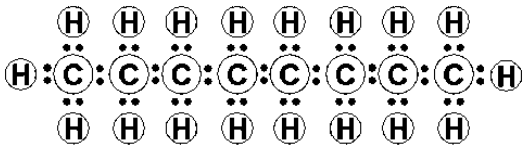
Chemical Names and Formulas

The total number of natural and synthetic chemical compounds runs in the millions. For some of these substances, certain common names remain in everyday use. For example, everybody recognizes dihydrogen monoxide by its popular name, water.

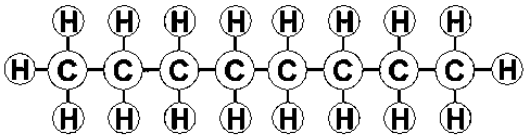
Significance of a Chemical Formula

Recall that a chemical formula indicates the relative number of atoms of each kind in a chemical compound. For a molecular compound, the chemical formula reveals the number of atoms of element contained in a single molecule of the compound.

Octane showing the electron pairs:



Octane with lines for electron pairs:



each

C_8H_{18}

Subscript indicates that there are 8 carbon atoms in a molecule of octane.
Subscript indicates that there are 18 hydrogen atoms in a molecule of octane.

Unlike a molecular compound, an ionic compound consists of a lattice of positive and negative ions held together by mutual attraction. The chemical formula for an ionic compound represents one formula unit—the simplest ration of the compound's positive ions (cations) and its negative ions (anions). The chemical formula for aluminum sulfate, an ionic compound consisting of aluminum cations and polyatomic sulfate anions, is:

$Al_2(SO4)_3$

Subscript 2 refers to 2 aluminum atoms. Subscript 4 refers to 4 oxygen atoms in sulfate ion. Subscript 3 refers to everything inside parentheses, giving 3 sulfate ions, with a total of 3 sulfur atoms and 12 oxygen atoms.

Monatomic Ions

By gaining or losing electrons, many main-group elements form ions with noble-gas configurations. For example, Group1 metals lose one electron to give 1+ cations, such as Na +. Group 2 metals lose two electrons to give 2+ cations, such as Mg 2+. *Ions formed from a single atom are known as* **monatomic ions**. The nonmetals of Groups 15, 16, and 17 gain electrons form anions.

Not all main-group elements readily form ions, however. Rather than gain or lose electrons, atoms carbon and silicon form covalent bonds in which they share electrons with other atoms. Other elements tend to form ions that do not have noble-gas configurations.

Elements from the d-block form 2+, 3+, or, in a few cases, 1+ or 4+ cations. Many d-block elements form two ions of different charges. For example, copper form s 1+ and 2+ cations as well as 3+ cations. And vanadium forms 2+, 3+, and 4+ cations.

Naming Monatomic Ions

Monatomic cations are identified simply by the element's name. Naming monatomic anions is slightly more complicated. First, the ending of the element's name is dropped. Then the ending *–ide* is added to the root name. The numerals of the ions in the tables are part

Examples of Anions

Element	Anion
F	**F-**
Flour*ine*	Fluor*ide* anion
N	**N-3**
Nitro*gen*	Nitr*ide* anion