

Balancing equations

Name _____ Class _____ Mark _____ / 14

What you are practising

I can balance a formula equation by counting each type of atom on both sides.

Worked example: magnesium burning in air

- 1 $\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow \text{MgO(s)}$ O does not match.
 2 $\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{MgO(s)}$ O matches, Mg does not.
 3 $2\text{Mg(s)} + \text{O}_2\text{(g)} \rightarrow 2\text{MgO(s)}$ balanced.

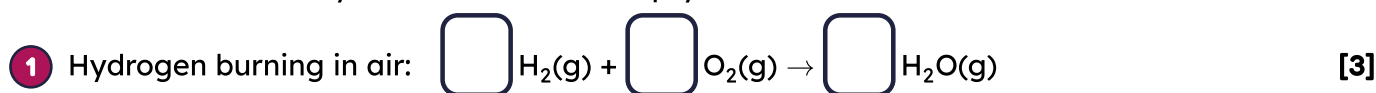
	Step 1		Step 2		Step 3	
Atom	react.	prod.	react.	prod.	react.	prod.
Mg	1	1	1	2	2	2
O	2	1	2	2	2	2

Why balance? In a reaction atoms are rearranged, not made or destroyed. The number of each type of atom is the same before and after, so mass is conserved.

The rule: change the big number in front of a formula, never the small number in the formula. A big number multiplies the whole formula: 2MgO is 2 Mg and 2 O. A "1" is not written.

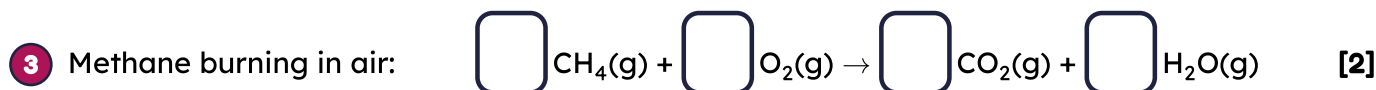
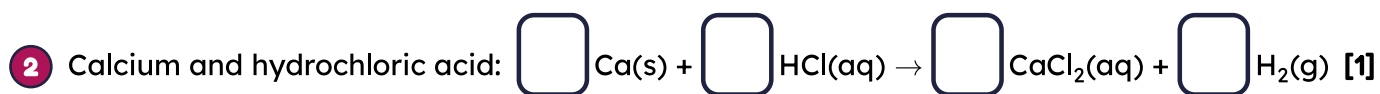
Balance the equations

Write a number in every box. Leave a box empty if the number is 1.



Fill in the atom count for the equation before you balance it, and after.

	Before balancing		After balancing	
Atom	Reactants	Products	Reactants	Products
Hydrogen (H)				
Oxygen (O)				



5 Hydrogen and iodine make hydrogen iodide: $\text{H}_2(\text{g}) +$ $\text{I}_2(\text{s}) \rightarrow$ $\text{HI}(\text{g})$ [1]

6 Stretch. Propane burning in air: $\text{C}_3\text{H}_8(\text{g}) +$ $\text{O}_2(\text{g}) \rightarrow$ $\text{CO}_2(\text{g}) +$ $\text{H}_2\text{O}(\text{g})$ [2]

Explain

A Sodium hydrogen carbonate and hydrochloric acid react in an open flask on a balance. The mass goes down. Explain, using atoms, why mass is still conserved. [2]

Who is right?

B Balancing $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$:

Ola: $\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow \text{MgO}_2(\text{s})$

Ben: $2\text{Mg}(\text{s}) + \text{O}_2(\text{g}) \rightarrow 2\text{MgO}(\text{s})$

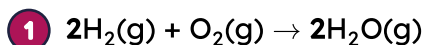
Who is right, and why?

[2]

Answers

Balance the equations

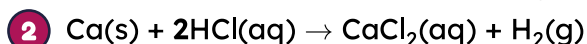
[10]



[3]

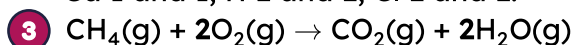
Atom	Before balancing		After balancing	
	Reactants	Products	Reactants	Products
Hydrogen (H)	2	2	4	4
Oxygen (O)	2	1	2	2

Correct equation (1); before-balancing columns correct (1); after-balancing columns correct (1).



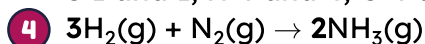
[1]

Ca 1 and 1; H 2 and 2; Cl 2 and 2.



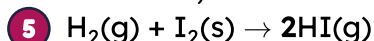
[2]

C 1 and 1; H 4 and 4; O 4 and 4 (2 in CO_2 + 2 in $2\text{H}_2\text{O}$). One mark for each correct big number.



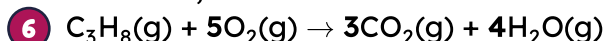
[1]

H 6 and 6; N 2 and 2.



[1]

H 2 and 2; I 2 and 2.



[2]

C 3 and 3; H 8 and 8; O 10 and 10 (6 + 4). Balance C first, then H, then O. Two numbers correct (1); all three correct (1).

Explain

[2]

One product, carbon dioxide, is a gas and escapes from the open flask into the air, so its atoms are no longer weighed (1). The atoms are not destroyed: the total number and type of atoms is the same before and after, so if the gas is trapped (for example with a balloon) the mass stays the same (1).

Who is right?

[2]

Ben (1). Ola changed the small number in the formula. MgO_2 is not magnesium oxide, so her equation shows a different substance. To balance, change the big number in front, never the small number in the formula (1).

How to revise this

Look at the three steps in the worked example and the rule. Cover them. Balance $\text{Mg} + \text{O}_2 \rightarrow \text{MgO}$ from memory with an atom count table. Check against page 1. Repeat only the steps you missed.