AIM 12 | What are compounds and molecules?

A deck of playing cards has 52 cards. How many different ways can you put them together? Does the number 8 followed by 67 zeros surprise you? This is what it looks like:

80,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000,000.

What if you combined the chemical elements? There are only 106 elements, but we all know that there are more than 106 substances. In fact, there are millions and millions of substances.

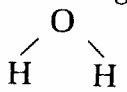
Most of the substances we know are made up of two or more elements: water, salt, carbon dioxide, baking soda. These substances are possible because atoms of different elements can link up.

A *compound* is a substance made of linked-up atoms. The elements in the compound lose their own properties. The compound takes on new properties. Compounds do not even have to be in the same state as the elements of which they are made. For example, hydrogen and oxygen are both gases. They can link up to make water—a liquid. A compound must have at least one metal element and one nonmetal.

A *molecule* [MOL uh kyool] is the smallest part of a compound that still has the properties of that compound. A molecule must have at least two atoms. Some molecules have thousands of atoms.

Most compounds are found in nature. Some compounds are made by scientists.

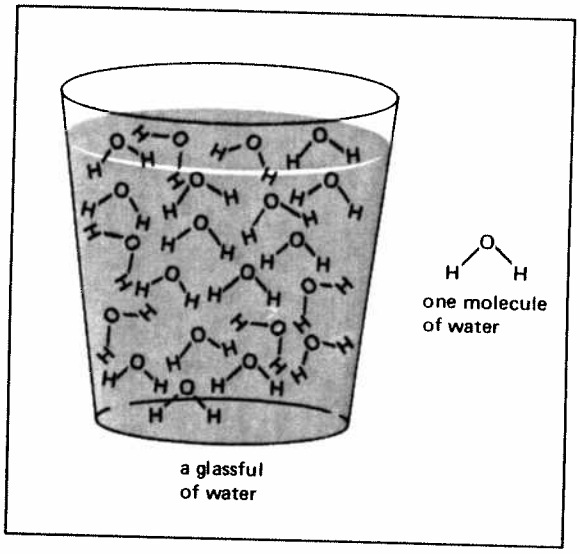
ABOUT MOLECULES

In the picture to the right, each of the groups labeled  stands for one molecule of water.

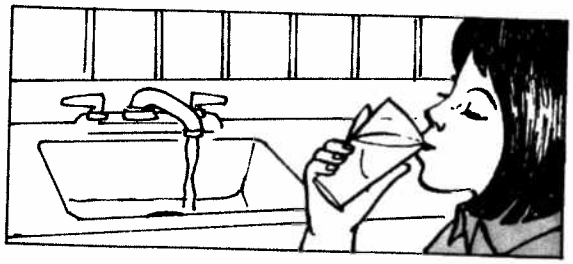
Each molecule is the same. Each molecule has all the properties of water.

The smallest part of a compound is just *one molecule* of that compound.

The molecules of any one compound are exactly alike.



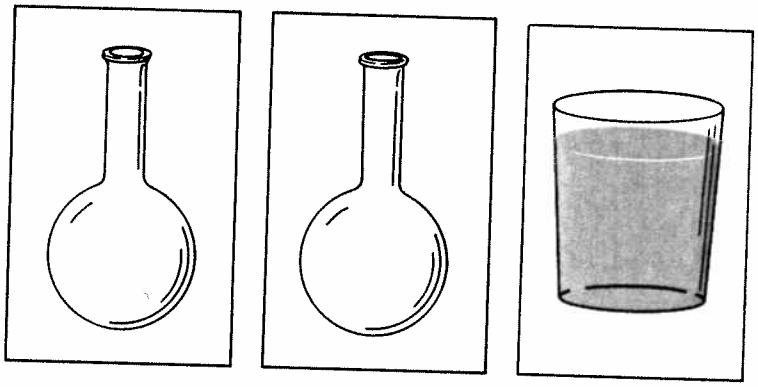
Three Different Molecules: Water, Salt, and Carbon Dioxide



1. Water

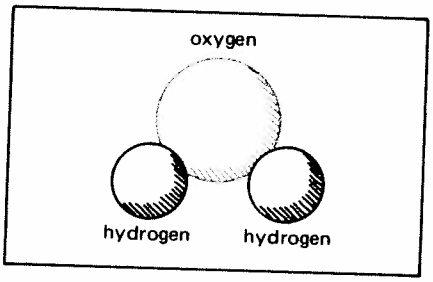
Water is a liquid compound. It is made of the elements hydrogen and oxygen.

