

Gas Laws

- Laws that are used to relate volume, pressure & temperature of gases.

What is volume? amount of space occupied by a mass

What is pressure? Force exerted on a volume

Robert Boyle (1600's) theorized that volume is inversely proportional to pressure @ constant temp.
in other words, as long as you don't change temp:

↑ pressure = ↓ volume ≠ ↓ pressure = ↑ volume

* pressure has many different units for measurements
like: mmHg, inHg, torr, atm, kPa, bars, lbs/in², ... etc

mathematically we say:

$$P_1 V_1 = P_2 V_2$$

P₁ = initial pressure

V₁ = initial volume

P₂ = final pressure

V₂ = final ~~pressure~~ volume

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When solving a problem using gas laws (like Boyle's) you are given all variables except for one, so that's what you solve for.

$$\text{ex) } P_1 = 2.5 \text{ atm} \quad V_1 = 50 \text{ ml} \\ P_2 = 3.0 \text{ atm} \quad V_2 = ? \text{ ml}$$

$$\frac{(2.5)(50 \text{ ml})}{3} = \frac{(3.0) x}{3} \quad \text{solve for } x$$

$$x = \underline{41.7 \text{ ml}}$$

Sometimes you are given word problems - the first info given to you is initial volume & pressure, and last info is final volume & pressure

ex) If a balloon containing 750 ml of air with a pressure of 27 kPa changes to 500 ml when it float up into the air, what is the final pressure?

$$P_1 = 27 \text{ kPa} \quad P_2 = x \\ V_1 = 750 \text{ ml} \quad V_2 = 500 \text{ ml}$$

$$\text{solve. } \frac{27 \cdot 750}{500} = \frac{500 \cdot x}{500}$$

$$x = \underline{40.5 \text{ kPa}}$$