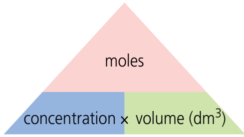
(4.3.4) Concentration in mol/dm³

This is effectively the number of moles of solute dissolved in each 1 dm³ of solution



(4.3.3.2) Atom Economy

This is the percentage of product that is desired in comparison to all of the reactants. It shows how much is wasted.

$$\text{Atom economy} = 100 \times \frac{\text{sum of relative formula mass of desired product from equation}}{\text{sum of relative masses of all reactants from equation}}$$

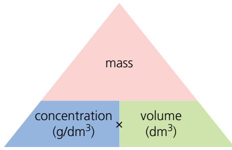
(4.3.3.1) Percentage Yield

This is the percentage product that is actually in comparison to what could theoretically be produced. It is usually expressed as a percentage.

$$\frac{actual}{theoretical} \times 100$$

(4.3.2.5) Concentration of solutions

The concentration of a solution is how much of a given solute there is in a given volume of solution - so the low the volume the higher the concentration will be as there is less area for the solute to go.

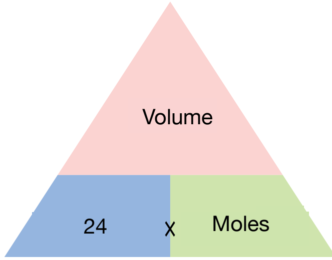


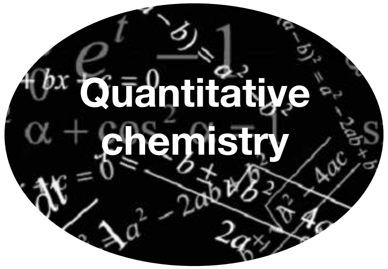
(4.3.2.4) Limiting Reactants

In many reactions involving two reactants, it is very common for an excess of one of the reactants to be used to ensure that all of the other reactant is used up. This is often done if one of the reactants is readily available but the other one is expensive or is in limited supply. For example, when many fuels are burned an excess of oxygen is used. Fuels are expensive and in limited supply. The oxygen is readily available from the air and using an excess of oxygen ensures that all the fuel burns. When one of the reactants is in excess, the other reactant is a limiting reactant that is completely used up. This is because it is the amount of this substance that determines the amount of product formed in a reaction, in other words it limits the amount of product made.

(4.3.5) Volume of Gases

The volume of one mole of any gas at room temperature (20°C) and pressure (1 atmosphere) is 24 dm³; 24 dm³ is the same volume as 24 litres. Therefore at room temperature and pressure,1 mole of argon gas has a volume of 24 dm³. Moles can be calculated by $\frac{mass}{M_r} \times 24$ or the triangle below for moles





(4.3.2.3) Using moles to balance symbol equation

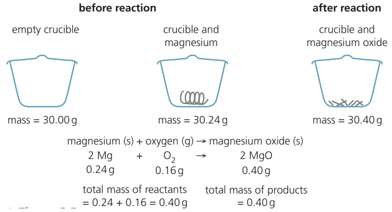
The numbers that are needed to balance a symbol equation can be worked out be calculating the moles of each of the reactants and products. E.g

Substance	Magnesium (Mg)	Oxygen (O_2)	Magnesium oxide (MgO)
Calculate the moles of each substance	moles = $\frac{mass}{M_r}$ = $\frac{1.2}{24} = 0.05$	moles = $\frac{mass}{M_r}$ = $\frac{0.8}{32} = 0.025$	moles = $\frac{mass}{M_r}$ = $\frac{2.0}{40} = 0.05$
Simplest Ratio	$\frac{0.05}{0.025} = 2$	$\frac{0.025}{0.025} = 1$	$\frac{0.05}{0.025} = 2$

= **$2Mg + O_2 \rightarrow 2MgO$**

(4.1.3.1) Conservation of mass and balanced chemical equations

The law states that no atoms are created or destroyed, this means that the mass of the products will equal the mass of the reactants.



This also means that equations can be balanced, by ensuring that there is an equal number of particles of each element or compound on either side of the equation

(4.1.3.2) Relative Formula Mass

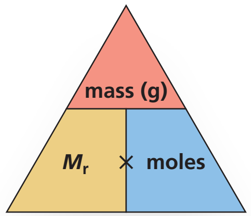
The relative formula mass (M_r) of a compound is the sum of the relative atomic masses of the atoms in the numbers shown in the formula. The relative atomic mass (A_r) of an element is the average mass of atoms of that element taking into account the mass and amount of each isotope it contains on a scale where the mass of a ^{12}C atom is 12.

(4.3.1.3) Mass changes when a reactant or product is a gas

A mass change usually occurs when one of the products is a gas. This is particularly apparent in the thermal decomposition of metal carbonates, which produces CO_2, which is released as a gas. This gas can escape from the container if it isn't fully sealed - meaning the conservation of mass law may not appear to be followed; whilst if the gas given off was taken into account: it would.

(4.3.2.1) Moles

Amounts of chemicals are often measured in moles. This makes it much easier to work out how much of a chemical is needed in a reaction. One atom of ^{12}C has a relative mass of 12. The mass of 602 000 000 000 000 000 000 000 (6.02×10^{23}) atoms of ^{12}C is exactly 12 g. The number 6.02×10^{23} is a very special number and is known as the Avogadro constant.



(4.3.2.2) Amounts of substances in equations

$Mg + 2HCl\ MgCl_2 + H_2$

From the above equation it can be denoted that one mole of magnesium reacts with two moles of hydrochloric acid to produce one mole of magnesium chloride and one mole of hydrogen gas.