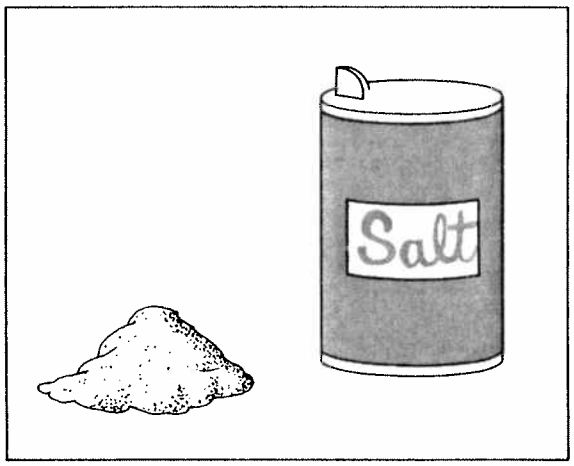
Hydrogen and oxygen are invisible gases. They can link up to make water.



$$\underbrace{\overbrace{\text{hydrogen}}^{\text{invisible gas}}}_{\text{element}} + \underbrace{\overbrace{\text{oxygen}}^{\text{invisible gas}}}_{\text{element}} \longrightarrow \underbrace{\overbrace{\text{water}}^{\text{liquid}}}_{\text{compound}}$$

A. one molecule of water





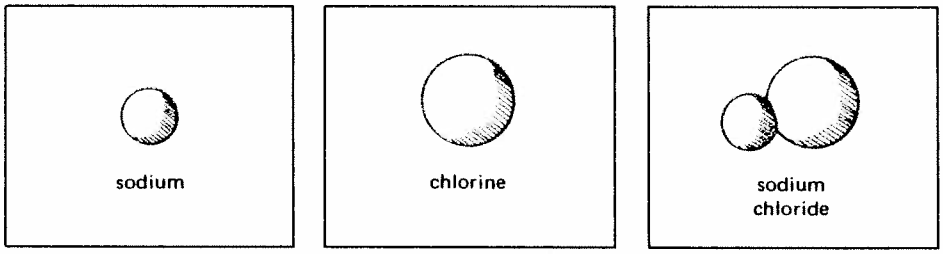
2. Salt

Table salt is a compound. It is made up of the elements sodium and chlorine.

Sodium is a dangerous metal. Chlorine is a poisonous gas.

They can link up to form a compound that our bodies need.

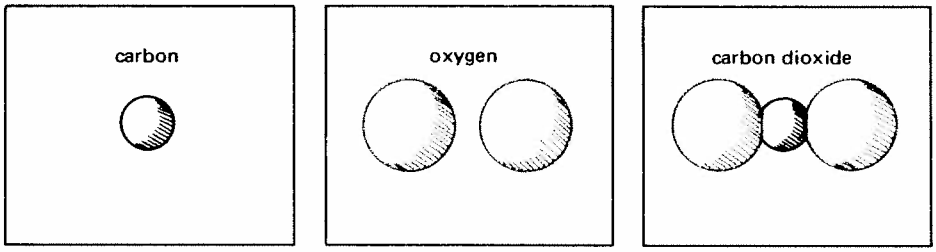
The compound is sodium chloride. We call it *salt.*



dangerous solid		deadly gas		white solid needed in our diet
sodium	+	chlorine	⟶	sodium chloride
element		element		compound

3. Carbon Dioxide

Carbon dioxide is a gas compound. It is made of the elements carbon and oxygen.



dark solid		invisible gas		invisible gas
carbon	+	oxygen	⟶	carbon dioxide
element		element		compound

COMPLETING SENTENCES

Complete the sentences with the choices below.

one million	millions	metal	molecule
compounds	106	elements	linked-up
nonmetal	lose	two	molecules

1. There are _____ known elements.
2. The number of different known substances is more than _____.
3. Elements combine to form _____.
4. Elements of a compound _____ their properties.
5. A compound has at least _____ elements.
6. A compound must have at least one _____ atom and one _____ atom.
7. The smallest part of a compound is called a _____.
8. In a small amount of a compound there may be _____ of molecules.
9. A compound is made of _____ atoms.
10. All matter is made up of _____ or _____.

MATCHING

Match the two lists. Write the correct letter on the line next to each number.

1. _____ atom
2. _____ molecule
3. _____ symbol
4. _____ element
5. _____ compound

a) has one kind of atom
b) short way of writing an element
c) smallest part of an element
d) two or more elements linked together
e) smallest part of a compound

THROW ONE OUT In each of the following sets of terms, one of the terms does *not* belong. Circle that term.

1. oxygen carbon element compound
2. carbon dioxide water element compound
3. chlorine sodium compound element
4. Na Hg compound symbol
5. symbol rust compound Epsom salts

TRUE OR FALSE Write T on the line next to the number if the sentence is true. Write F if the sentence is false.

1. _____ All matter is made of atoms.
2. _____ An element is matter.
3. _____ A compound is matter.
4. _____ All matter is made of elements or compounds.
5. _____ Elements and compounds are made of atoms.
6. _____ Compounds link up to make elements.
7. _____ A compound can have one element.
8. _____ The smallest part of a compound is one atom of that compound.
9. _____ A compound must have at least one metal atom and one nonmetal atom.
10. _____ There are more elements than compounds.

REACHING OUT Why should you always follow instructions carefully when mixing chemicals?

_____

_____

_____

_____