



Chemistry:

Transition from GCSE to AS level

Part 7 - Balancing equations

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EQUATIONS

Equations **must** balance

When balancing an equation,

- never change a correct formula,
- change the numbers of moles by writing a number in front of a formula

For **Ionic Equations** the charges must balance as well as the atoms

Calculations involving reactions will be wrong unless a balanced equation is written first.

How to balance equations

- (i) write a word equation
- (ii) write the chemical formula
- (iii) balance using Ya's method: pick the most difficult compound, put **1** in front, this defines the other compounds; work through for all elements - penultimate H, and lastly O !
- (iv) write down the atoms on the l.h.s. and those on the r.h.s.
- (v) Check, is it balanced ?

example

Write an equation for the reaction between copper carbonate and dilute nitric acid

method

(i) copper carbonate + nitric acid → copper nitrate + carbon dioxide + water
(*number 4 in list of general equations*)

(ii) $\text{CuCO}_3 + \text{HNO}_3 \rightarrow \text{Cu}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$

(iii) $\text{CuCO}_3 + \text{HNO}_3 \rightarrow \mathbf{1} \text{Cu}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$

put a "one" in front of $\text{Cu}(\text{NO}_3)_2$

therefore:

$\mathbf{1} \text{CuCO}_3 + \mathbf{2} \text{HNO}_3 \rightarrow \mathbf{1} \text{Cu}(\text{NO}_3)_2 + \text{CO}_2 + \text{H}_2\text{O}$

finally:

$\mathbf{1} \text{CuCO}_3 + \mathbf{2} \text{HNO}_3 \rightarrow \mathbf{1} \text{Cu}(\text{NO}_3)_2 + \mathbf{1} \text{CO}_2 + \mathbf{1} \text{H}_2\text{O}$

(iv) to check, count the number of each atom on each side

Left hand side: 1 x Cu, 1 x C, 2 x H, 2 x N and 9 x O

Right hand side: 1 x Cu, 1 x C, 2 x H, 2 x N and 9 x O

Therefore, Balanced ✓

Note:

If H appears in any compound on the left hand side of any equation, then unless you **know** hydrogen gas is produced (eg *MASH*) you may assume that **water** is probably formed.

Work through the following exercise

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																	(18)
																	4.0 He helium 2
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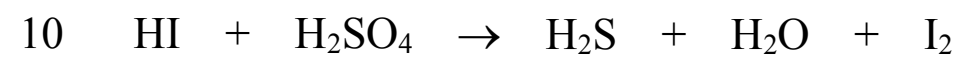
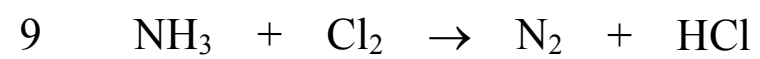
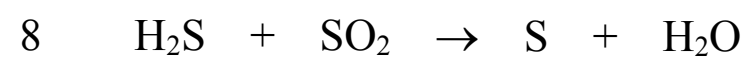
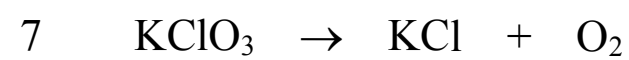
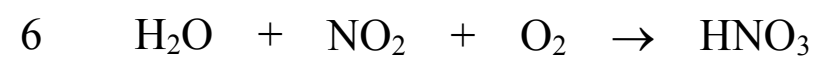
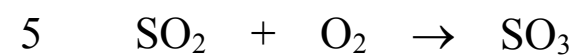
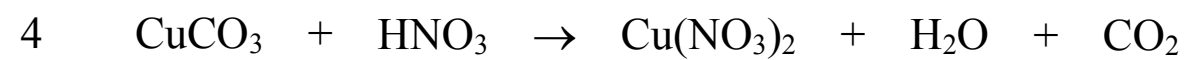
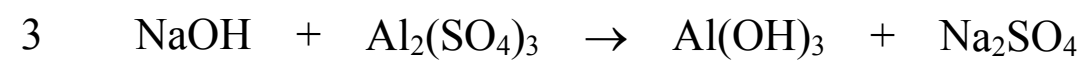
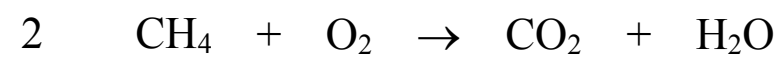
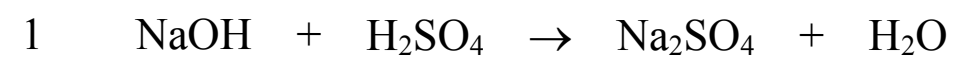
* 58 – 71 Lanthanides

† 90 – 103 Actinides

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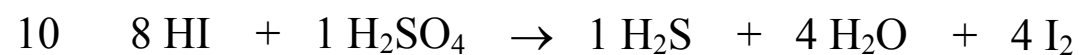
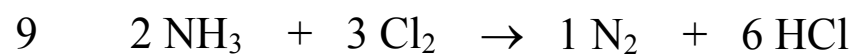
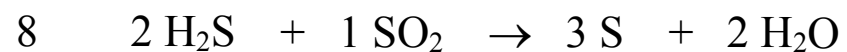
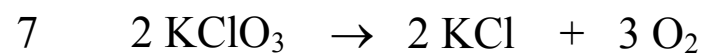
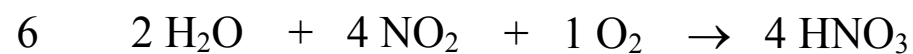
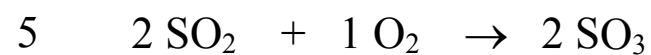
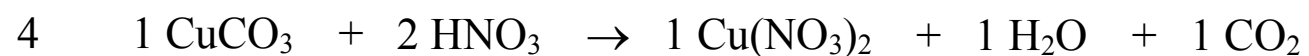
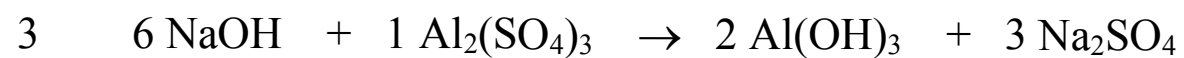
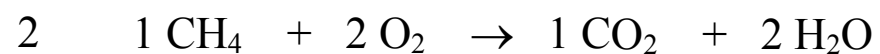
Balance these equations:



Pause this presentation while you complete the exercise on the previous page.

When complete move to the next page where you can check your answers.

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More practice !

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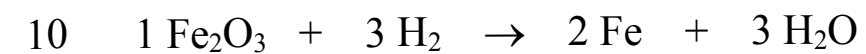
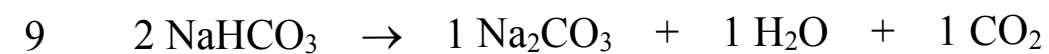
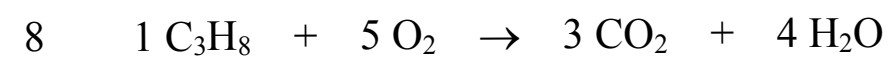
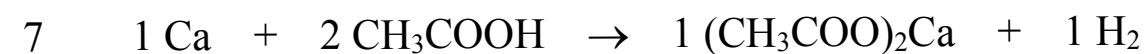
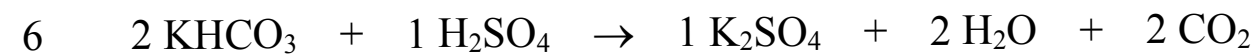
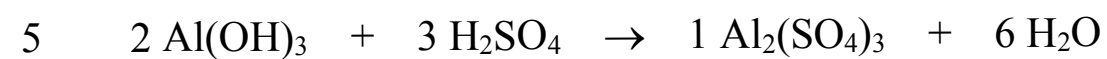
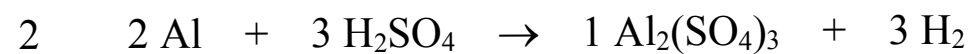
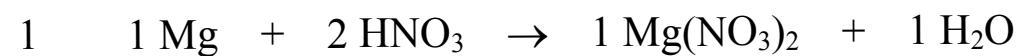
Write balanced symbol equations for the following reactions:

- 1 magnesium + nitric acid
- 2 aluminium + sulphuric acid
- 3 sodium + phosphoric acid
- 4 copper oxide + hydrochloric acid
- 5 aluminium hydroxide + sulphuric acid
- 6 potassium hydrogencarbonate + sulphuric acid
- 7 calcium + ethanoic acid
- 8 complete combustion of propane (C₃H₈)
- 9 thermal decomposition of sodium hydrogencarbonate
- 10 reduction of iron (III) oxide by hydrogen

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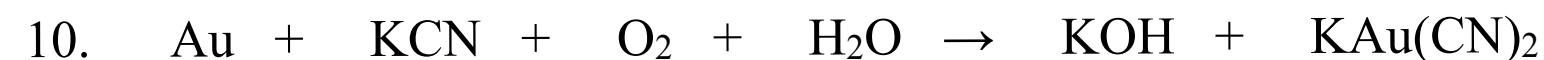
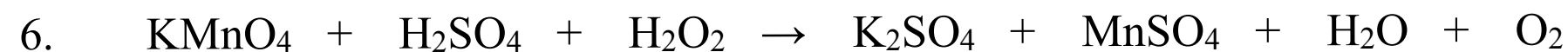
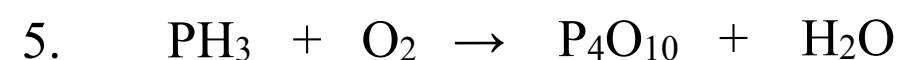
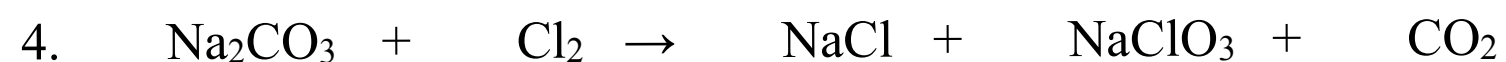
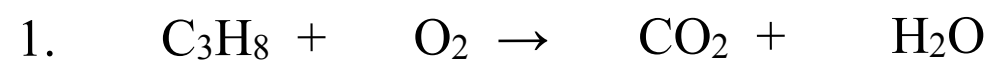
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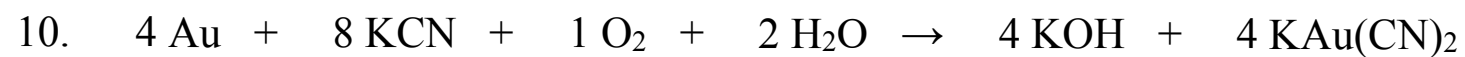
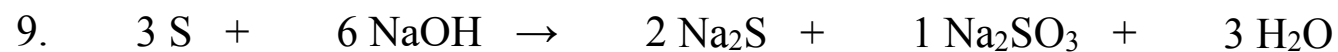
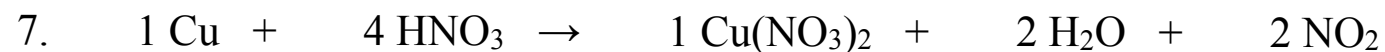
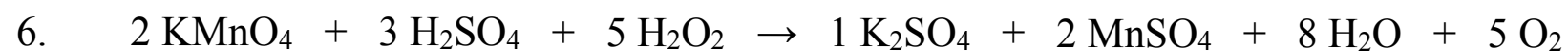
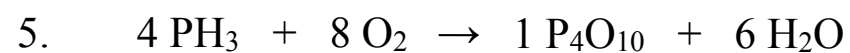
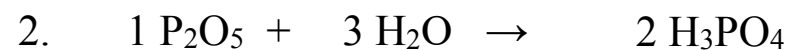
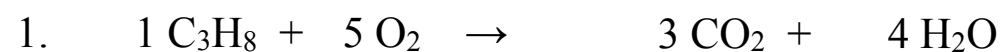
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When you're confident with this
topic move onto part 8:

Calculations in equations