UNIT 5: CHEMISTRY OF CLIMATE CHANGE

Workbook 5.1: Gas Laws

Lesson 3: Sorry Charlie

GUIDING QUESTION: EXPLAIN CHARLES'S LAW AND HOW TO USE IT TO SOLVE SIMPLE GAS LAW PROBLEMS INVOLVING VOLUME AND TEMPERATURE.

- Do Now:

A lava lamp contains a waxy substance and water, which do not mix, and a light bulb at the base. As the bulb heats the waxy substance, it rises. Near the top of the lamp, the waxy substance cools and falls. Explain why this happens.

NOTES – PAGE 9

- Over the next few days we will be looking at the relationship between different gas variables. Some will be directly proportional and some will be indirectly proportional.

NOTES – PAGE 9

- Directly proportional variables change in the same way. They either both increase or both decrease when one is changed.

- Inversely proportional variables change in the opposite way. When one increases, the other decreases by the same amount and vis versa.

NOTES – PAGE 9

- Charles's Law: For a sample of gas, the volume of gas is directly proportional to its Kelvin temperature. (The amount of gas and pressure do not change, the volume and temperature do change).

$$k = V/T = \mathbf{V_1/T_1 = V_2/T_2}$$

Lowercase k!

- The ratio between V and T will always be the same *for a given sample of gas* and this ratio can be expressed using a proportionality constant, k.

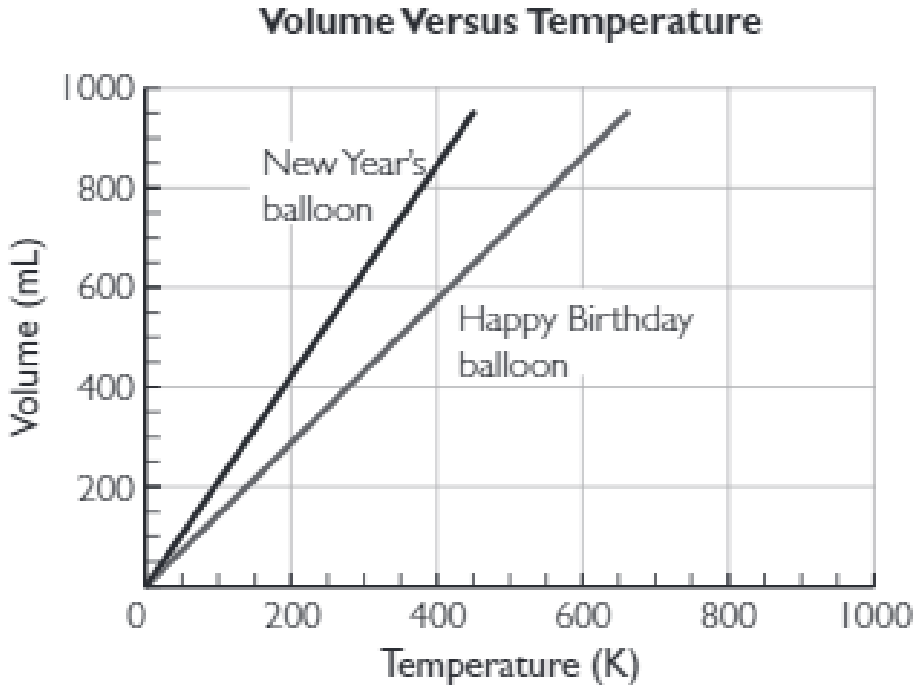
Lowercase k!

NOTES – PAGE 9

- The ratio between V and T will always be the same *for a given sample of gas* and this ratio can be expressed using a proportionality constant, k.

NOTES – PAGE 9

- Because volume is proportional to temperature, the graph of volume versus temperature is a straight line that goes through the origin, (0,0).
  - 0 volume = 0 degrees is only true using the Kelvin scale. **Thus, when we are using Charles's Law or any other gas law we must use temperature values in Kelvin.**



CHECK-IN – PAGE 5

Complete this problem at the bottom of page 5

- The first thing in the morning, you fill a balloon with air to a volume of 180 mL at 50˚C. After several hours in the Sun, the air inside the balloon has warmed to 85˚C. Calculate the new volume of the balloon.

