Boyle's Law

$$P_1V_1 = P_2V_2$$

P = Pressure of the gas

V = Volume of the gas

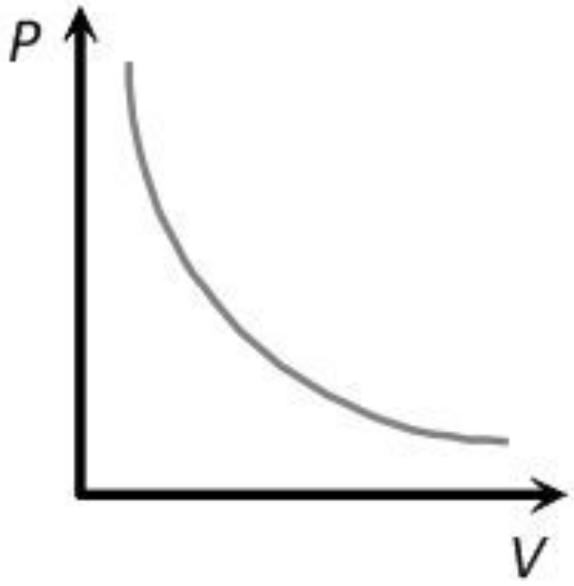
Temperature must be constant

Conversions: 1atm = 760 mmHg = 760 torr = 101.3kPa

STP: 273K

Proportionality: $P \propto \frac{1}{V}$

inverse; as one goes up, the other goes down.



Charles' Law

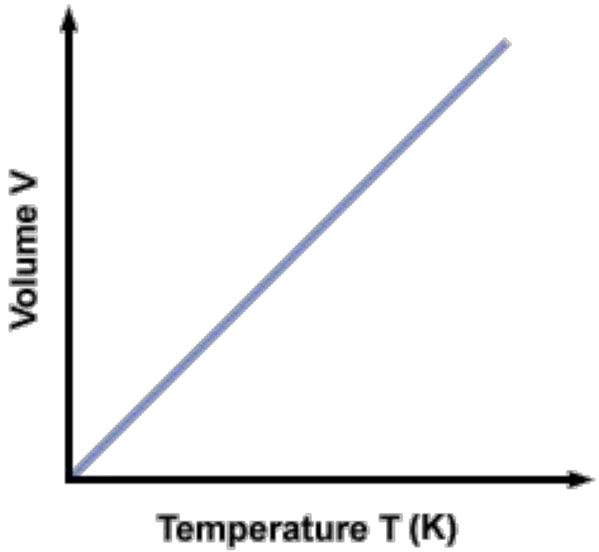
Conversions: °C + 273 = K
STP: 1atm
Proportionality: $V \propto T$

direct; as one goes up, the other goes up.

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

T = Temperature of the gas
V = Volume of the gas

Pressure must be constant



Gay-Lussac's Law

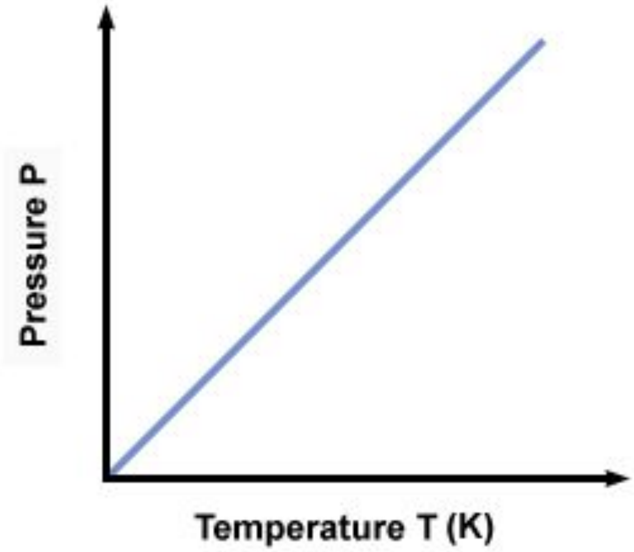
$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

P_1 P_2 are pressure of gas
T_1 T_2 are Temperature of gas

Volume must be constant

Conversions: °C + 273 = K
1atm = 760 mmHg = 760 torr = 101.3kPa
STP:
Proportionality: $P \propto T$

direct; as one goes up, the other goes up.



