

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.)

Iron is the most widely used metal in North America. Iron can be produced by the reaction of iron (III) oxide, from iron ore, with carbon monoxide to produce iron metal and carbon dioxide. What mass of iron (III) oxide is required to produce 1000. g of iron?



Step 1: # moles known

$$1000. \text{g Fe} \times \frac{1 \text{ mol Fe}}{55.85 \text{ g Fe}} = 17.905 \text{ mol Fe}$$

Step 2: moles unknown

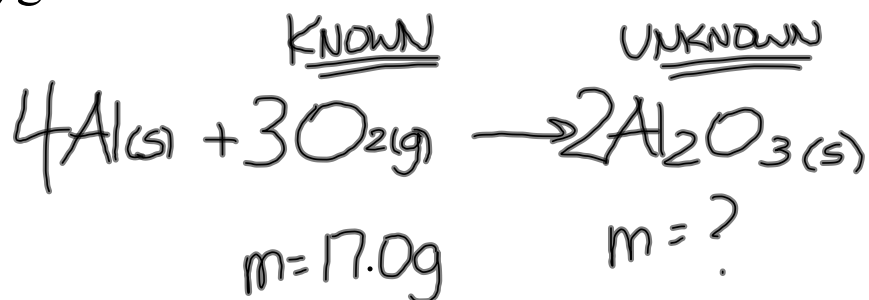
$$17.905 \text{ mol Fe} \times \frac{1 \text{ mol Fe}_2\text{O}_3}{2 \text{ mol Fe}} = 8.953 \text{ mol Fe}_2\text{O}_3$$

Step 3: mass unknown

$$8.953 \text{ mol Fe}_2\text{O}_3 \times \frac{159.70 \text{ g Fe}_2\text{O}_3}{1 \text{ mol Fe}_2\text{O}_3} = 1430. \text{g Fe}_2\text{O}_3$$

Try This

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



Step 1: Moles Known

$$17.0\text{g O}_2 \times \frac{1\text{ mol O}_2}{32.00\text{g O}_2} = 0.530\text{ mol O}_2$$

Step 2: Moles Unknown

$$0.530\text{ mol O}_2 \times \frac{2\text{ mol Al}_2\text{O}_3}{3\text{ mol O}_2} = 0.354\text{ mol Al}_2\text{O}_3$$

Step 3: Mass Unknown

$$0.354\text{ mol Al}_2\text{O}_3 \times \frac{101.96\text{g Al}_2\text{O}_3}{1\text{ mol Al}_2\text{O}_3} = \boxed{36.1\text{g Al}_2\text{O}_3}$$

Worksheet

