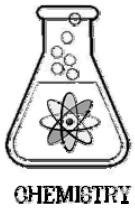

Name_____

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 of elements 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 molecules 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 that e*lement is present.
For example, the formula for water is $\mathbf{H_2O}$, which means there are 2 atoms of hydrogen and one atom of oxygen in the molecule. Carbon dioxide is $\mathbf{CO_2}$, which means there is one atom of carbon and two atoms of oxygen in the molecule.

To show the number of molecules, a number is put in front of the molecule. This number is called a **coefficient**.

For example 4 molecules of carbon dioxide are written as: $\mathbf{4CO_2}$

This means there are a total of **4 C** atoms and **8 O** atoms in the combination. Think about what you do in your math classes when you are multiplying: 4 x ($\mathbf{CO_2}$).

Materials:

Pony beads in assorted colors	Pipe cleaners

Before you Begin:
Use your Periodic table to complete the table:

Name	Hydrogen	Oxygen					Magnesium
Symbol			Na	S		Cl	
Atomic #					6		
Atomic Mass							
# Protons							
# Electrons							
Group	1					17	
Period	1			3			

Procedure:

1. Pick one color of bead to represent 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.
4. Use the beads and pipe cleaners to make models of the compounds.
5. Make a diagram of each model.
6. Get your teacher to check and initial your models and diagrams.

Data:

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	

Teacher Initials:

NaCl	Cl_2	O_3	HCl	CO_2
SO_2	O_2	$MgCl_2$	CCl_4	NaOH

Questions & Conclusions:
Answer using complete sentences.

1. Which molecules are pure elements?

2. Which molecules are compounds?

3. Which is larger, an atom or a molecule? Explain your answer.

4. How are oxygen and ozone alike?

5. How are oxygen and ozone different?

6. 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?