Ideal Gas Law

* Ideal gases behave according to Kinetic Molecular Theory
* Uses one set of conditions.

$$\boxed{PV = nRT}$$

* P = Pressure (atm)
* T = Temperature (K)
* V = Volume (L)
* R = 0.0821 $\frac{L \cdot atm}{mol \cdot K}$ ← Ideal Gas Law Constant
* n = moles (mol)

Examples

1) Calculate the pressure of 0.412 moles of He at 16°C and 3.25L.

Given	Work
P = ? n = 0.412 mol T = 16°C + 273 = 289 K V = 3.25 L R = 0.0821 $\frac{L \cdot atm}{mol \cdot K}$	$\frac{PV}{V} = \frac{nRT}{V}$ $P = \frac{nRT}{V}$ $P = \frac{(.412 \text{ mol} \times .0821 \frac{L \cdot atm}{mol \cdot K} \times 289 K)}{(3.25 L)} =$ $\boxed{P = 3.01 \text{ atm}}$

2) Find the volume of 85g O_2 at 25°C and 104.5 kPa.

Given	Work
V = ? $n = 85 g O_2 \times \frac{1 \text{ mol } O_2}{32.00 g O_2} = 2.7 \text{ mol}$ T = 25.0°C + 273 = 298 K P = 104.5 kPa = 1.031 atm R = 0.0821 L·atm/mol·K	$PV = nRT \rightarrow V = \frac{nRT}{P}$ $V = \frac{(2.7 \text{ mol} \times 0.0821 \frac{L \cdot atm}{mol \cdot K} \times 298 K)}{(1.031 \text{ atm})}$ $\boxed{V = 64 L}$