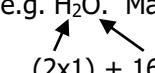


Chemistry 3: Quantitative Chemistry	
Section 1: Bonding Key Terms	
1 Law of conservation of mass	<b>No atoms</b> are <b>lost</b> or <b>gained</b> during a <b>chemical reaction</b> . The mass of the products is the same as the mass of the reactants. Some reactions <b>appear to give a change in mass</b> , but this is because a <b>gas may have escaped</b> from the reaction container.
2 Relative atomic mass ( $A_r$ )	The <b>average mass</b> of an <b>atom of an element</b> compared to Carbon-12.
3 Relative formula mass ( $M_r$ )	The <b>sum of all the atomic masses</b> of the atoms in a <b>formula</b> (e.g. $\text{H}_2\text{O}$ ).
4 Uncertainty	The <b>interval</b> within which the <b>true value</b> can be <b>expected to lie</b> . E.g. $25^\circ\text{C} \pm 2^\circ\text{C}$ – the true value lies between $23^\circ\text{C}$ and $27^\circ\text{C}$ .
5 Mole (HT)	A measurement for the amount of a chemical. It is the <b>mass</b> (in grams) of <b><math>6.02 \times 10^{23}</math></b> (the Avogadro constant) <b>atoms of an element</b> . Symbol: mol.
6 Balanced equation (HT)	Balanced symbol equations show <b>the number of moles that react</b> . e.g. $\text{Mg} + 2\text{HCl} \rightarrow \text{MgCl}_2 + \text{H}_2$ Shows one mole of magnesium reacting with two moles of hydrochloric acid to form one mole of magnesium chloride and one mole of hydrogen.
7 Limiting reactant (HT)	The <b>reactant</b> that is <b>completely used up</b> in a chemical reaction. It <b>limits the amount of product</b> formed.
8 Excess reactant (HT)	The reactant that is <b>not completely used up</b> in a chemical reaction. There is some reactant left at the end.
9 Concentration	A measure of the <b>number of particles</b> of a chemical in a <b>volume</b> . Can be measured in <b><math>\text{g}/\text{dm}^3</math></b> .
10 Decimetre <sup>3</sup> ( $\text{dm}^3$ )	A <b>measurement of volume</b> . Contains <b><math>1000\text{cm}^3</math></b> .

Section 2: Calculations and Examples	
11 Calculating relative formula mass ( $M_r$ )	Add up all the atomic masses in a formula.  e.g. $\text{H}_2\text{O}$ . Mass of hydrogen = 1. Mass of oxygen = 16. <div>  <math>(2 \times 1) + 16 = 18</math> </div>
12 Percentage uncertainty	Percentage uncertainty = $\frac{\text{Uncertainty}}{\text{Quantity being measured}} \times 100$  e.g. What is the percentage uncertainty of a $50\text{cm}^3$ measuring cylinder accurate to $\pm 2\text{cm}^3$ ?  Percentage uncertainty = $\frac{2}{50} \times 100 = 4\%$
13 Number of moles	Number of moles = $\frac{\text{Mass of chemical}}{\text{Relative formula mass}}$  e.g. How many moles of water are there in 36g of $\text{H}_2\text{O}$ ?  Number of moles = $\frac{36}{18} = 2$ moles
14 Volume in $\text{dm}^3$	Volume in $\text{dm}^3$ = $\frac{\text{volume of liquid}}{1000\text{cm}^3}$  e.g. What is the volume in $\text{dm}^3$ of $500\text{cm}^3$ of hydrochloric acid?  Volume in $\text{dm}^3$ = $\frac{500}{1000} = 0.5\text{dm}^3$
15 Concentration of a solution	Concentration = $\frac{\text{Mass of solute}}{\text{Volume (in } \text{dm}^3 \text{)}}$  e.g. What is the concentration of a solution of hydrochloric acid which contains 100g of hydrochloric acid in $500\text{cm}^3$ ?  Concentration = $\frac{100}{0.5} = 200\text{g}/\text{dm}^3$