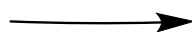


Ideal Gas Equation

Boyle's Law+Charles'
Law+Avogadro Law



a single equation

ideal gas
equation

$$\begin{aligned} V &\propto \frac{1}{p} \\ V &\propto T \\ V &\propto n \end{aligned}$$

$$V \propto \frac{nT}{p} \quad (5.15)$$

$$\Rightarrow V = R \frac{nT}{p} \quad V \propto n \quad (5.16)$$

R is proportionality constant

ideal gas
equation



$$pV = nRT \quad R \propto V \quad (5.17)$$

$$\Rightarrow R = \frac{pV}{nT} \quad R \propto p \quad (5.18)$$

$$R \propto 1/T$$

$$R \propto 1/n$$

R is called **gas constant**. It is same for all
gases = **Universal Gas Constant**

value of R depends **upon units** in which p, V and T are
measured [pascal, cm³, Kelvin-K]



What is the volume (in liters) occupied by 49.8 g of HCl
at STP?

$$T = 0^\circ\text{C} = 273.15\text{ K}$$

$$P = 1.000\text{ atm}$$

$$PV = nRT$$

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

$$n = 49.8\text{ g} \times \frac{1\text{ mole HCl}}{36.45\text{ g HCl}} = 1.37\text{ mole}$$

$$V = \frac{1.37\text{ mole} \times 0.0821\frac{\text{L}\cdot\text{atm}}{\text{mole}\cdot\text{K}} \times 273.15\text{ K}}{1\text{ atm}}$$

$$V = 30.6\text{ L}$$

$$\text{mole} = \text{wt}/\text{fwt}$$