Ideal Gas Law Applications

Density $D = \frac{M}{V} = \frac{g}{mL}$ ← volume → relates to moles

Id. Gas $PV = nRT$

rearrange to get V and n on the same side with $\frac{n}{V} = ?$

$$\frac{n}{V} = \frac{P}{RT} = \frac{mol}{L}$$

ex: What is the density of CO_2 if it is at 3.0 atm and 25°C?

$$\frac{n}{V} = \frac{(3.0\ atm)\ mol\ K}{.0821\ L \cdot atm\ (298K)} = .12\ \frac{mol}{L}$$

* Use molar mass to convert to density

$$\frac{.12\ mol}{L} \left| \frac{44.01\ g}{1\ mol} \right| \frac{1\ L}{1000\ mL} = \boxed{5.3 \times 10^{-3}\ \frac{g}{mL}}$$