Quantitative chemistry

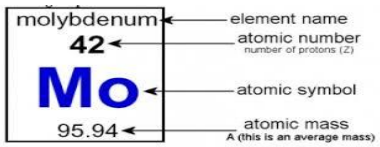
Threshold Concept

To understand that total mass of reactants equals total mass of products

Keywords

Conservation – the mass of the reactants must equal the mass of the products in a chemical reaction
Formula mass – the combined mass numbers of an element or compound
Concentration – the amount of substance dissolved in a solution
Equation – symbol representation of a chemical reaction
Loss – the process of losing something
Gain – the process of gaining something

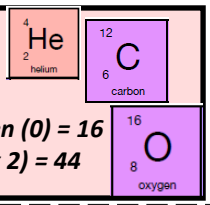
RFM



RAM is atomic mass of an element

RFM is the combination of all elements **Ar** in a compound or Molecule

Work example
Helium (He) Ar = 4
Carbon dioxide = CO_2
Carbon (C) = 12 Oxygen (0) = 16
Mr of CO_2 = 12 + (16 x 2) = 44



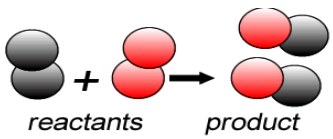
Balancing Equations

As the same number of elements are at the start and the end of reactions. The Equation needs to be balanced.

$Mg + O_2$ —> MgO **(Unbalanced)**

2$Mg + O_2$ —> **2**MgO **(Balanced)**

Conservation of Mass



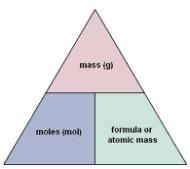
The reactants mass must always equal the mass of the products

2g + 2g —> 4g

We can not destroy atoms.

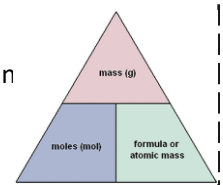
Moles

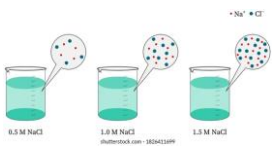
Chemical amounts are measured in moles. One mole of a substance contains **6.02×10^{23} particles (Avagadro's number)**



Concentration

Concentration is the amount of substance in a certain volume of solution (g/dm3)





Percentage by mass

The amount of an element in a compound is called its percentage composition. It can be calculated using the mass of the given element in the compound and the **RFM** of the Compound.

$$\text{Mass \%} = \frac{\text{Mass of solute}}{\text{Mass of solution}} \times 100\%$$

Limiting reactions

The reactant that gets used up first in a reaction is called the limiting reactant. This reactant is not in EXCESS

Reacting masses

The mass of a product or reactant can be determined from having a balanced symbol equation. Once balanced, the equation tells you how many moles of each substance react with each other : Mg + **2**HCl —> **$MgCl_2$ + H_2** **(Balanced)**

This equation states that: 1 : Mg 2 : HCl to form 1 : $MgCl_2$ 1 : H_2

Using the formula and moles you can use this information to work out how much product you will make