# GAS LAWS

# VISUAL CHEM CARDS

www.chemtextbook.com

# Gas Laws

**Units of Pressure**

1 atm
= 760 mmHg
= $1.013 \times 10^5$ Pa
= 101.3 kPa
= 1.013 bar

**Units of Volume**

1 $m^3$
= $10^3$ $dm^3$
= $10^3$ L
= $10^6$ $cm^3$
= $10^6$ mL
= 1.013 bar

**Temperature Conversion**

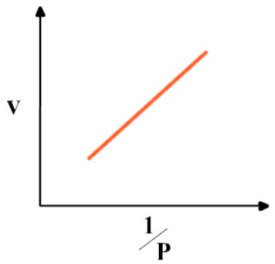
$$^0K = {}^0C + 273$$

All temperatures must be in Kelvin.
Absolute zero = 0 $^0$K or -273$^0$C

## Boyles Law

Pressure is inversely proportional to volume

$$P_1V_1 = P_2V_2$$




## Gay-Lussac Law

Pressure is proportional to temperature

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

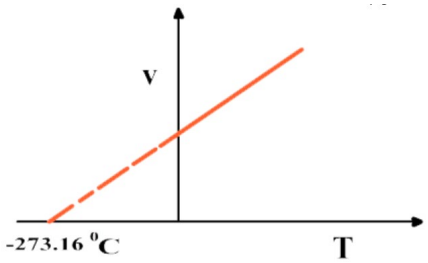
## Avogadro's Law

Volume is proportional to number of moles

$$\frac{V_1}{V_2} = \frac{n_1}{n_2}$$

## Charles Law

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




## Combined Gas Law

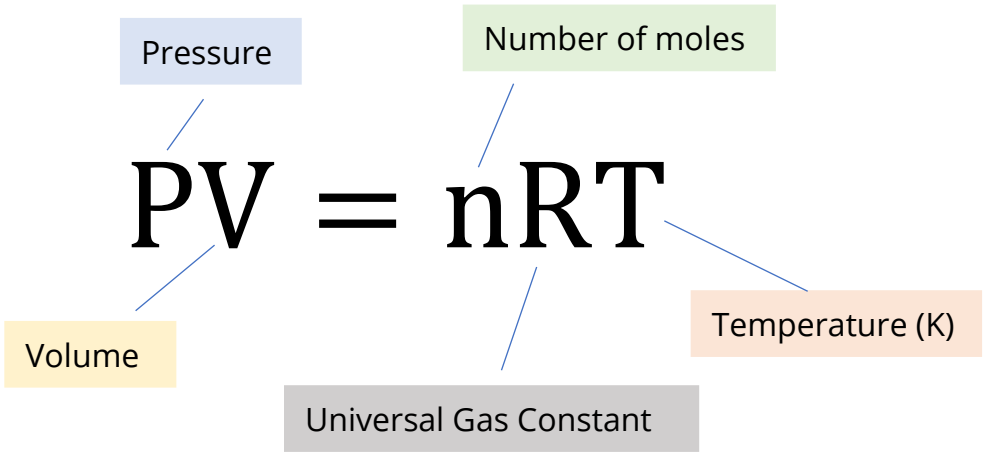
$$\frac{P_1V_1}{T_1} = \frac{P_2V_2}{T_2}$$

# Gas Laws

**Molar Volume ($V_m$)** – volume occupied by one mole of gas at a given temperature and pressure.

At **S**tandard **T**emperature (273K) & **P**ressure (1 atm), **$V_m$ = 24,000 $cm^3$ (24 $dm^{-3}$)**

## Ideal Gas Equation




The value of the gas constant 'R' depends on the units used for pressure, volume and temperature.

- R = 0.0821 litre·atm/mol·K
- R = 8.3145 J/mol·K
- R = 8.2057 $m^3$·atm/mol·K
- R = 62.3637 L·Torr/mol·K or L·mmHg/mol·K