

## NOMENCLATURE

**Nomenclature** – the system of naming chemical compounds

**IUPAC** – International Union of Pure and Applied Chemistry, the organization that developed the rules for naming compounds.

## MOLECULAR COMPOUNDS

Molecular compounds contain non-metals only. (only atoms to the right of the staircase on the periodic table, but don't forget hydrogen is also on the right!)

In order to get full outer energy levels the atoms that make up molecular compounds share their valence electrons (more in the bonding unit)

Molecular compounds can be solids, liquids, or gases at room temperature. If they do dissolve in water, their solutions do not conduct electricity. Aqueous molecular compounds are non-electrolytes.

The individual parts of a molecular compound are called molecules. The molecular formula tells us how many atoms of which elements are sharing electrons. For example, H<sub>2</sub>O tells us in every molecule of water there are two hydrogen atoms and one oxygen atom.

We will deal with five categories of molecular compounds:

1. mono-atomic elements
2. diatomic elements
3. polyatomic elements
4. trivial (common) compounds
5. binary molecular compounds

### **1. Mono-atomic elements**

If we look at the name of the heading, mono - means one, so these are the non-metals that exist in nature as individual atoms. Although these are not compounds we have included them here because we will reference them many times.

Noble Gases (group 18)

<b>He</b>	<b>Helium</b>
<b>Ne</b>	<b>Neon</b>
<b>Ar</b>	<b>Argon</b>
<b>Kr</b>	<b>Krypton</b>
<b>Xe</b>	<b>Xenon</b>
<b>Rn</b>	<b>Radon</b>

## 2. Diatomic molecular elements

As the heading suggest these are elements composed of two (di) nonmetal atoms.  
(just remember the **gen's**)

oxygen	<b>O<sub>2</sub></b>	
hydrogen	<b>H<sub>2</sub></b>	
nitrogen	<b>N<sub>2</sub></b>	
the halogens (group 17)	fluorine	<b>F<sub>2</sub></b>
	chlorine	<b>Cl<sub>2</sub></b>
	bromine	<b>Br<sub>2</sub></b>
	iodine	<b>I<sub>2</sub></b>

## 3. Polyatomic molecular elements

These are non-metal elements composed of many (poly) atoms.

<b>O<sub>3</sub></b>	<b>ozone</b>
<b>S<sub>8</sub></b>	<b>sulfur</b>
<b>P<sub>4</sub></b>	<b>phosphorus (red)</b>
<b>P<sub>10</sub></b>	<b>Phosphorus (white)</b>

## 4. Trivial Names: Common names.

Despite the IUPAC rules for naming many molecular compounds still go by their trivial (common) names.

Here is a list of the molecular compounds with trivial names that you need to know.

<b>O<sub>3</sub></b>	<b>ozone</b>
H <sub>2</sub> O	<b>water</b>
H <sub>2</sub> O <sub>2</sub>	<b>hydrogen peroxide</b>
<b>NH<sub>3</sub></b>	<b>ammonia</b>
<b>CH<sub>4</sub></b>	<b>methane</b>
<b>CH<sub>3</sub>OH</b>	<b>methanol</b>
<b>C<sub>2</sub>H<sub>5</sub>OH</b>	<b>ethanol</b>
<b>C<sub>12</sub>H<sub>22</sub>O<sub>11</sub></b>	<b>sucrose</b>
<b>C<sub>6</sub>H<sub>12</sub>O<sub>6</sub></b>	<b>glucose</b>

## 5. Binary Molecular Compounds

These are molecular compounds that contain two different non-metal atoms.

- binary - 2
- molecular - non-metal atoms only
- compound - two different atoms

Carbon dioxide – CO<sub>2</sub> is a common example. It consists of carbon atoms and oxygen atoms.

The IUPAC rules for naming and formula writing involve use of a prefix system that indicates the number of atoms present.

You must know this list (first ten prefixes) in order to convert formula to names or to convert names to formulas.

### IUPAC Prefixes from 1 - 10

<b>1</b>	<b>mono-</b>
<b>2</b>	<b>di-</b>
<b>3</b>	<b>tri-</b>
<b>4</b>	<b>tetra-</b>
<b>5</b>	<b>penta-</b>
<b>6</b>	<b>hexa-</b>
<b>7</b>	<b>hepta-</b>
<b>8</b>	<b>octa-</b>
<b>9</b>	<b>nona-</b>
<b>10</b>	<b>deca-</b>

**What do you do when you are given the formula and you are asked to write the IUPAC name?**

#### **NAMING BINARY MOLECULAR COMPOUNDS:**

1. Write the name of the **first element** of the formula in **full**.
2. Shorten the name of the **second element** and add the **ide** ending.
3. Use **prefixes** to indicate the number of atoms of each element in the molecular formula.
4. The prefix mono on the first name is optional.

Write a IUPAC name for  $\text{CCl}_4$ .

**Answer**

1. The first element is **C**.
  - Its full name is **carbon**.
2. The second element is **chlorine**.
  - Its name is shortened to **chlor**, and the prefix **-ide** is added to give **chloride**.
3. The prefix **mono (1)** is added to carbon, and the prefix **tetra (4)** is added to chloride to give the name: **monocarbon tetrachloride**.
4. The prefix mono is omitted from the first element name to give **carbon tetrachloride**.

What do you do when given the name of the molecular compound and you are asked to write the formula for the molecular compound?

**Rules For Writing Molecular Formulas:**

1. Write the **symbols** for each element in the compound.
2. Use the prefix to determine the **number of atoms** of each element in the formula and write the appropriate number as a subscript to the right of the element's symbol.
3. If an element name lacks a prefix, assume that there is just one atom of that element. It is not necessary to write the numerical subscript 1 since it is implied.

Write the formula for diboron hexahydride.

**Answer**

1. The compound contains **boron** and **hydrogen** atoms.
2. **Diboron** means that the molecule contains **two** boron atoms (**B<sub>2</sub>**)
3. **hexahydride** means the molecule contains **six** hydrogen atoms (**H<sub>6</sub>**).

Bringing the two symbols together in the order they appear in the name gives.

The formula for diboron hexahydride is **B<sub>2</sub>H<sub>6</sub>**.

