

## Making Molecules

Background Information: An element is a substance consisting of a single type of atom. There are 92 naturally occurring elements in the world, ; yet there are many, many more types of matter. These different types of matter are combinations of elements. A particular type of combination is a compound.

A chemical compound is a chemical substance formed from two or more elements in a specific proportion. The elements lose their individual chemical properties and the compound has new properties. A molecule is the smallest unit of a compound that can exist alone and keep the properties of that compound. Molecules are made up of one or more atoms. If they have more than one atom, the atoms can be the same (an oxygen molecule has two oxygen atoms) or different (a water molecule has two hydrogen atoms and one oxygen atom). Molecules in living organisms, such as proteins and DNA, can be made up of many thousands of atoms.

Compounds are written using formulas. The chemical formula of a molecule or compound shows how many atoms of each element are in one molecule of the compound. Formulas are written by putting the element symbols next to each other. If there is more than one atom of an element in the molecule, the formula shows it by a small number after the symbol of that element. This number is called a subscript. No number after an element's symbol is understood to mean one atom of the element is present.

For example, the formula for water is  $H_2O$ , which means that there are 2 atoms of hydrogen and one atom of oxygen in the molecule. Carbon dioxide is  $CO_2$ , which means there is one atom of carbon and two atoms of oxygen in the molecule.

### Before you begin:

Use your periodic table to complete the table.

Name	Hydrogen	Oxygen					Magnesium
Symbol			Na	S		Cl	
Atomic #							
Atomic Mass							
# Protons							
# electrons							
Group	1					17	
Period	1			3			

**Procedure:**

1. Pick one color for each of the elements below. Use map pencils to color the circle with the color you chose to represent the element.

Hydrogen (H) ☐

Oxygen (O) ☐

Sodium (Na) ☐

Sulfur (S) ☐

Carbon (C) ☐

Chlorine (Cl) ☐

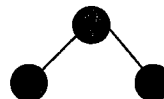
Magnesium (Mg) ☐

2. Given this information:

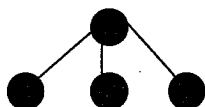
a. Molecules with two atoms are linear:



b. Molecules with two atoms on either side of a center atom are bent:



c. Molecules with three atoms around a center atom are shaped like pyramids:



3. Fill in the chart below with the correct number of atoms of each element in the compound.

Compound	Formula	Number of atoms of each element in the molecule
Sodium Chloride (table salt)	NaCl	Na-1, Cl-1
Chlorine gas	$Cl_2$	
Ozone	$O_3$	
Hydrochloric acid	HCl	
Carbon dioxide	$CO_2$	
Sulfur dioxide	$SO_2$	
Oxygen	$O_2$	
Magnesium chloride	$MgCl_2$	
Carbon tetrachloride	$CCl_4$	
Sodium hydroxide	NaOH	

4. Draw a diagram of each molecule using the correct colors for each atom. Label the box with the correct molecule.


Questions:

1. Which molecules are compounds?
2. Which is larger, an atom or a molecule? Explain your answer.
3. How are oxygen and ozone alike?
4. How are oxygen and ozone different?
5. Salt (NaCl) is made of sodium, a very reactive, gray metal , and chlorine, a toxic, greenish-yellow gas. What can you conclude about what happens to atoms when they form molecules?