

Basic Properties of Gases

What is Volume?

What is Temperature?

What are Moles?

What is Pressure?

Pressure Units

STP

Barometers

Robert Boyle

1) What happens to the volume of a 1.00 L balloon at 1.00 atm if the pressure around it is dropped to 0.500 atm?

2) What is the new pressure when a 5.00 L balloon at 4.00 atm is expanded to 10.00 L?

Jacques Charles

The Absolute Temperature Scale

1) What is the new volume if 10.0 L of gas at 273 K is heated to 373K?

2) What is the new temperature if 20.0 L of gas at 273 K is compressed to 10.0 L?

Can we combine these ideas?

Combined Gas Law

Joseph Gay-Lussac

1) What is the new pressure if a gas at 273 K exerts 1.00 atm is heated to 373K?

2) What is the new volume if 15.0 L of gas at STP is heated to 373K and 0.500 atm?

6) If three gases, each at 3.00 atm, are mixed in a container what is the total pressure in the container?

7) What's the new pressure when 17.5 L of Helium at 5.23 atm is compressed to 1.50 L?

8) A balloon is filled with 62.3 L of gas at 100.0°C. The balloon is then cooled to 50.0°C. What is the final volume?

9) A container is filled with a gas at a pressure of 4.0 atm at 125°C. What will the pressure be if the container is heated to 450°C?

10) Consider 27.5 L of Helium at STP that is cooled to 200. K at 1.50 L. What is the new pressure of the sample?

Ideal Gas Law

Put all of these laws together into one equation:

Just what is this R thing anyway?

$$R = 0.0821 \frac{\text{liter atm}}{\text{mol K}} = 62.4 \frac{\text{liter mmHg}}{\text{mol K}} = 62.4 \frac{\text{liter torr}}{\text{mol K}} = 8.31 \frac{\text{liter kPa}}{\text{mol K}}$$

What forms can the equation take?

What are the four assumptions of the Ideal Gas Law?

- 1)
- 2)
- 3)
- 4)

Just what do we mean by Molar Volume?

- 1) What is the pressure in atm of 2.00 moles of O₂ at 273 K if it occupies 10.00 L?

The Kinetic Molecular Theory of Gases

Do all the molecules of a gas travel at the same speed?

Ice Cream Graph

Dalton's Law

What happens if one balloon contains two different gases?

What is the pressure inside a container that holds Argon at 1.00 atm, Helium at 1.00 atm, and Nitrogen at 10.00 atm?

Why do we assume volume and temperature are the same?

Which gas has the highest number of molecules present?

Effusion and Diffusion

Which gas molecules move faster under identical conditions of temperature helium or uranium hexafluoride?

Grahams Law

Let us think about the one thing two gases at the same temperature have in common, their average kinetic energy.

1) Helium diffuses at a rate of 15.0 mL per minute from a porous cup. At what rate would nitrogen diffuse through the same porous cup?

2) How much faster does methane diffuse than oxygen?

Gas Stoichiometry

A New Roadmap!

How many liters of carbon dioxide will form at STP from the reaction of 50.0 grams of CaCO_3 with excess hydrochloric acid?

Reaction

Calculations

How many grams of KClO_3 must decompose to produce 5.25L of oxygen at 25°C and 1.00 atm.?

Reaction

Calculations

