High School Science Virtual Learning

Chemistry

Gas Laws

May 8, 2020

High School Chemistry
Lesson: May 8, 2020

Objective/Learning Target:

Students will be able to calculate the effect of changing the temperature, volume, pressure or amount of a gas.

Let’s Get Started:

1. What does the pressure of a gas actually measure?

2. What does the temperature of a gas actually measure?

Let's Get Started: Answer Key

1. What does the pressure of a gas actually measure?
   The amount and impact of collisions between gas particles and the container walls.
2. What does the temperature of a gas actually measure?
   The average kinetic energy of gas particles, which is related to how fast the particles are moving.

Lesson Activity:

Directions:

1. Watch this video from The Science Classroom.
2. Answer these questions as you watch the video.

Important tips:

- Temperature MUST be in Kelvin, but the other variables can be in any unit (as long as the unit is the same on both sides)
- These equations are used when you change a system, such as blowing up a balloon, or heating a gas.
- n represents moles. Every other variable is represented by its first letter.

Important tips:

- When solving for a variable on the bottom, double check your algebra. Cross multiplying is safest.
- In each equation, the ones represent the properties before the change. The twos represent the properties after the change. They should not be entered into the calculator.

Practice

Complete the following questions using the information you learned during the lesson activity.

Questions:

1. A 5 L sample of a gas is heated from 265 K to 392 K. What is the sample's final volume?
2. A gas initially has a pressure of 2.6 atm and a temperature of 85 K. If the pressure is increased to 7.3 atm, what is the gas's final temperature?
3. A gas has a temperature of 364 K and a pressure of 88 kPa. Both variables are increased until the temperature is 488 K, and the pressure is 215 kPa. If the final volume is 2.56 L, what was the initial volume?

Once you have completed the practice questions check with the answer key.

1. $\frac{V_1}{T_1} = \frac{V_2}{T_2} \rightarrow \frac{5\ L}{265\ K} = \frac{V_2}{392\ K} \rightarrow \frac{5\ L \cdot 392\ K}{265\ K} = V_2$

$V_2 = 7\ L$

Once you have completed the practice questions check with the answer key.

2.

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \Rightarrow \frac{2.6\ \text{atm}}{85\ \text{K}} = \frac{7.3\ \text{atm}}{T_2} \Rightarrow 2.6\ \text{atm} \cdot T_2 = 7.3\ \text{atm} \cdot 85\ \text{K}$$

$$T_2 = \frac{7.3\ \text{atm} \cdot 85\ \text{K}}{2.6\ \text{atm}} \Longrightarrow T_2 = 238.7\ \text{K} \quad (240\ \text{K with sig figs})$$

Once you have completed the practice questions check with the answer key.

3.

$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2} \Longrightarrow \frac{88\ \text{kPa} \cdot V_1}{364\ \text{K}} = \frac{215\ \text{kPa} \cdot 2.56\ \text{L}}{488\ \text{K}}$$

$$V_1 = \frac{215\ \text{kPa} \cdot 2.56\ \text{L} \cdot 364\ \text{K}}{488\ \text{K} \cdot 88\ \text{kPa}} = 4.7\ \text{L}$$

More Practice:

Follow the links below to do more practice.

1. This simulation will help you see how these laws in action.
2. This practice set will check your answers as you go.

Additional Practice:
Click on this link for additional practice.

You can change the settings so that you see the types of problems on which you need more practice. **In the section "Type of problem", make sure you uncheck "Ideal Gas Law."**