1. Blue particles are _____ while red particles are _____.
2. What are the two possible units for temperature in the simulation?

3. What are the two possible units for pressure in the simulation?.

4. What does checking the width, stopwatch, and collision counter boxes add to your screen?

5. What does using the air pump do?

6. What does dragging the marker up and down on the heat/cool bucket do? (You should list THREE things that it can change)

Part 2: Gas Particles Simulation data:

Heavy Particles

Scenario	Actual Temperature in ^{o}C	Wall Collisions			Average Wall Collisions	Pressure (atm)	Description of Particle Movement
Room Temperature							
Increased Temperature							
Decreased Temperature							
Absolute Zero							

Light Particles

Scenario	Actual Temperature in ^{o}C	Wall Collisions			Average Wall Collisions	Pressure (atm)	Description of Particle Movement
Room Temperature							
Increased Temperature							
Decreased Temperature							
Absolute Zero							

Name _____ Date _____ Hr ___

Phet- Gas Particle Behavior Follow up Questions

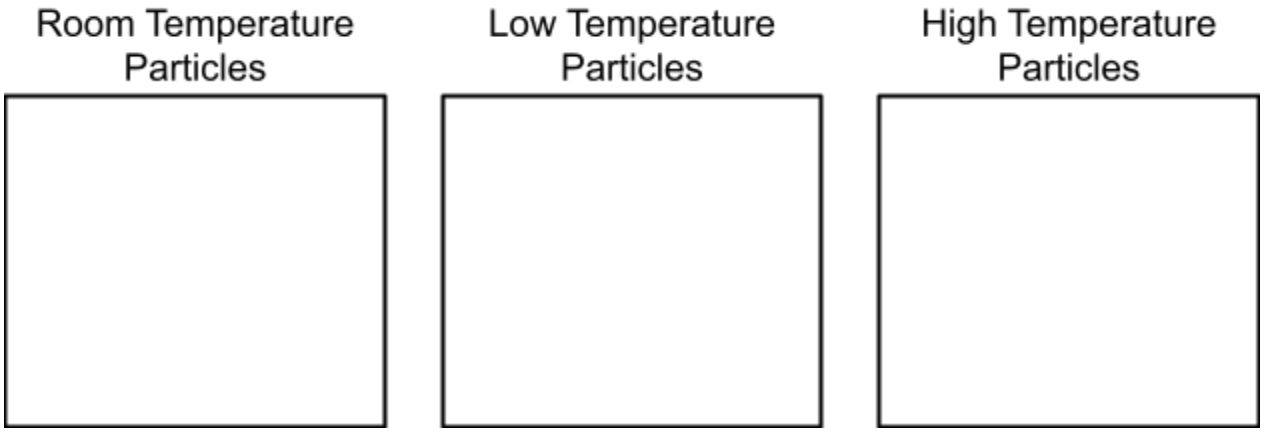
1. Variables/Constants
    a. What aspects in the blue particle experiment were kept constant? (List 2)

    b. What aspect in the blue particle experiment did we change? (Independent variable)

    c. What aspects in the blue particle experiment changed as a result of our alterations? (Dependent variable)

    d. What aspect did we change from one experiment (blue particles) to the next (red particles)? (secondary variable)

2. Draw a particle diagram showing the ROOM temperature particles, low temp Particles, and high temp. Use arrow size and thickness to indicate speed. (larger arrow/thicker arrow means faster)



3. Based on the images you drew in question #2, what is the relationship between the KINETIC ENERGY (motion) of the particles and the temperature of the particles?

4. Look at the Wall collisions; what was the relationship between temperature and Wall collisions? Explain, why does this make sense?

5. Look at your pressure data; how do the wall collisions and the pressure readings compare? Is there a relationship between the two? If so, what is the relationship?

6. Based on your answer to #5, what would be a good definition of Pressure in terms of gas particles and wall collisions?

7. How do temperature and pressure compare in your charts above? Is there a relationship between these variables?