Hello everyone! Good job, y’all made it through another week!!

I’ll be posting weekly resources on the topics that will be covered in class the following week. Reach out to me if you need help with anything. Also do let me know if there are any specific resources you find helpful in the discussion board. If you cannot make it to Group Tutoring, remember these resources are available to you on the tutoring center website.

Our group Tutoring sessions will be every Wednesday from 5:15-6:15 PM. We will go over important topics that you will be covering in class, and we will practice problems that you will need to be familiar with. You can reserve a spot at https://baylor.edu/tutoring. I hope to see you there!

Topics I'll be covering in this resource: Pressure, Boyle’s Law, Charle’s Law, Avogadro’s Law, Ideal Gas Equation

Keywords: Pressure, Boyle, Charles, Gas Law

**TOPIC OF THE WEEK**

**Pressure**

- Pressure is the force acting on an object per unit area
- Gravity exerts a force on the earth’s atmosphere

**Atmospheric Pressure and the Barometer:**

- If a tube is inserted into a container of mercury open to the atmosphere, the mercury will rise 760 mm up the tube
- 1 atm = 760 mmHg = 760 torr
HIGHLIGHT #1: Boyle’s Law

- the volume of a fixed quantity of gas is inversely proportional to its pressure

\[ P \alpha \frac{1}{V} \]

\[ PV = \text{constant} \]

\[ P_1V_1 = P_2V_2 = P_3V_3 = \ldots = \text{constant} \]

In the figure on the left, pressure is denoted by \( P \), and volume is denoted by \( V \). Inverse relationship signifies that if \( P \) increases, \( V \) will decrease and vice versa.

https://opentextbc.ca/introductorychemistry/chapter/pressure-2/

An example that can help you answer questions on Boyle’s Law:

In this example, we recognize the volumes and pressures of the gas given to us in the question stem. We plug in these values in the equation \( P_1V_1 = P_2V_2 \) to get her answer.

HIGHLIGHT #2: Charle’s Law

- the volume of a fixed quantity of gas at constant pressure increases as the temperature increases, showing a direct relation

\[ \frac{V_1}{T_1} = \frac{V_2}{T_2} \]

In the figure on the left, \( V \) signifies Volume and \( T \) signifies Temperature. As stated above, volume and temperature are directly proportional to each other.

\( T = \) Temperature of the gas
\( V = \) Volume of the gas

Pressure must be constant
An example that can help you answer questions on Charle’s Law:

In this example, we follow the same steps we did to answer the question on Boyle’s Law. In this example, we use the equation for Charle’s Law, \( \frac{V_1}{T_1} = \frac{V_2}{T_2} \) to answer the question.

HIGHLIGHT #3: Avogadro’s Law

- the volume of gas at a given temperature and pressure is directly proportional to the number of moles of gases.

The picture on the right is a visual representation of the direct relationship between volume (V) and moles of gas (n). If the volume of a gas at a given temperature and pressure increases, the moles of the gas increase too.

\[
\frac{V}{n} \propto k
\]

\[
\frac{V_1}{n_1} = \frac{V_2}{n_2}
\]

HIGHLIGHT #4: Ideal Gas Law

- The ideal gas law, also called the general gas equation, is the equation of state of a hypothetical ideal gas. It is a good approximation of the behavior of many gases under many conditions, although it has several limitations.

**Ideal Gas Law:**

\[
PV = nRT
\]

- **P** → Pressure
- **V** → Volume
- **n** → number of moles
- **R** → gas constant (8.314 J mol\(^{-1}\) K\(^{-1}\))
- **T** → temperature
An example that can help you answer questions on Ideal Gas Law:

In this example, we use the Idea Gas Law $PV = nRT$ to solve for volume. The question stem gives us the pressure ($P$), moles ($n$), and temperature ($T$). $R$ is a constant. Rearranging the question enables us to solve for volume ($V$) as required in the question.

**CHECK YOUR LEARNING**

1. A sample of gas (24.2 g) initially at 4.00 atm was compressed from 8.00 L to 2.00 L at a constant temperature. After the compression, what is the pressure of the gas?
2. A balloon originally had a volume of 4.39 L at 44 °C and a pressure of 729 torr. To what temperature must the balloon be cooled to reduce its volume to 3.78 L (at constant pressure).
3. How many moles of gas will occupy 60.82 L at 31 °C and 367 mmHg?

**THINGS YOU MAY STRUGGLE WITH**

- Remember that while solving a Charle’s Law problem, make sure you recognize that $V_1$ and $T_1$ belong to the same system and $V_2$ and $T_2$ belong to the same system. This will make it easier to set up your equation.
- Direct relation means that if one of the quantities increases, the other will increase as well.
- Inverse relation means that if one of the quantities increases, the other will decrease.
- In order to find “$n$”, remember to set up dimensional analysis to convert grams to moles.

Thank you!! Hope y’all have a great time learning chemistry! Please reach out if you have any questions and don’t forget to visit the Tutoring Center website for further information at www.baylor.edu/tutoring.

**Answer key**

1. 16 atm, 2. 0 celsius, 3. 1.18 moles