

Question 1: Convert the following measurements of pressure into the desired units of pressure. I recommend using the **Exam 3 Handout** found in Module 15 for a listing of pressure relationships.

- A patient's systolic blood pressure is 128 mmHg, what is the pressure in units of atm?

0.168 atm

- A car tire has a pressure of 35.0 psi, what is the pressure in units of mmHg?

1810 mmHg

*Hint: You'll need to first convert psi to atm, then convert atm to mmHg if using the conversions in the Exam 3 Handout

- The atmospheric pressure at the top of Mt. Haleakala on Maui is 0.691 atm, what is the pressure in units of torr?

525 torr

- Glaucoma can be diagnosed by measuring the intraocular pressure (IOP) inside the eye. A patient has an IOP of 23.2 mmHg, what is the value in kPa?

3.09 kPa

*Hint: You'll need to first convert atm to mmHg, then convert mmHg to kPa if using the conversions in the Exam 3 Handout

Question 2: Using your knowledge of Boyle's Law, Charles' Law, and Gay-Lussac's Law, predict what would happen to a sample of gas in each scenario.

- When pressure decreases, the volume would **increase**
- When temperature decreases, the volume would **decrease**
- When volume increases, the pressure would **decrease**
- When pressure increases, the temperature would **increase**
- When temperature increases, the volume would **increase**
- When volume decreases, the temperature would **decrease**
- When pressure increases, the volume would **decrease**

Question 3: A sample of xenon gas has a volume of 3.0 L at a pressure of 8.0 atm. What is the volume of the gas at a pressure of 12.0 atm?

2.0 L

Using Boyle's Law

Question 4: A sample of carbon dioxide gas has a volume of 150 mL at a pressure of 0.25 atm. What is the pressure if the volume is changed to 30. mL?

1.3 atm

Using Boyle's Law

Question 5: A 25.0 L sample of neon gas at 96 K is heated to 220 K, what is the new volume?

57 L

Using Charles' Law

Question 6: A 2.60 L sample of chlorine gas at 100. K is compressed to a new volume of 1.42 L, what is the new temperature?

54.6 K

Using Charles' Law

Question 7: A sample of argon gas at 25°C and 3.2 atm is cooled to a 150 K, what is the new pressure?

1.6 atm

Using Gay-Lussac's Law

Question 8: The pressure of a sample of radon gas at 212°F and 0.632 atm is reduced to 0.540 atm, what is the new temperature of the gas?

319 K

Using Gay-Lussac's Law

Question 9: What is the total pressure of a gas sample containing 467 mmHg of nitrogen gas, 310 mmHg of oxygen gas, and 132 mmHg of argon gas?

909 mmHg

Using Dalton's Law

Question 10: What is the new pressure of an argon gas sample with an initial pressure of 2.0 atm when the volume is increased from 12.5 L to 25 L?

1.0 atm

Using Boyle's Law

Question 11: What is the new temperature of an argon gas sample with an initial pressure of 2.0 atm and temperature of 330 K, when the pressure is increased to 3.6 atm?

590 K

Using Gay-Lussac's Law

Question 12: A helium balloon at a volume of 15.0 L and a temperature of 298K is cooled to 273 K, what is the new volume?

13.7 L

Using Charles' Law

Question 13: If the pressure of a 15.2 L sample of xenon gas at 2.0 atm is reduced to 0.50 atm of pressure, what is the new volume?

61 L

Using Boyle's Law

Question 14: The total pressure of a gas sample is 870 mmHg which contains two gases. The partial pressure of one gas is 540 mmHg. What is the partial pressure of the other gas?

330 mmHg

Using Dalton's Law

Question 15: For each molecule below, list all the intermolecular forces it would exhibit.

C_8H_{18} dispersion forces

CH_4O dispersion forces, dipole-dipole, hydrogen bonding

Cl_2 dispersion forces

HCl dispersion forces, dipole-dipole

CH_5N dispersion forces, dipole-dipole, hydrogen bonding

A sample of xenon gas has a volume of 3.0 L at a pressure of 8.0 atm. What is the volume of the gas at a pressure of 12.0 atm?

$$P_1 \times V_1 = P_2 \times V_2$$

$$\frac{8.0 \text{ atm} \times 3.0 \text{ L}}{12.0 \text{ atm}} = \frac{12.0 \text{ atm} \times V_2}{12.0 \text{ atm}}$$

$$\boxed{2.0 \text{ L} = V_2}$$

A sample of carbon dioxide gas has a volume of 150 mL at a pressure of 0.25 atm. What is the pressure if the volume is changed to 30. mL?

$$P_1 \times V_1 = P_2 \times V_2$$

$$\frac{0.25 \text{ atm} \times 150 \text{ mL}}{30. \text{ mL}} = \frac{P_2 \times 30. \text{ mL}}{30. \text{ mL}}$$

$$\boxed{1.3 \text{ atm} = P_2}$$

A 25.0 L sample of neon gas at 96 K is heated to 220 K, what is the new volume?

