

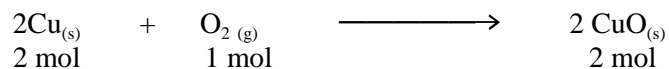
Moles and chemical equations: Stoichiometry

SCH3U_06-07

An equation's coefficient allows us to determine the relative masses of products and reactants by using mol calculations.

When we write a balanced chemical equation we are indicating the numbers of moles of reactants and products involved in the chemical reaction.

Consider the reaction between copper and oxygen:



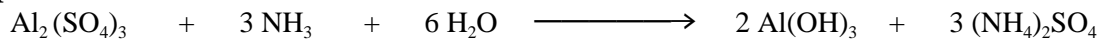
This equation shows that 2 mol of copper atoms react with 1 mol of oxygen molecules to give 2 mol of copper(II) oxide.

$$\begin{array}{rcccl} \text{Hence:} & 2 \times 63.5 & 1 \times (16 \times 2) & & 2 \times (63.5 + 16) \\ = & 127 \text{ g} & 32 \text{ g} & & 159 \text{ g} \end{array}$$

Total mass of reactants is equal to the total mass of the products, as predicted by the **Law of Conservation of mass**, (FYI: this law was formulated by Antoine Lavoisier in 1774), for any chemical reaction.

We can thus use this idea to calculate the masses of products formed and reactants used in a chemical reaction.

Example:



- Name the reactants and the products.
- How many moles of H_2O are required to react with 2.50 moles of aluminium sulphate?
- How many moles of aluminium hydroxide would be produced by the reaction of 5.00 moles of NH_3 ?
- How many grams of aluminium hydroxide would be produced by the reaction of 5.00 moles of NH_3 ?
- How many moles are there in 200.0 g of ammonium sulphate?
- How many moles of aluminium sulphate are required to produce 200.0 g of ammonium sulphate?
- How many grams of aluminium hydroxide will be produced if 36.0 g of water react?
- How many molecules of ammonia are required to react with 50.0 g of aluminium sulphate?
- If 4.50×10^{46} molecules of water react, how many grams of aluminium hydroxide will be formed?