

# C3 Quantitative Chemistry – Knowledge organiser

## Foundation Combined Science (Trilogy) GCSE

4.3.1	Chemical measurements
<p><b>Conservation of mass and balanced chemical equations</b></p>	<ul style="list-style-type: none"> <li>- <b>no atoms are lost or made</b> during a chemical reaction so <b>the mass of the products equals the mass of the reactants</b>.</li> <li>- This is why symbol equations must be <b>balanced</b>, so that there is the same number of atoms on both sides of the equation. e.g. <math>\text{CH}_4 + 2\text{O}_2 \rightarrow \text{CO}_2 + 2\text{H}_2\text{O}</math> (now each side has 1 C, 4 H's and 4 O's)</li> </ul>
<p><b>Relative formula mass (<math>M_r</math>)</b></p>	<ul style="list-style-type: none"> <li>- This is the <b>sum of all the atomic masses (<math>A_r</math>)</b> of the atoms in a molecule/compound. e.g. <math>M_r</math> of <math>\text{H}_2\text{O} = 2 \times 1 + 1 \times 16 = 18</math>; <math>M_r</math> of <math>\text{CaCO}_3 = 1 \times 40 + 1 \times 12 + 3 \times 16 = 100</math></li> <li>- In a balanced symbol equation: <b><math>M_r</math> of the reactants = <math>M_r</math> of the products</b></li> </ul>
<p><b>Explaining mass changes</b> (when a reactant or product is a gas)</p>	<ul style="list-style-type: none"> <li>- <b>State symbols</b> in an equation show the state of the substance: <b>(s)</b> solid; <b>(l)</b> liquid; <b>(g)</b> gas; <b>(aq)</b> aqueous (=dissolved in water)</li> <li>- If there appears to be a change in mass in a reaction this is usually because <b>one of the reactants or products is a gas</b> whose mass has not been included. e.g. <math>2\text{Mg (s)} + \text{O}_2 \text{(g)} \rightarrow 2\text{MgO (s)}</math> : the <b>mass</b> will appear to <b>increase</b>, because the magnesium is <b>gaining</b> the atoms of oxygen <b>gas</b>. e.g. <math>\text{CaCO}_3 \text{(s)} \rightarrow \text{CO}_2 \text{(g)} + \text{CaO (s)}</math> : the <b>mass</b> appears to <b>decrease</b>, because carbon dioxide <b>gas</b> is made and <b>escapes into the air</b>.</li> </ul>
<p><b>Uncertainty</b> in chemical measurements</p>	<ul style="list-style-type: none"> <li>- Whenever a measurement is made there is always some <b>uncertainty</b> about the result obtained. This can be represented on a graph by plotting the <b>range</b> of repeats as well as the <b>mean</b>. <b>The bigger the range around the mean, the more uncertainty there is</b> about the results.</li> </ul>
4.3.2	Masses and concentrations
<p><b>Concentrations of solutions</b></p>	<ul style="list-style-type: none"> <li>- The concentration of a solution (aq) can be measured in <b><math>\text{g/dm}^3</math></b> (mass/volume) <b>Concentration = mass <math>\div</math> volume</b></li> </ul>