

5.2.10: Naming Binary Molecular Compounds

Learning Objectives

- Name binary molecular compounds.

Naming *binary* (two-element) covalent compounds is very similar to naming simple ionic compounds. The first element in the formula is simply listed using the name of the element. The second element is named by taking the stem of the element name and adding the suffix *-ide*. Unlike for ionic compounds, molecular compounds can be formed using the same elements in different ratios. Therefore, it is important to indicate the number of each type of atom, using a system of numerical prefixes, listed in Table 5.2.10.1. Normally, no prefix is added to the first element's name if there is only one atom of the first element in a molecule. If the second element is oxygen, the trailing vowel is usually omitted from the end of a polysyllabic prefix but not a monosyllabic one (that is, we would say "monoxide" rather than "monooxide" and "trioxide" rather than "troxide").

Table 5.2.10.1: Numerical Prefixes for Naming Binary Covalent Compounds

| Number of Atoms in Compound | Prefix on the Name of the Element |
|-----------------------------|-----------------------------------|
| 1 | mono-* |
| 2 | di- |
| 3 | tri- |
| 4 | tetra- |
| 5 | penta- |
| 6 | hexa- |
| 7 | hepta- |
| 8 | octa- |
| 9 | nona- |
| 10 | deca- |

*This prefix is not used for the first element's name.

Let us practice by naming the compound whose molecular formula is CCl_4 . The name begins with the name of the first element carbon. The second element, *chlorine*, becomes *chloride*, and we attach the correct numerical prefix ("tetra-") to indicate that the molecule contains four chlorine atoms. Putting these pieces together gives the name *carbon tetrachloride* for this compound.

✓ Example 5.2.10.1

Write the molecular formula for each compound.

- chlorine trifluoride
- phosphorus pentachloride
- sulfur dioxide
- dinitrogen pentoxide

Solution

If there is no numerical prefix on the first element's name, we can assume that there is only one atom of that element in a molecule.

- ClF_3
- PCl_5
- SO_2
- N_2O_5 (The *di-* prefix on nitrogen indicates that two nitrogen atoms are present.)

? Exercise 5.2.10.1

Write the molecular formula for each compound.

- a. nitrogen dioxide
- b. dioxygen difluoride
- c. sulfur hexafluoride
- d. selenium monoxide

Answer a:

a. NO_2

Answer b:

O_2F_2

Answer c:

SF_6

Answer d:

SeO

Because it is so unreactive, sulfur hexafluoride is used as a spark suppressant in electrical devices such as transformers.

✓ Example 5.2.10.2

Write the name for each compound.

- a. BrF_5
- b. S_2F_2
- c. CO

Solution

- a. bromine pentafluoride
- b. disulfur difluoride
- c. carbon monoxide

? Exercise 5.2.10.2

Write the name for each compound.

- a. CF_4
- b. SeCl_2
- c. SO_3

Answer a:

carbon tetrafluoride

Answer b:

selenium dichloride

Answer c:

sulfur trioxide

For some simple covalent compounds, we use common names rather than systematic names. We have already encountered these compounds, but we list them here explicitly:

- H_2O : water
- NH_3 : ammonia
- CH_4 : methane

Methane is the simplest organic compound. Organic compounds are compounds with carbon atoms and are named by a separate nomenclature system that we will introduce later.

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