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$220 \text{ K} \times \frac{25.0 \text{ L}}{96 \text{ K}} = \frac{V_2}{220 \text{ K}} \times 220 \text{ K}$$

$$\boxed{V_2 = 57 \text{ L}}$$

A 2.60 L sample of chlorine gas at 100. K is compressed to a new volume of 1.42 L, what is the new temperature?

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$\frac{2.60 \text{ L}}{100. \text{ K}} = \frac{1.42 \text{ L}}{T_2}$$

↓ cross multiply

$$\frac{T_2 \times 2.60 \text{ L}}{2.60 \text{ L}} = \frac{100. \text{ K} \times 1.42 \text{ K}}{2.60 \text{ K}}$$

$$\boxed{T_2 = 54.6 \text{ K}}$$

A sample of argon gas at 25°C and 3.2 atm is cooled to a 150 K, what is the new pressure?

must
convert to Kelvin
 $\rightarrow 25 + 273 = 298 \text{ K}$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \quad 150 \text{ K} \times \frac{3.2 \text{ atm}}{298 \text{ K}} = \frac{P_2}{150 \text{ K}} \quad \boxed{P_2 = 1.6 \text{ atm}}$$

The pressure of a sample of radon gas at 212°F and 0.632 atm is reduced to 0.540 atm, what is the new temperature of the gas?

must convert
to Kelvin
 $\rightarrow \frac{212 - 32}{1.8} = 100^\circ\text{C} + 273 = 373 \text{ K}$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

$$\frac{0.632 \text{ atm}}{373 \text{ K}} = \frac{0.540 \text{ atm}}{T_2}$$

$$T_2 \times 0.632 \text{ atm} = 373 \text{ K} \times 0.540 \text{ atm}$$

$$\boxed{T_2 = 319 \text{ K}}$$

What is the total pressure of a gas sample containing 205 mmHg of nitrogen gas, 310 mmHg of oxygen gas, and 132 mmHg of argon gas?

$$P_{\text{total}} = P_1 + P_2 + P_3$$

$$P_{\text{total}} = 205 \text{ mmHg} + 310 \text{ mmHg} + 132 \text{ mmHg}$$

$$P_{\text{total}} = 647 \Rightarrow \boxed{650 \text{ mmHg}}$$

Round to
2 sig figs.

What is the new pressure of an argon gas sample with an initial pressure of 2.0 atm when the volume is increased from 12.5 L to 25 L?

$$P_1 \times V_1 = P_2 \times V_2$$

$$\frac{2.0 \text{ atm} \times 12.5 \text{ L}}{25 \text{ L}} = \frac{P_2 \times 25 \text{ L}}{25 \text{ L}}$$

$$\boxed{1.0 = P_2}$$

atm

What is the new temperature of an argon gas sample with an initial pressure of 2.0 atm and temperature of 330 K, when the pressure is increased to 3.6 atm?

$$\frac{P_1}{T_1} = \frac{P_2}{T_2} \quad \frac{2.0 \text{ atm}}{330 \text{ K}} = \frac{3.6 \text{ atm}}{T_2}$$

$$\frac{T_2 \times 2.0 \text{ atm}}{2.0 \text{ atm}} = \frac{330 \text{ K} \times 3.6 \text{ atm}}{2.0 \text{ atm}}$$

$$T_2 = 594 \text{ K} \Rightarrow \boxed{590 \text{ K}}$$

A helium balloon at a volume of 15.0 L and a temperature of 298 K is cooled to 273 K, what is the new volume?

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

$$273 \text{ K} \times \frac{15.0 \text{ L}}{298 \text{ K}} = \frac{V_2}{273 \text{ K}} \times 273 \text{ K}$$

$$\boxed{13.7 \text{ L} = V_2}$$

If the pressure of a 15.2 L sample of xenon gas at 2.0 atm is reduced to 0.50 atm of pressure, what is the new volume?

$$P_1 \times V_1 = P_2 \times V_2$$

$$\frac{2.0 \text{ atm} \times 15.2 \text{ L}}{0.50 \text{ atm}} = \frac{0.50 \text{ atm} \times V_2}{0.50 \text{ atm}}$$

$$\boxed{61 \text{ L} = V_2}$$

The total pressure of a gas sample is 870 mmHg which contains two gases. The partial pressure of one gas is 540 mmHg. What is the partial pressure of the other gas?

$$P_{\text{total}} = P_1 + P_2$$

$$870 \text{ mmHg} = 540 \text{ mmHg} + P_2$$

$$\begin{array}{r} 870 \text{ mmHg} \\ - 540 \text{ mmHg} \\ \hline \end{array} \quad \begin{array}{r} 540 \text{ mmHg} + P_2 \\ - 540 \text{ mmHg} \\ \hline \end{array}$$

$$\boxed{330 \text{ mmHg} = P_2}$$