

Chemistry Lecture #38: Naming Covalent Compounds

Binary ionic compounds (which are made of metals and nonmetals) are named by listing the metal first, followed by the nonmetal. The nonmetal ends with "ide."

For example, NaCl is made of sodium (Na) and chlorine (Cl). The name of the compound is sodium chloride.

Covalently bonded compounds are called molecules. Molecules are made of nonmetals. Molecules made of only two types of elements are called binary molecular compounds. The rules for naming binary molecular compounds are similar to the rules for binary ionic compounds.

To name a binary molecular compound from its formula -

- give the name of the first element in the formula
- put "ide" at the end of the second element in the formula
- put prefixes in front of the names of the elements to indicate the number of each type of atom.

For example, what is the name of CO_2 ? First, notice that carbon and oxygen are on the right side of the periodic chart. They are both nonmetals, so this is a binary molecular compound. We follow the naming rules for molecular compounds, not ionic compounds.

The first element listed is carbon and the second is oxygen. So an incomplete version of the name would be carbon oxide.

Next, we put prefixes in front of the names of the elements to tell us how many atoms are in the molecule. Since there are two oxygens, we put the prefix "di" in front of "oxide" to get "dioxide."

The prefix for "one" is "mono." Do we put "mono" in front of carbon to get "monocarbon"? No- we do not affix "mono" to an element if it is the first one listed in the formula.

Thus, the name of a molecule with one carbon and two oxygens is carbon dioxide.

The name of the molecule CO would be carbon monoxide since it is made of one carbon and one oxygen. Notice that the name is not "carbon monooxide." We drop an "o" to make it easier to pronounce. Sometimes we drop a vowel if the name of an element starts with a vowel, but this rule is not always followed.

For example, NI_3 is made of one nitrogen and three iodines. The prefix for "three" is "tri." You'd think you'd drop an "i" to get "nitrogen triiodide." But the name is spelled "nitrogen triiodide." You just have to memorize when to drop the vowel and when not to drop the vowel.

Memorize the meaning of the following prefixes:

Prefix	meaning
Mono	1
Di	2
Tri	3
Tetra	4
Penta	5
Hexa	6
Hepta	7
Octa	8
Nona	9
Deca	10

For practice, try to name the following (the last one is a trick question).

1. CS_2 2. CS 3. N_2O 4. SF_6 5. Cl_2O_8
6. CCl_4 7. PBr_3 Ba_3P_2

Answers

1. carbon disulfide 2. carbon monosulfide
3. Dinitrogen monoxide 4. Sulfur hexafluoride
5. dichlorine octoxide 6. Carbon tetrachloride
7. phosphorous tribromide
8. barium phosphide. Why no prefixes? Ba_3P_2 is an ionic compound, not a molecule.

The formulas of the molecules can be written using the prefixes to tell us how many of each atom there are.

Write the formulas for the following (the last question is a trick question).

1. dinitrogen tetroxide

Answer: N_2O_4

2. silicon dioxide

Answer: SiO_2

3. phosphorous pentachloride

Answer: PCl_5

4. magnesium chloride

Answer: $MgCl_2$ magnesium chloride is an ionic compound. To write the formula, you have to put the oxidation numbers on top and crisscross them to get the correct number of atoms.

There are some molecules that have commonly used names. You need to memorize the names of these molecules.

Formula	common name
O_3	ozone
NH_3	ammonia
H_2O_2	hydrogen peroxide
H_2S	hydrogen sulfide
C_6H_6	benzene
HCl	hydrochloric acid
HNO_3	nitric acid
H_2SO_4	sulfuric acid
H_3PO_4	phosphoric acid
$HC_2H_3O_2$ or CH_3COOH	acetic acid