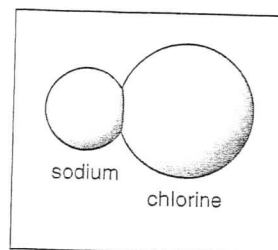


LESSON 9 | What is a chemical formula?

Each element has its own chemical symbol. Each compound has its own **chemical formula**. A formula tells us two important things about a compound. It tells us what elements the compound is made of. It also tells us how many atoms of each element are in a molecule or formula unit of the compound.

The formula for table salt is NaCl.

- Na is the symbol for sodium.
- Cl is the symbol for chlorine.

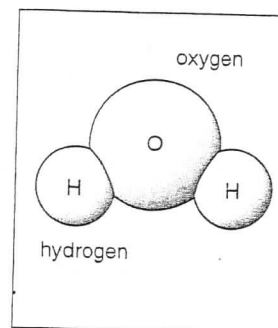


One formula unit of NaCl has a total of two atoms. One of the atoms is sodium (Na). The other atom is chlorine (Cl).

Sometimes a symbol has a small number written next to it. This number tells us the number of atoms there are of that element.

The formula for water is H₂O.

- H is the symbol for hydrogen.
- O is the symbol for oxygen.
- H₂ means two atoms of hydrogen.
- O means one atom of oxygen.



One molecule of H₂O, then, has a total of three atoms. Two of the atoms are hydrogen. One atom is oxygen.

The formula for a compound is always the same. A change in the formula means that a new substance was formed.

It is helpful to learn to recognize some chemical symbols. However, if you see one you do not know, you can always look it up in a dictionary, an encyclopedia, or a chemistry book.

COMPLETING SENTENCES

Choose the correct word or term for each statement. Write your choice in the spaces provided.

1. A molecule is made up of _____ .
atoms, oxygen
2. A single molecule has at least _____ atoms.
one, two
3. _____ are combined to make _____ .
Elements, Compounds elements, compounds
4. There are _____ elements than compounds.
more, fewer
5. Molecules are usually _____ than atoms.
larger, smaller

The formula for starch is $C_6H_{10}O_5$. This stands for one molecule of starch. Answer these questions about the starch molecule.

6. Starch is made up of _____ elements.
one, two, three
7. The number of different kinds of atoms in starch is _____ .
three, billions
8. One molecule of starch has _____ atoms of hydrogen.
two, six, ten
9. The total number of atoms in one molecule of starch is _____ .
6, 10, 16, 21
10. The number of molecules in a teaspoon of starch is _____ .
about one hundred, more than a billion

MATCHING

Match each term in Column A with its description in Column B. Write the correct letter in the space provided.

Column A	Column B
_____ 1. CaF_2	a) contains one kind of atom
_____ 2. HF	b) 3 atoms in each formula unit
_____ 3. formula	c) 2 atoms in each formula unit
_____ 4. element	d) short way of writing an element
_____ 5. symbol	e) short way of writing a compound

COMPLETE THE CHART

Complete the chart by filling in the missing information. The first one has been done for you.

Formula	Name	Number of Elements	Names of the Elements	Number of Atoms of Each Element	Total Number of Atoms In One Formula Unit
1. MgO	magnesium oxide	2	magnesium oxygen	1 1	2
2. SO ₂	sulfur dioxide				
3. NH ₃	ammonia				
4. H ₂ CO ₃	carbonic acid (soda water)				
5. C ₁₂ H ₂₂ O ₁₁	table sugar				
6. MgSO ₄	magnesium sulfate (Epsom salts)				
7. NaOH	sodium hydroxide (lye)				
8. H ₂ O ₂	hydrogen peroxide				
9. Fe ₂ O ₃	iron oxide (rust)				
10. NaHCO ₃	sodium bicarbonate (baking soda)				


 SECTION
1

Reinforcement

Stability in Bonding

Directions: Each statement below contains a pair of terms or phrases in parentheses. Circle the term or phrase that makes each statement true.

- The properties of a compound are (the same as, different from) the properties of the elements that make up the compound.
- Na and Cl are chemical (symbols, formulas).
- NaCl and NaOH are chemical (symbols, formulas).
- In the formula H_2O , the number 2 is a (subscript, superscript).
- The number 2 in the formula H_2O tells you that each unit of this compound contains two (hydrogen, oxygen) atoms.
- If a symbol in a chemical formula does not have a subscript after it, a unit of that compound contains (no atoms, one atom) of that element.
- The total number of atoms in Fe_2O_3 is (two, five, six).
- There are (three, seven, ten) different elements in H_2SO_4 .
- An atom is chemically stable if its outer energy level (is filled with, contains no) electrons.
- For atoms of most noble gases and most other elements, the outer energy level is full when it has (three, eight) electrons.
- The noble gases do not readily form compounds because they (are, are not) chemically stable.
- A chemical bond is a (force, chemical) that holds atoms together in a compound.
- Chemical bonds form when atoms lose, gain, or (share, multiply) electrons.

Directions: Complete the table below by using the formula of each compound to identify the elements that each compound contains and the number of atoms of each of these elements in a unit of the compound. The first formula has been done for you.

Formula	Element 1	Element 2	Element 3
H_2O	2 hydrogen	1 oxygen	
14. NaOH			
15. NaCl			
16. NH_3			
17. H_2SO_4			
18. SiO_2			