CLOSURE

- Answer Guiding Question on page 9:
  - Explain Charles's Law and how to use it to solve simple gas law problems involving volume and temperature.

- Homework #8 due Friday, 4/13.

- Achieve 3000: "No Idle Law" due Friday, 4/20.

UNIT 5: CHEMISTRY OF CLIMATE CHANGE

Workbook 5.1: Gas Laws

Lesson 4: Show Me Your Moves

GUIDING QUESTION: EXPLAIN BOYLES'S LAW AND HOW TO USE IT TO SOLVE SIMPLE GAS LAW PROBLEMS INVOLVING PRESSURE AND VOLUME.

- Do Now:

An empty plastic water bottle has a cork fitted into the opening.

1. Predict what would happen if you stepped on the plastic bottle.
2. Explain your answer in terms of pressure and volume.

NOTES – PAGE 12

- The model simulated the Kinetic Theory of Gases which states:
  - Gas particles are constantly moving
  - The motion of gas particles is random
  - Gas particles move in straight lines

NOTES – PAGE 12

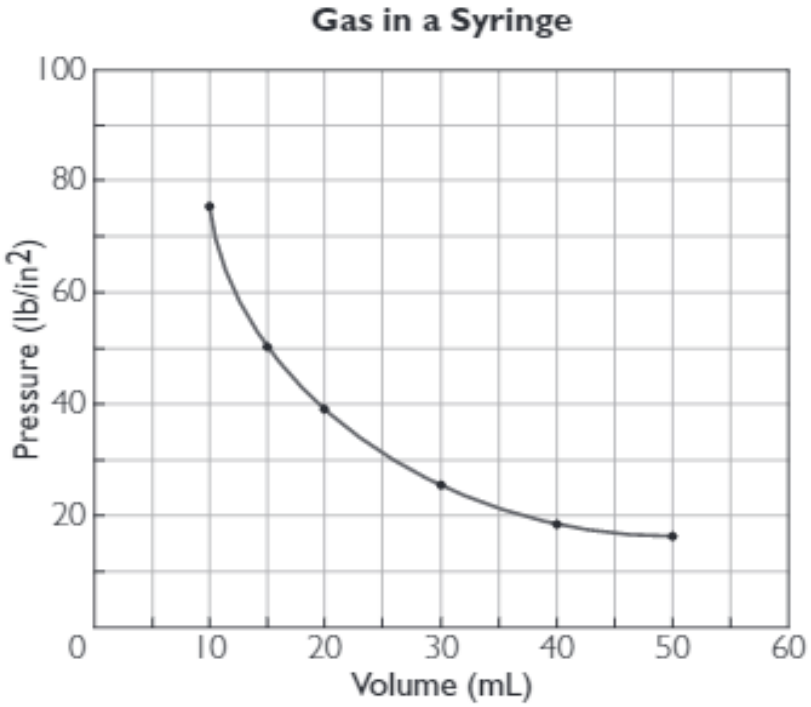
- The speeds of particles in a sample are not all the same. The average speed (average kinetic energy) allows us to determine the temperature of a sample.
  - Kinetic energy is the energy of movement. More movement = more kinetic energy and vis versa.
  - Temperature is the *average* kinetic energy of a substance.
- Gas particles are tiny relative to the amount of space they occupy.
- Gas particles change direction when they hit each other or the walls of the container.

NOTES – PAGE 12

- Boyle's Law: The pressure of a given amount of gas is inversely proportional to its volume, if the temperature and the amount of gas are not changed.

$$k = P \cdot V = \mathbf{P_1V_1 = P_2V_2}$$

- For small volumes, pressure is very high
- For large volumes, pressure is very low



CLOSURE

- Answer Guiding Question on page 12:
  - Explain Boyle's Law and how to use it to solve simple gas law problems involving volume and pressure.

- Homework #8 due Friday, 4/13.

- Achieve 3000: "No Idle Law" due Friday, 4/20.