Stoichiometry – Mole Ratio Conversions
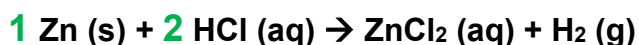[Must Show All Work]

1) How many moles of zinc will react with 12 moles of hydrochloric acid?

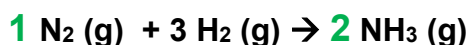**1 Zn (s) + 2 HCl (aq) → ZnCl₂ (aq) + H₂ (g)**

Word Problem   Balanced Coefficients

$$\frac{?\ \text{moles Zn}}{12\ \text{moles HCl}} = \frac{1\ \text{mole Zn}}{\div\ 2\ \text{moles HCl}}$$

= 6 moles of Zn

2) How many moles of nitrogen gas are required to make 7.2 moles of ammonia?

1 N₂ (g) + 3 H₂ (g) → 2 NH₃ (g)

Word Problem   Balanced Coefficients

$$\frac{7.2\ \text{moles NH}_3}{1}\ \left|\ \frac{\times\ \ 1\ \text{mole N}_2}{\div\ 2\ \text{moles NH}_3}\ \right| = \textbf{3.6 moles N}_2\ \textbf{required}$$

3) How many grams of iron will be produced from the reaction of 2.5 moles of aluminum and excess iron III oxide?

Fe₂O₃ (aq) + 2 Al (s) → 2 Fe (s) + Al₂O₃ (aq)

Molar Mass of Iron   Word Problem   Balanced Coefficients   Molar Mass

55.847
Fe
26
Iron

$$\frac{2.5\ \text{moles Al}}{1}\ \left|\ \frac{2\ \text{mole Fe}}{2\ \text{mole Al}}\ \right|\ \frac{56\ \text{grams Fe}}{1\text{mole Fe}}\ \left|\ = \textbf{140 grams Fe}\right.$$

4) How many liters of oxygen gas are required to react with 6.40 moles of methane?

$$\mathbf{1}\ CH_4\ (g)\ +\ \mathbf{2}\ O_2\ (g)\ \rightarrow\ CO_2\ (g)\ +\ 2\ H_2O\ (g)$$
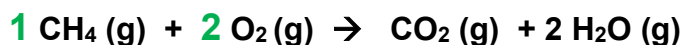
Word Problem	Balanced Coefficients	Gas Law Conversion	
$\dfrac{6.40\ \text{moles}\ CH_4}{1}$	$\dfrac{2\ \text{mole}\ O_2}{1\ \text{moles}\ CH_4}$	$\dfrac{22.4\ \text{Liters}\ O_2}{1\ \text{mole}\ O_2}$	$= \mathbf{287\ liters\ O_2}$

5) How many grams of calcium phosphate will be produced from the reaction of 1.25 grams of calcium hydroxide and excess phosphoric acid?

$$H_3PO_4\ (aq)\ +\ \mathbf{3}\ Ca(OH)_2\ (aq)\ \rightarrow\ \mathbf{1}\ Ca_3(PO_4)_2\ (aq)\ +\ H_2O\ (l)$$
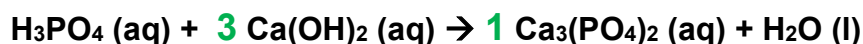
Molar Mass of Ca(OH)₂
Ca: 1 x 40 = 40
O: 2 x 16 = 32
H: 2 x 1 = 2
Total Mass = 74 g

$$\dfrac{1.25\ \text{grams}\ Ca(OH)_2}{1}\ \bigg|\ \dfrac{1\ \text{mole}\ Ca(OH)_2}{74\ \text{grams}\ Ca(OH)_2}\ \bigg|\ \dfrac{1\ \text{moles}\ Ca_3(PO_4)_2}{3\ \text{mole}\ Ca(OH)_2}\ \bigg|\ \dfrac{310\ \text{grams}\ Ca_3(PO_4)_2}{1\ \text{mole}\ Ca_3(PO_4)_2}\ \bigg|\ =\ \mathbf{1.75\ grams\ Ca3(PO4)2}$$

Molar Mass of Ca₃(PO₄)₂
Ca: 3 x 40 = 120 g
P: 2 x 31 = 62 g
O: 8 x16 =   128g
Total Mass = 310 g