

Balancing Equations

Chemical 10 Equations

Writing balanced symbol equations

There are four stages to writing a full equation for a reaction:

1. Write out the word equation
2. Work out the formulae for all elements and compounds present
3. Balance the equation
4. Add information about the state of each chemical (solid, liquid, gas or aqueous solution).

This worksheet is concerned with the third task – balancing symbol equations.

Example 1 - The reaction between magnesium and oxygen

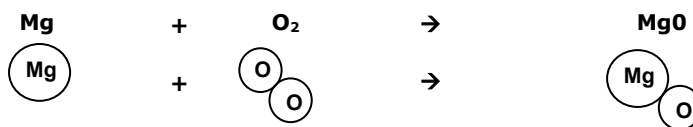


We can work out (using valency or otherwise) that the formula for magnesium oxide is MgO. We need to remember that oxygen is a diatomic molecule and hence has the formula O₂.

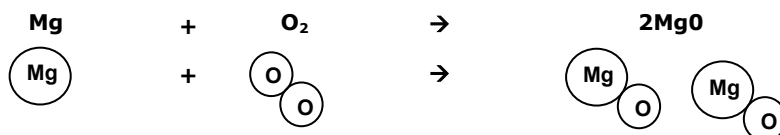
We can now begin our symbol equation:



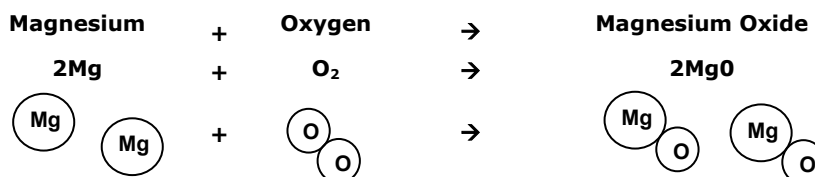
The next stage is to look at the number of atoms of each type of element on either side of the equation. If we start with one magnesium atom, we must finish the reaction with one. If we start with two oxygen atoms, we must also end up with two.



We can see from the diagram that there is the same number of magnesium atoms on either side of the arrow, but the oxygen atoms are not balanced. We cannot introduce a single oxygen atom to the right hand side. We can only introduce a whole magnesium oxide group. We do this by placing a 2 **before** the MgO formula.



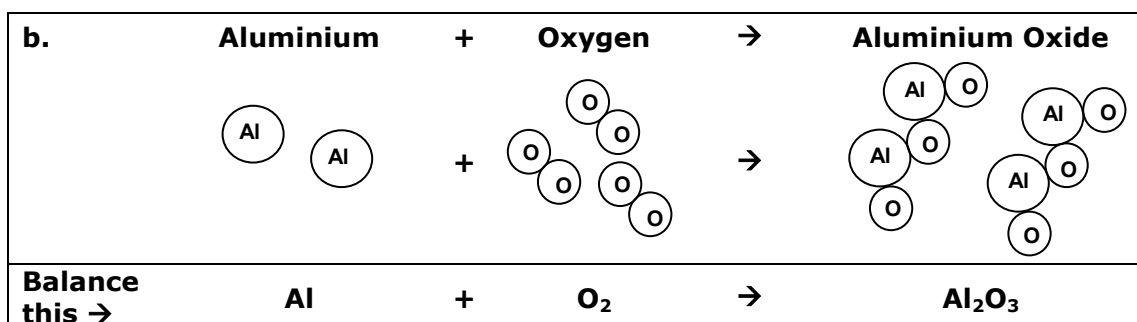
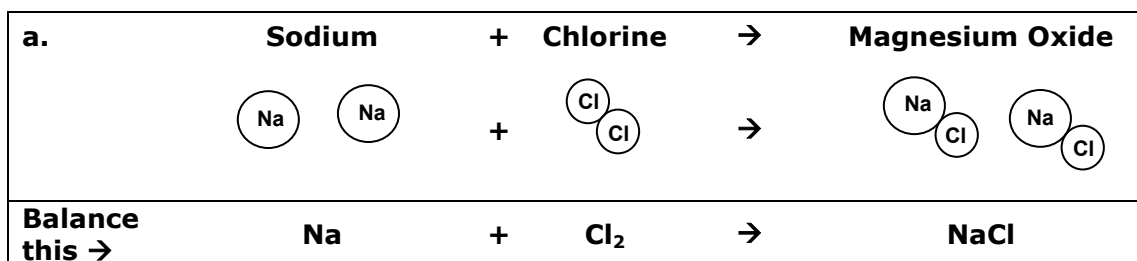
We now have two oxygen atoms on each side of the equation, but the magnesium atoms no longer match. We have to introduce one more magnesium atom to the left hand side, We do this by placing a 2 **in front** of the magnesium symbol.



Our symbol equation is now balanced.

Task 1

Use the diagrams to help balance these symbol equations:



Task 2

Use diagrams or any other method to help balance these symbol equations:

- a. $\text{Ca} + \text{O}_2 \rightarrow \text{CaO}$
- b. $\text{Li} + \text{F}_2 \rightarrow \text{LiF}$
- c. $\text{Mg} + \text{Br}_2 \rightarrow \text{MgBr}_2$
- d. $\text{K} + \text{O}_2 \rightarrow \text{K}_2\text{O}$
- e. $\text{Al} + \text{Cl}_2 \rightarrow \text{AlCl}_3$
- f. $\text{Fe} + \text{O}_2 \rightarrow \text{Fe}_2\text{O}_3$
- g. $\text{H}_2 + \text{O}_2 \rightarrow \text{H}_2\text{O}$
- h. $\text{H}_2 + \text{Cl}_2 \rightarrow \text{HCl}$
- i. $\text{S} + \text{O}_2 \rightarrow \text{SO}_2$
- j. $\text{C} + \text{H}_2 \rightarrow \text{CH}_4$
- k. $\text{Ag} + \text{O}_2 \rightarrow \text{Ag}_2\text{O}$
- l. $\text{Ca} + \text{HCl} \rightarrow \text{CaCl}_2 + \text{H}_2$
- m. $\text{Mg} + \text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$
- n. $\text{Na} + \text{HCl} \rightarrow \text{NaCl} + \text{H}_2$
- o. $\text{Al} + \text{HCl} \rightarrow \text{AlCl}_3 + \text{H}_2$