Combined Gas Law

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

$$V \propto \frac{nT}{P}$$

Factor in "R" a proportionality constant

$$V = \frac{RnT}{P}$$

Avogadro's Law

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

V_1 V_2 are Volumes of gas

n_1 n_2 are amount of gas

Pressure and temperature must be constant

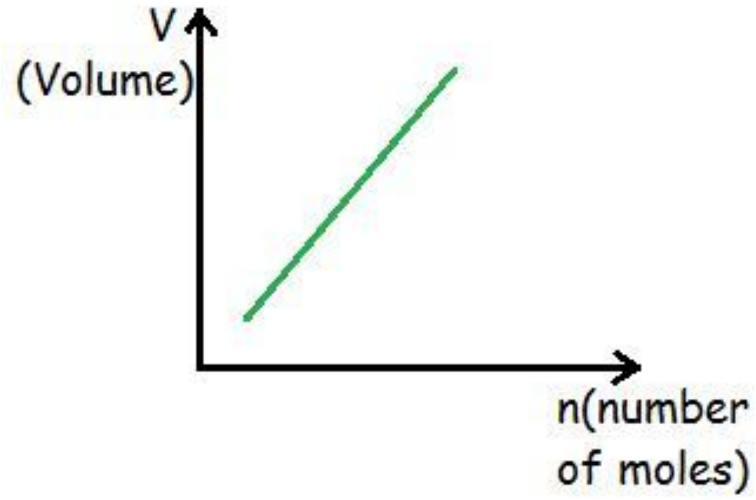
Conversions: 22.4L = 1 mol

mass/molar mass = mol

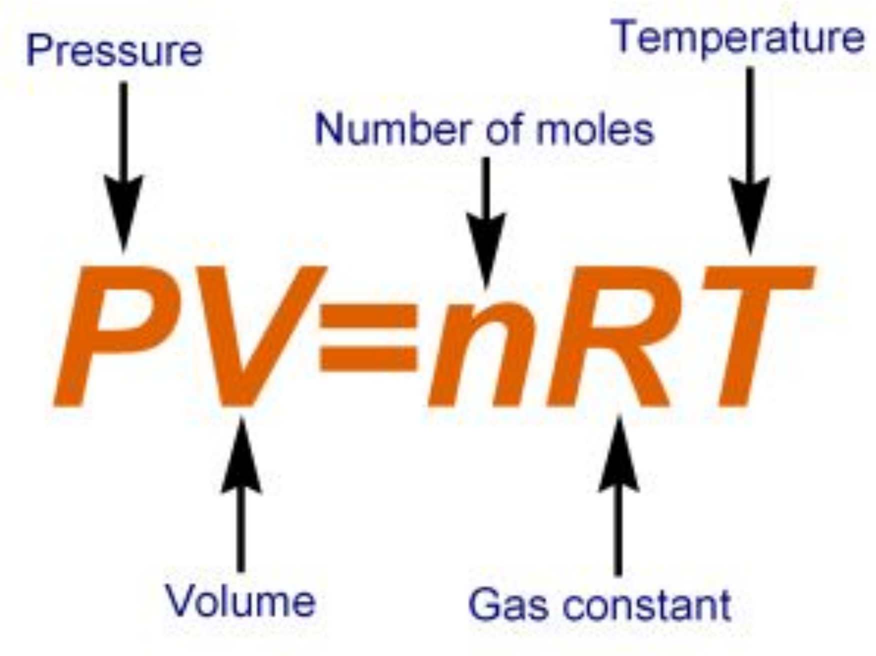
STP: 1 atm, 273K

Proportionality: $V \propto n$

direct; as one goes up, the other goes up.



Ideal Gas Law



Conversions: 1atm = 760 mmHg = 760 torr = 101.3kPa

°C + 273 = K

22.4L = 1 mol

mass/molar mass = mol

Constants:

R = 0.08206 L atm K^{-1} mol^{-1}

R = 62.4 L mmHg K^{-1} mol^{-1}

R = 8.314 L kPa K^{-1} mol^{-1}

Dalton's Partial Pressure

$$P_T = P_1 + P_2 + P_3 \ldots$$

$$P_T = P_{gas} + P_{water}$$

$$P_A = \frac{n_A}{n_A + n_B + n_C} \times P$$

$$P_B = \frac{n_B}{n_A + n_B + n_C} \times P$$

$$P_C = \frac{n_C}{n_A + n_B + n_C} \times P$$

Variables and Constants

Pressure, P
Units: atm, mmHg, torr, kPa
Comments: For the ideal gas law, pick the R value with the correct unit.

Volume, V
Units: mL, , cm^3, L, dm^3
Comments: mL/1000 = L

Temperature, T
Units: °C, K
Comments: °C + 273 = K

moles, n
Units: mole
Comments: