

Balanced chemical equations

1. Chemical equations are used to describe the changes that occur during a chemical reaction.

(a) Define the terms 'reactants' and 'products' in relation to chemical reactions.

i. Reactants

(1 mark)

ii. Products

(1 mark)

(b) Complete the sentences to describe what happens during a chemical reaction in terms of the atoms of the reactants and products.

For any chemical reaction, the _____ of the reactants used is always the same as that of the products formed.

During a chemical reaction, the atoms of the reactants are _____ to form the products.

The number of atoms of each element present in the products is _____ the number of atoms of each element in the reactants.

(3 marks)

(c) State symbols are used in chemical equations to show the physical state of the reactant or product at room temperature.

Identify the physical state represented by each of the following state symbols.

State symbol	Physical state
(s)	
(l)	
(g)	
(aq)	

(2 marks)

2. The changes that occur during chemical reactions can be described using chemical formulas in chemical equations.

(a) Complete the sentence. 'A chemical formula uses chemical symbols to show ...'

(1 mark)

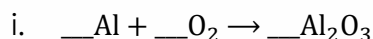
(b) Complete the table with the names and chemical formulas for each of the following common compounds and elements.

Name	Chemical formula
water	
oxygen	
	H ₂
carbon dioxide	
carbon monoxide	
sulfur dioxide	
	SO ₃
hydrochloric acid	
	H ₂ SO ₄
nitric acid	
chlorine	
	NH ₃

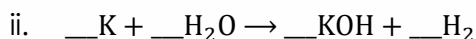
(6 marks)

3.

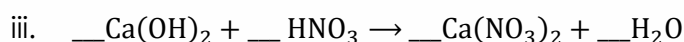
(a) Complete the chemical equations by adding the missing numbers in front of the **relevant** formulas to balance the equation.



(1 mark)



(1 mark)



(1 mark)

(b) The table includes examples of unbalanced and balanced chemical equations. Complete the table by ticking the boxes to identify the balanced and unbalanced chemical equations.

Chemical equations	Balanced	Unbalanced
$2\text{Al} + 3\text{Br}_2 \rightarrow 2\text{AlBr}_3$		
$\text{Mg}(\text{OH})_2 + \text{H}_2\text{SO}_4 \rightarrow \text{MgSO}_4 + \text{H}_2\text{O}$		
$\text{NaOH} + \text{H}_2\text{SO}_4 \rightarrow \text{Na}_2\text{SO}_4 + \text{H}_2\text{O}$		
$\text{K}_2\text{CO}_3 + 2\text{HCl} \rightarrow 2\text{KCl} + \text{CO}_2 + \text{H}_2\text{O}$		
$\text{FeCl}_3 + \text{NH}_4\text{OH} \rightarrow \text{Fe}(\text{OH})_3 + \text{NH}_4\text{Cl}$		
$\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$		

(3 marks)

(c) For each of the equations you identified as unbalanced in **part (b)**, write the correct balanced version.

(3 marks)

4. Write balanced chemical equations, including the correct state symbols, for each of the chemical reactions being described below. Some of the formulas have been provided in the questions.

Hint: You can look back at previous questions and use the periodic table to help with some of the formulas needed.

(a) Nitrogen gas reacts with hydrogen gas to produce ammonia gas (NH_3).

(3 marks)

(b) Solid calcium carbonate (CaCO_3) reacts with an aqueous solution of hydrochloric acid to produce an aqueous solution of calcium chloride (CaCl_2), carbon dioxide gas and liquid water.

(3 marks)

(c) Solid zinc metal reacts with an aqueous solution of nitric acid (HNO_3) to produce an aqueous solution of zinc nitrate ($\text{Zn}(\text{NO}_3)_2$) and hydrogen gas.

(3 marks)

5. Balanced ionic equations are used to show how oppositely charged ions react with each other during a chemical reaction.
Write the balanced ionic equations for each reaction described, including state symbols.

(a) Aqueous silver ions (Ag^+) react with aqueous carbonate ions (CO_3^{2-}) to produce a solid precipitate of silver carbonate (Ag_2CO_3).

(2 marks)

(b) Aqueous aluminium ions (Al^{3+}) react with aqueous hydroxide ions (OH^-) to produce solid aluminium hydroxide ($\text{Al}(\text{OH})_3$) precipitate.

(2 marks)

[Total: 36 marks]



Which question(s) did you get wrong? Why?

What will you do next time you're asked a similar question?