(11) m = ?

V = 275mL

C = 0.925M

$C_{12}H_{22}O_{11}$

$C = \frac{n}{V}$

$0.925\,mol/L = \frac{n}{0.275L}$

$n = (0.925\,mol/L)(0.275L)$

$n = 0.254\,mol$

$0.254\,mol\ C_{12}H_{22}O_{11} \times \frac{342.34g\ C_{12}H_{22}O_{11}}{1\ mol\ C_{12}H_{22}O_{11}} = 87.0g$

$C_{12}H_{22}O_{11} \rightarrow (12 \times 12.01)_{C} + (22 \times 1.01)_{H} + (11 \times 16.00)_{O}$

$= 342.34g/mol$

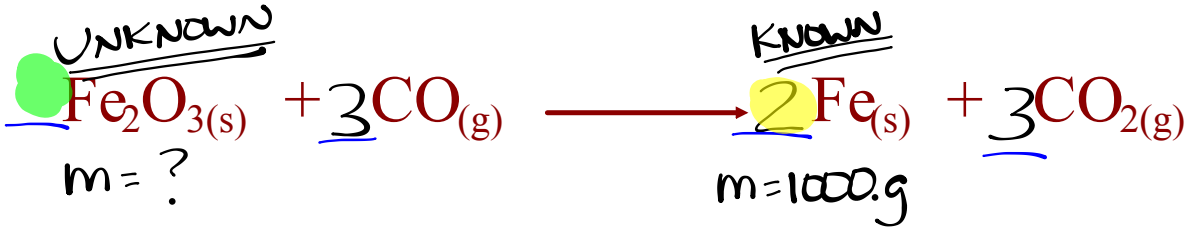
Gravimetric Stoichiometry

Gravimetric - refers to mass measurement
Stoichiometric - refers to the procedure used to calculate quantities of chemicals.
GRAVIMETRIC STOICHIOMETRY - the procedure for calculating the masses of reactants and products in a chemical reaction.

ASSUMPTIONS IN STOICHIOMETRY
- the reaction is spontaneous.
- the reaction is fast
- the reaction is quantitative.
- the reaction is stoichiometric.
(there is a whole number ratio between MOLES of reactant and MOLES of product.)

Gravimetric Stoichiometry

What mass of iron (III) oxide is required to produce 1000. g of iron according to the following reaction?



Step 1: # moles known

$$1000.\text{g Fe} \times \frac{1\ \text{mol Fe}}{55.859\ \text{g Fe}} = 17.905\ \text{mol Fe}$$

Step 2: moles unknown

$$17.905\ \text{mol Fe} \times \frac{1\ \text{mol } Fe_2O_3}{2\ \text{mol Fe}} = 8.953\ \text{mol } Fe_2O_3$$

Step 3: mass unknown

$$8.953\ \text{mol } Fe_2O_3 \times \frac{159.70\ \text{g } Fe_2O_3}{1\ \text{mol } Fe_2O_3} = 1430.\ \text{g } Fe_2O_3$$

$Fe_2O_3 \rightarrow (2 \times 55.85) + (3 \times 16.00) = 159.70\ \text{g/mol}$

Try This

What mass of aluminum oxide will be produced if 17.0 g of oxygen reacts with excess aluminum?

Al^{3+} O^{2-}

KNOWN UNKNOWN

$$4Al_{(s)} + 3O_{2(g)} \longrightarrow 2Al_2O_{3(s)}$$

$m = 17.0\,g$ $m = ?$

Step 1: Moles Known

$$17.0\,g\,O_2 \times \frac{1\,mol\,O_2}{32.00\,g\,O_2} = 0.531\,mol\,O_2$$

Step 2: Moles Unknown

$$0.531\,mol\,O_2 \times \frac{2\,mol\,Al_2O_3}{3\,mol\,O_2} = 0.354\,mol\,Al_2O_3$$

Step 3: Mass Unknown

$$0.354\,mol\,Al_2O_3 \times \frac{101.96\,g\,Al_2O_3}{1\,mol\,Al_2O_3} = 36.1\,g\,Al_2O_3$$

Worksheet

1) $Zn_{(s)} + S_{8(s)} \Rightarrow ZnS_{(s)}$

2) $Al_2O_{3(s)} \Rightarrow Al_{(s)} + O_{2(g)}$

3) $C_3H_{8(l)} + O_{2(g)} \Rightarrow CO_{2(g)} + H_2O_{(g)}$

4) $NaCl_{(aq)} + Pb(NO_3)_{2(aq)} \Rightarrow NaNO_{3(aq)} + PbCl_{2(s)}$

5) $Al_{(s)} + H_2SO_{4(aq)} \Rightarrow H_{2(g)} + Al_2(SO_4)_{3(aq)}$

6) $KOH_{(aq)} + Cu(NO_3)_{2(aq)} \Rightarrow KNO_{3(aq)} + Cu(OH)_{2(s)}$