Gas Properties Simulation

Introduction: In this simulation, you will explore the relationship of volume, temperature, and pressure in a gas. You will also discover how concentration and temperature affect the rate of diffusion of gases.

1. Follow the link on Canvas to open the “Gas Properties” Simulation.

2. Click the “Ideal” tab.

Part 1: Gas Properties – Temperature, Pressure and Volume

3. In this part of the lab, you will explore how gases behave when you change the temperature and volume of a system.

4. Look at the different parts of the simulation. Notice the Pressure Gauge, the “Heat/Cool” Bucket, the thermometer and the pump.

5. Click on the drop-down box above the thermometer and change the temperature units from °K to °C.

7. Click and drag the handle on the tire pump one time. What happened in the simulation when you did this?

8. Now that there is matter in the box, there will also be a temperature and a pressure. Look at the pressure gauge and the thermometer. Record the temperature and pressure below.

Temperature \_\_\_\_\_\_\_\_\_\_\_\_ Pressure \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

9. Use the “Heat/Cold” bucket to raise the temperature in the box. Click and hold the slider over the “Heat”. What happened to the pressure in the box when you raised the temperature? Record the pressure once it stabilizes.

Pressure \_\_\_\_\_\_\_\_\_\_\_

10. Look the box that contains the gas particles. Use the handle to make the box about half as big. What happened to the pressure of the gas when you decreased the volume of the box? Record the pressure once it stabilizes.

Pressure \_\_\_\_\_\_\_\_\_\_

 11. Slide the handle at the top of the box to open it. What happens to the gas molecules? Why does this happen?

12. As the gas particles leave the box, what happens to the temperature and pressure in the box?

13. Use the yellow button in the bottom right corner to reset the simulation.

14. Click and drag the tire pump 5 times. What happens to the pressure when there are more particles in the box?

15. On the right side of the screen, click the box for the “Collision Counter”. Click the play button to record the number of times the gas particles collide with the wall.

Number of Collisions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

16. Now click and drag the pump 5 more times. Click the play button and record the number of collisions. What relationship is there between pressure and the amount gas in a container?

Number of Collisions \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Part 2: Diffusion of Gases

Review: Gases will spread themselves out so that they evenly fill any container they are in. This is called diffusion. In this part of the lab, you explore the effect of temperature and pressure on the rate of diffusion.

17. Now click on the “Diffusion” tab at the very bottom of the window.

18. Look at the different parts of the simulation. We will use the Stopwatch, the “Number of Particles”, and the “Initial Temperature” controls.

19. Set the number of blue to 10. Describe the motion of the particles. (Are they moving fast or slow? Are they all clumped together or spread out?)

20. Click the blue Pause button at the bottom right. Next, click the green “Remove Divider” button in the controls box.

21. Click the blue Play button at the bottom right corner. What do the blue particles do when you remove the barrier?

22. Use the yellow Reset button to reset the simulation.

23. Set the number of blue and red particles to 10. Change the initial temperature of the blue particles to 500 K and the red particles to 50 K. Compare the movement of blue and red particles.

24. Do the blue or red particles have more kinetic energy? Explain your reasoning.

Post Simulation Questions

25. How does increasing the temperature of a gas affect its kinetic energy?

26. If you decrease the volume of a gas, what happens to the amount of pressure in the gas?

27. Explain what “Diffusion” is in your own words. What factors affect the rate of diffusion?