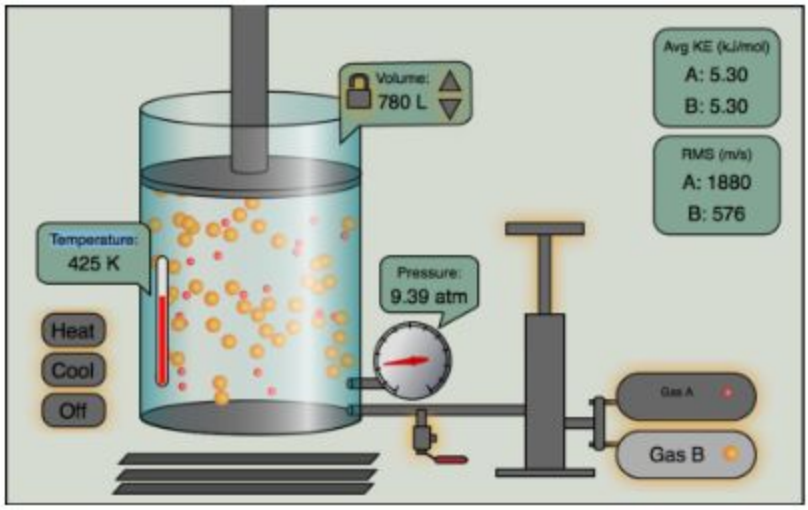
Name: Date:

Behavior of Gases Lab Simulation:

- ☐ Go to http://ch301.cm.utexas.edu/section2.php?target=gases/kmt/gas-simulator.html OR type "Chem 301 Gas law simulator" into Google and click on the first link
- ☐ Click on the bottom image to open up the simulation. Familiarize yourself with all of the controls on the simulation



- ☐ Click on the valve to let all the gas out of the container

1. Click the pump once to put Gas A into the container.

(To answer the following questions, keep your eye on one particle and notice how it moves.)

2. How do the particles move? (straight line, circular, random, etc.)

3. Do the particles stay at a constant speed?

4. Do they always move in the same direction?
5. If not, what causes their direction to change?
6. Are the particles attracted to each other?
7. Are the particles repulsed by each other?

- ☐ Deselect Gas A and Select Gas B. Only Gas B should be highlighted
- ☐ Click on the pump once to add Gas B to the container. Make sure temperature is still at 325K
- ☐ Look at the RMS(m/s) velocity for each gas in the top right. This represents how fast each type of gas molecule is moving

8. Record the following information:

Gas	Speed of particles (RMS Vel) m/s
Gas A	
Gas B	

9. Which gas is moving faster?

10. Come up with an explanation for why the gas from Question #9 moves faster than the other gas:

☐ Cool the container until the temperature is 200K

11. Record the following information:

Gas	Speed of particles (RMS Vel) m/s
Gas A	
Gas B	

☐ Heat the container until the temperature is 350K

12. Record the following information:

Gas	Speed of particles (RMS Vel)
Gas A	
Gas B	

13. How does the temperature and speed of the particles relate to each other?

Gas Pressure:

☐ Refresh the webpage to reset all the settings. Make sure the pressure starts at 1atm.

14. There are several factors that affect the pressure that a gas exerts on a container. Explore the simulation to discover at least two factors that **INCREASE** the pressure. Record your observations in the following table:

	What did you do to increase the pressure?	**WHY do you think this increased the pressure? (What changed about the particles?)**
Method #1:		
Method #2:		

☐ Refresh the webpage to reset all the settings.
☐ Click on the valve to drain all of the gas particles from the container

15. Complete the tasks outlined in the following table and record your observations. Drain the gas from the container after completing each task.

Pressure of ONE PUMP of Gas A alone	Pressure of ONE PUMP of Gas B alone	Pressure of ONE PUMP of each gas (one pump of Gas A, one pump of Gas B)

16. Did the size of the particle have an effect on the pressure it exerted on the container? Explain

17. How does the pressure exerted by each INDIVIDUAL gas compare to the pressure exerted by the combination of both gases?

Gas Laws: Relationships between Volume, Pressure and Temperature

- ☐ Refresh the webpage to reset all of the settings on the simulation.
- ☐ Keep the temperature at 325K – DO NOT CHANGE THIS!

18. Complete the tasks outlined in the table below and record all of your observations:

	Pressure	Volume	Temperature	RMS Velocity
Original Settings	**1 atm**	**800L**	**325K**	**1644 m/s**
Change volume to 1000L		**1000L**	**325K**	
Change volume to approximately 500L		**500L**	**325K**	
Change volume to approximately 250L		**250L**	**325K**	

19. Complete the following two sentences by highlighting the correct word:

- If temperature is kept constant, the pressure of a gas (increases/decreases) as the volume of the gas *increases*.
- If temperature is kept constant, the pressure of a gas (increases/decreases) as the volume of the gas *decreases*.

20. When the volume was cut in half (from 1000L to 500L, or from 500L to 250L), how much did the pressure change?

21. When you changed the volume of the gas, did the speed of the particles (RMS Vel) change?

22. Why do you think this happened (or didn't happen)?

23. Do you think you would see the same type of results in your data table if you used Gas B instead of Gas A? Why or why not?

- ☐ Refresh the webpage to reset all of the settings on the simulation.
- ☐ Click on the lock next to the arrows under "Volume" to keep the volume constant.

24. Complete the tasks outlined in the table below and record all of your observations:

	Pressure	Volume	Temperature	RMS Velocity
Original Settings	**1 atm**	**800 L**	**325K**	**1644 m/s**
Change temperature to 200K		**800 L**	**200K**	
Change temperature to 100 K		**800 L**	**100K**	
Change temperature to 600K		**800 L**	**600K**	

25. Complete the following two sentences by highlighting the correct word:

- If volume is kept constant, the pressure of a gas (increases/decreases) as the temperature of the gas *increases*.
- If volume is kept constant, the pressure of a gas (increases/decreases) as the temperature of the gas *decreases*.

26. When the temperature decreased (from 200 to 100, or from 600 to 325), what did you notice about the change in pressure?

27. When the temperature increased (from 100 to 200), what did you notice about the change in pressure?

28. When you changed the temperature of the gas, did the speed of the particles (RMS Vel) change?

29. Do you think the speed of the particles is directly related to the pressure of the gas? Explain.

30. Accelerate: You have a gas with a temperature of 100K and a pressure of 1atm. If you change the temperature to 200K, will the pressure increase or decrease? What will the new pressure of the gas be?

Calculating gas laws is beyond the scope of this class and will NOT be on the test.