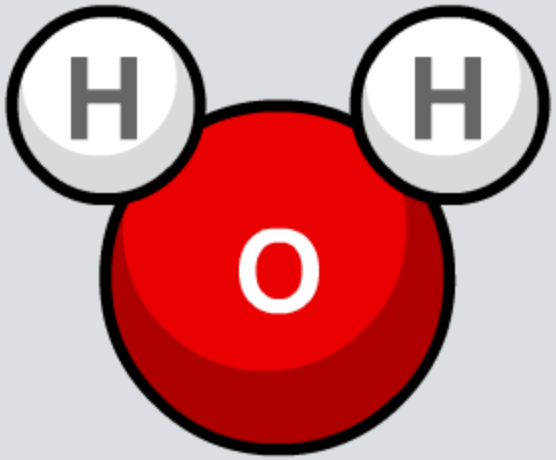
Formulae of Compounds



H_2O

Composition of compounds

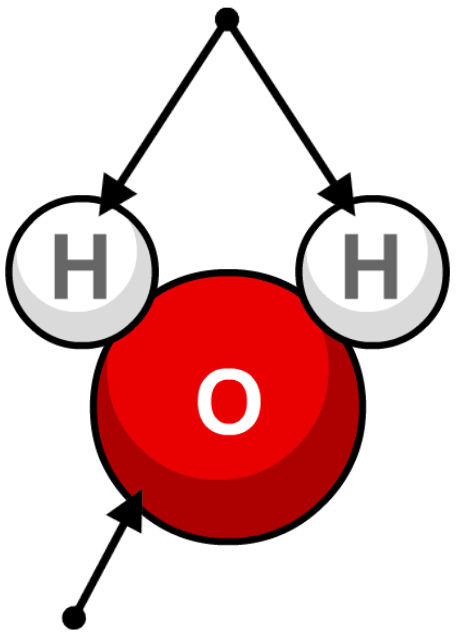
A compound always contains a particular amount of each element. It has a **fixed composition**.

For example, water molecules always contain twice as much hydrogen as oxygen.

This is shown in its **formula**, H_2O.

What is the formula of carbon dioxide?

How many atoms of each element does a carbon dioxide molecule contain?



Match the names and the formulae

What are the formulae of these compounds?

calcium sulfate	1
sodium nitride	2
sodium nitrate	3
carbon monoxide	4
aluminum oxide	5
sulfur dioxide	6

CO | SO_2 | Al_2O_3 | $NaNO_3$

Na_3N | $CaSO_4$

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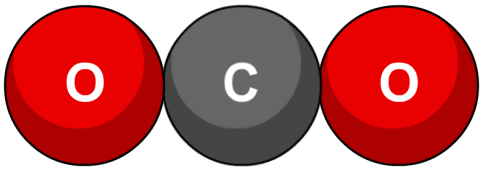
Writing a formula

A formula uses the symbols of the elements in a compound.

When there is more than one atom of an element, the number is always written **after the symbol**.

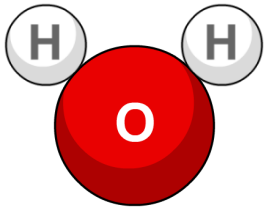


carbon dioxide

carbon atoms = 1

oxygen atoms = 2

formula = CO_2



water

hydrogen atoms = 2

oxygen atoms = 1

formula = H_2O

The formula shows the **ratio of atoms** in a compound.

What is the formula?

What is the formula of each of these compounds? (remember when you write a formula, put the metal first)

1. **Titanium oxide**
   For every titanium atom there are two oxygen atoms.
   Formula = TiO_2

2. **Lithium oxide**
   For every two lithium atoms there is one oxygen atom.
   Formula = Li_2O

3. **Aluminum chloride**
   For every aluminum atom there are three chlorine atoms.
   Formula = $AlCl_3$

What does a formula show?

What is the ratio of atoms in each compound?

Al_2O_3	For every one magnesium atom, there is one oxygen atom.
MnO_2	For every one manganese atom, there are two oxygen atoms.
MgO	For every two silver atoms, there is one oxygen atom.
Ag_2O	For every two aluminum atoms, there are three oxygen atoms.

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solve

What is the ratio of atoms?

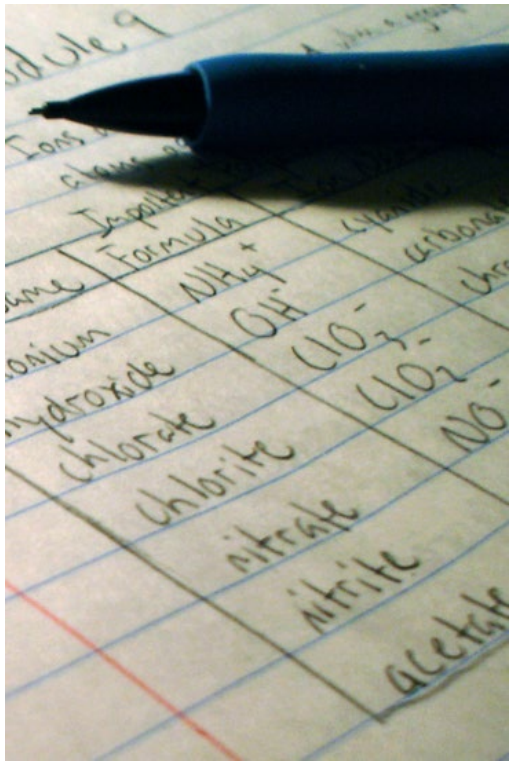
What is the ratio of atoms in each compound?

calcium carbonate ($CaCO_3$)

one calcium atom	one zinc atom	one carbon atom	three oxygen atoms
one boron atom	two boron atoms	one sulfur atom	four oxygen atoms
one sodium atom	two sodium atoms	one chlorine atom	two chlorine atoms

Why do scientists use formulae?

Elements and compounds have different names in different languages:



For example, sodium chloride is called:

- Cloruro sódico in Spanish
- Chlorek sodu in Polish
- Хлорид натрия in Russian.

This can lead to problems when scientists from different countries try to explain what they are investigating.

However, because formulae are the same in every language, scientists can communicate their ideas easily using these instead of names.