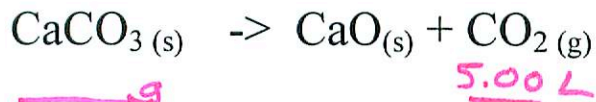


GAS STOICHIOMETRY

at STP: 1 mol any gas = 22.4 L

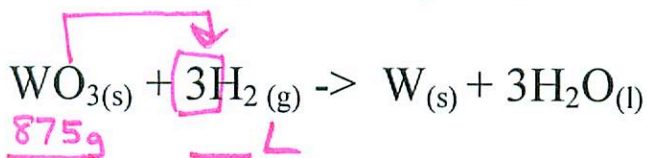
Prob Type 1: at STP



Ex) How many grams of calcium carbonate must be decomposed to produce 5.00 L of CO₂ at STP?

$$5.00 \text{ L CO}_2 \left(\frac{1 \text{ mol CO}_2}{22.4 \text{ L}} \right) \left(\frac{1 \text{ mol CaCO}_3}{1 \text{ mol CO}_2} \right) \left(\frac{100.09 \text{ g}}{1 \text{ mol CaCO}_3} \right) = \boxed{22.3 \text{ g CaCO}_3}$$

Prob Type 2: non-STP, run stoich, then PV=nRT (starts with g or mol given)



How many liters of hydrogen gas at 35°C and 0.980 atm are needed to react completely with 875 g of tungsten oxide?

$$875 \text{ g WO}_3 \left(\frac{1 \text{ mol WO}_3}{231.84 \text{ g}} \right) \left(\frac{3 \text{ mol H}_2}{1 \text{ mol WO}_3} \right) = \boxed{11.3 \text{ mol H}_2} = n$$

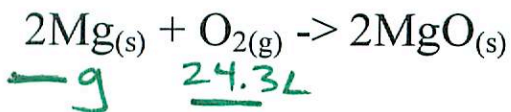
0.980 atm = P

$$V = \frac{nRT}{P} = \frac{(11.3 \text{ mol}) \left(0.0821 \frac{\text{L atm}}{\text{mol K}} \right) (308 \text{ K})}{0.980 \text{ atm}}$$

308 K = T

$$\boxed{L = 292 \text{ L H}_2}$$

Prob Type 3: non-STP, run $PV=nRT$, then stoich
(starts with volume given)



If you have 24.3 L of O_2 at 25 C and 0.975 atm, how many grams of magnesium would you need to react with it?

$$n = \frac{PV}{RT} = \frac{(0.975 \text{ atm})(24.3 \text{ L})}{(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(298 \text{ K})} = \underline{0.968 \text{ mol O}_2}$$

$$0.968 \text{ mol O}_2 \left(\frac{2 \text{ mol Mg}}{1 \text{ mol O}_2} \right) \left(\frac{24.31}{1 \text{ mol Mg}} \right) = \boxed{47.1 \text{ g Mg}}$$

↑

Opener 1/18 DO IN NOTES!

- 1) One mole of any ideal gas takes up ____ L at STP.
 - 2) One mole of any ideal gas takes up ____ L at standard pressure and 546 K (273 x 2)
+ - + -
 - 3) Ammonia gas (NH₃) has a volume of 22.08 L at STP. Solve for ammonia's R (gas constant) using this data.
 - 4) Why is wikipedia blacked out today?
-

1) 22.4 L

2) $PV = nRT$ $V = \frac{(1.0 \text{ mol})(0.0821 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}})(546 \text{ K})}{1 \text{ atm}}$

$$V = 44.8 \text{ L}$$

$$0.0821$$

3) $R = \frac{PV}{nT} = \frac{(1.0 \text{ atm})(22.08 \text{ L})}{(1.0 \text{ mol})(273 \text{ K})} = 0.08088 \frac{\text{L}\cdot\text{atm}}{\text{mol}\cdot\text{K}}$