CAIE IGCSE Chemistry

3.2 Relative masses of atoms and molecules

Notes

Describe relative atomic mass, A_r, as the average mass of the isotopes of an element compared to 1/12th of the mass of an atom of 12C

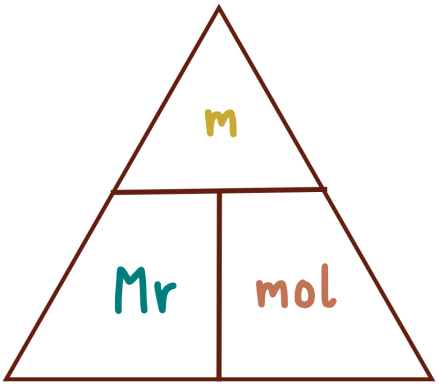
- The relative atomic mass, A_r, of an element is the average mass of the isotopes of an element compared to 1/12th of the mass of an atom of carbon-12
    - E.g. the relative atomic mass of oxygen is 16, chlorine is 35.5, etc

Define relative molecular mass, M_r, as the sum of the relative atomic masses. Relative formula mass, M_r, will be used for ionic compounds

- The relative molecular mass, M_r, is the relative atomic masses of each atom of each element in a molecule added up
    - E.g The M_r of H_2O is 18
    - A_r of H= 1 A_r of O= 16 so 16+1+1=18
- The balancing number (number in front of the symbol/formula) is always ignored when calculating the M_r of a compound
    - E.g The M_r of $3H_2O$ is still 18 regardless of the 3 in front of H_2O
- The relative formula mass, M_r, is the term used for ionic compounds, but the concept is the same
    - E.g The M_r of NaCl is 58.5
    - A_r of Na=23 A_r of Cl= 35.5 so 23+35.5= 58.5

Calculate reacting masses in simple proportions. Calculations will not involve the mole concept

To calculate reacting masses, the following formula triangle is used:



- Tip: To memorise this triangle, remember "Mr Mole carries a mass"
- M_r: The relative formula/molecular mass
- m: the mass of the substance, units: g
- Mol: the number of moles (balancing number of the substance)

- E.g.
  Calculate the mass of magnesium needed to form 12g of magnesium oxide:
  $2Mg\ (s) + O_2(g) \rightarrow 2MgO\ (s)$
  1. Find the M_r of magnesium: 24
  2. Find the M_r of magnesium oxide: (A_r of Mg is 24 and A_r of oxygen is 16)
  3. Find the mol of magnesium oxide: mass of MgO ÷ Mr of MgO
     12 ÷ 40= 0.3
  4. The moles of magnesium is also 0.3 since the balancing numbers of Mg and MgO are the same
  5. Calculate the mass of magnesium: Mr of Mg x mol of Mg
     24 x 0.3 =7.2g