

Symbols and formulae

Name _____ Class _____ Mark _____ / 18

What you are practising

I can read a chemical formula and say which atoms are in the substance and how many of each.

Worked example: calcium hydroxide, $\text{Ca}(\text{OH})_2$

Ca has no number after it: **1** calcium atom.

(OH)₂: the OH section is a unit and there are two of them. The 2 multiplies everything inside the bracket:

O $1 \times 2 = 2$ oxygen atoms, H $1 \times 2 = 2$ hydrogen atoms.

Total: $1 + 2 + 2 = 5$ atoms.

Symbol: one or two letters. First letter always a capital, second letter always lower case.

Subscript: the small number counts the atom just before it. No number means 1.

Brackets: everything inside is multiplied by the subscript after the bracket.

Names and symbols

Use the periodic table to fill in the missing name or symbol. One mark for every two correct. [4]

1 Cu	2 N	3 S	4 Fe
5 carbon	6 neon	7 silicon	8 gold

Count the atoms

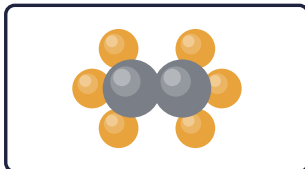
Fill in every blank cell. Pictures 9 and 10: write the formula.

[10]

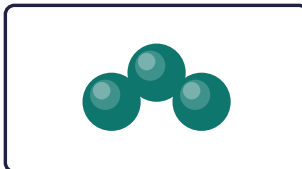
Formula	Atoms of each element	Total
water H_2O	$2 \times \text{H}$, $1 \times \text{O}$	3
1 CO_2		
2 FeCl_3		
3 H_2SO_4		
4 $\text{C}_6\text{H}_{12}\text{O}_6$		
5 $\text{C}_{10}\text{H}_{22}$		
6 $(\text{NH}_4)_2\text{SO}_4$		
7 four N_2 molecules		
8 caffeine	$8 \times \text{C}$, $10 \times \text{H}$, $4 \times \text{N}$, $2 \times \text{O}$	

Count the atoms (continued)

Picture 9



Picture 10



- carbon
- hydrogen
- oxygen

Overlapping atoms are joined.

Explain

- A** Use the symbol rule to explain why carbon dioxide is written CO_2 and not Co_2 . [2]

Who is right?

- B** **Maya:** "Water has two hydrogen atoms and one oxygen atom, so it is 2HO ." **Sam:** "It is H_2O ." Who is right, and why? [2]

Answers**Names and symbols****[4]****1** Cu copper**2** N nitrogen**3** S sulphur**4** Fe iron**5** carbon C**6** neon Ne**7** silicon Si**8** gold Au

One mark for every two correct. Symbols need the capital and lower-case letters exactly as shown: Ne, not NE or ne.

Count the atoms**[10]**

Formula	Atoms of each element	Total
1 CO ₂	1 × C, 2 × O	3
2 FeCl ₃	1 × Fe, 3 × Cl	4
3 H ₂ SO ₄	2 × H, 1 × S, 4 × O	7
4 C ₆ H ₁₂ O ₆	6 × C, 12 × H, 6 × O	24
5 C ₁₀ H ₂₂	10 × C, 22 × H	32
6 (NH ₄) ₂ SO ₄	2 × N, 8 × H, 1 × S, 4 × O	15
7 four N ₂ molecules	8 × N (2 in each molecule, 4 molecules)	8
8 caffeine C ₈ H ₁₀ N ₄ O ₂	8 × C, 10 × H, 4 × N, 2 × O	24

Rows 1–8: one mark per row; everything in the row must be right. In row 6 the 2 after the bracket doubles both N and H: $1 \times 2 = 2$ N and $4 \times 2 = 8$ H.

9 C₂H₆: 2 carbon atoms, 6 hydrogen atoms (**1**)

10 O₃: 3 oxygen atoms joined in one molecule. 3O would mean three separate atoms (**1**)

Explain**[2]**

A capital letter starts a new symbol, so CO is two symbols: C (carbon) and O (oxygen) (**1**). Co, with a lower-case o, is one symbol for a different, single element (cobalt), so Co₂ would be two atoms of that element, with no carbon or oxygen (**1**).

Who is right?**[2]**

Sam (**1**). The number that counts atoms is a subscript written after the atom it counts, so two hydrogen atoms is H₂. A large number in front counts whole particles: 2HO would mean two HO particles, not one water molecule (**1**).

How to revise this

Look at the three rules on page 1. Cover them. Write them out from memory. Check against page 1. Then re-count only the rows in the table you got wrong.