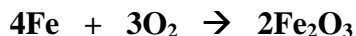


CALCULATE AMOUNTS OF REACTANTS AND PRODUCTS

Chemical equations are extremely important in industrial situations where profit and loss are constant concerns. If your company is producing a chemical, you want to make sure that you are making only what is needed. You don't want to squander reactants or generate excess products that could end up as waste. Chemical equations allow the *practical* application of chemical reactions. Chemical equations can be used to identify the amounts of reactants and products in convenient useable quantities.

Let's say you are given the chemical equation: $4\text{Fe} + 3\text{O}_2 \rightarrow 2\text{Fe}_2\text{O}_3$. If you have 280 grams of iron (Fe), how much oxygen (O_2) will be needed to react with the iron and how much iron III oxide (Fe_2O_3) will be produced? This is a realistic problem in that it deals with practical amounts of material rather than single atoms or molecules. Solving this problem is a three-step process.



Step 1: Change grams of Sub. A to moles of Sub. A. (*Use the gram molecular wt. from the Periodic Table*)

$$\frac{280 \text{ g of Fe}}{1} \times \frac{1 \text{ mole Fe}}{56 \text{ grams}} = 5 \text{ moles of Fe}$$

Step 2: Change moles of Sub. A to moles of Sub. B. (*Use the ratios in the Balanced Chemical Equation*)

$$\frac{5 \text{ moles of Fe}}{1} \times \frac{3 \text{ moles of O}_2}{4 \text{ moles of Fe}} = 3.75 \text{ moles of O}_2$$

Step 3: Change moles of Sub. B to grams of Sub. B. (*Use the gram molecular wt. from the Periodic Table*)

$$\frac{3.75 \text{ moles of O}_2}{1} \times \frac{32 \text{ grams}}{1 \text{ mole of O}_2} = 120 \text{ grams of O}_2$$

Repeat Steps 2 and 3 to find the amount of Iron III Oxide (Fe_2O_3) that would be produced.

Step 2:

$$\frac{5 \text{ moles of Fe}}{1} \times \frac{2 \text{ moles of Fe}_2\text{O}_3}{4 \text{ moles of Fe}} = 2.5 \text{ moles of Fe}_2\text{O}_3$$

Step 3:

$$\frac{2.5 \text{ moles of Fe}_2\text{O}_3}{1} \times \frac{160 \text{ grams}}{1 \text{ mole of Fe}_2\text{O}_3} = 400 \text{ grams of Fe}_2\text{O}_3$$