

Covalent compound naming

You've learned about naming ionic compounds and a lot about what covalent compounds are like. Now, if you're brave enough to face the challenge, it's time to learn how to name covalent compounds.

For those of you who didn't much like naming ionic compounds, I have good news: Covalent naming is much, much easier. Let's learn the steps for naming covalent compounds:

Step 1: Make sure the compound you're trying to name is actually covalent.

If the compound you're naming has a metal atom or the ammonium ion somewhere in it, it's an ionic compound and you're in the wrong tutorial. Go back to the [ionic naming tutorial](#) and use those steps to solve the problem. If you're still reading, go to step 2 below...

Step 2: Write the names of the elements in the order they're shown.

For example, if you see PF_3 , write the words "phosphorus fluoride". There will be no polyatomic ions or Roman numerals – just those two words.

Step 3: Add prefixes to these names to indicate how many of each atom is present in the compound.

In the case of PF_3 , you can see that there is one phosphorus and three fluorine atoms. As a result, we don't need a prefix for phosphorus (we assume that if there's no prefix there's just one of them) and the "tri-" prefix for fluoride to indicate that there are three atoms of it in the compound. Put it together, and you've got the name "phosphorus trifluoride", which literally means "one phosphorus atom and three fluorine atoms." Which is a pretty accurate description of PF_3 .

For those of you who don't remember your prefixes, here they are:

- 1 atom of an element = mono (only use for oxygen if it's the second atom shown!)
- 2 atoms of an element = di
- 3 atoms of an element = tri
- 4 atoms of an element = tetra
- 5 atoms of an element = penta
- 6 atoms of an element = hexa
- 7 atoms of an element = hepta
- 8 atoms of an element = octa
- 9 atoms of an element = nona
- 10 atoms of an element = deca

That all seems pretty straightforward, except for maybe the part with the "mono" in it. My little note above means that the only time you ever use the "mono" prefix is if oxygen is the second atom in the compound *and* there is only one atom of it. As a result, we name these compounds:

- CO = carbon monoxide
- OF_2 = oxygen difluoride

This is the only exception that you're going to run into for covalent compounds, so don't worry about it too much.

To work backwards and write a formula from a name is even easier. After all, there will only be two elements and the number of atoms of each element will be told to you in the formula. As a result, “dinitrogen trioxide”, which means “two nitrogens and three oxygens” is written as N_2O_3 .

Exceptions

I have good news and bad news. The bad news is that, like all things in life, there are exceptions to these rules. The good news is that you’re not going to run into very many of them when naming compounds, so there’s not a lot of weird stuff to memorize. Here are some of the common exceptions that you should really learn:

- **Compounds to memorize:** water is H_2O , ammonia is NH_3 , methane is CH_4
- **Diatomic elements:** There are seven elements on the periodic table that are diatomic, which means that if they’re in their pure elemental form they have a “2” subscript written after them. These include hydrogen (H_2), nitrogen (N_2), oxygen (O_2), fluorine (F_2), chlorine (Cl_2), bromine (Br_2), and iodine (I_2).

The image shows a standard periodic table of elements. The seven diatomic elements are highlighted with red boxes: Hydrogen (H) at the top left, and Nitrogen (N), Oxygen (O), Fluorine (F), Chlorine (Cl), Bromine (Br), and Iodine (I) along the right side of the table. The table includes element symbols, atomic numbers, and names.

My own high school teacher told us to more easily remember the seven diatomic elements as “the big 7 and the weirdo.” I hated that guy, but he was right.

- **Two other elements have unusual formulas:** Phosphorus is P_4 and sulfur is S_8 .
- **Organic compounds:** Compounds containing C and H atoms belong to a class of compounds known as “organic compounds.” You’re not likely to see much of that in general chemistry.
- **Common names:** Some compounds have common names that you’ll just have to memorize. These don’t hold to any particular rules – they’re pretty much leftovers from the old days when people didn’t know what compounds they had. If your teacher uses them, you should use them too. But he or she probably won’t use them much.