

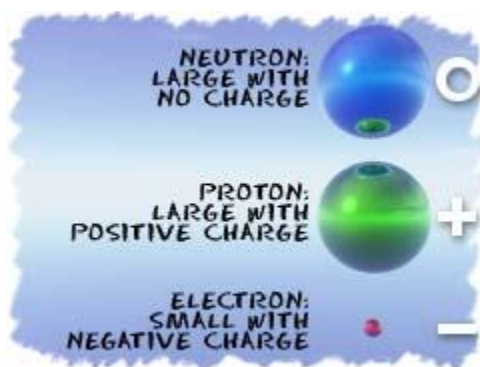
## Basic Chemistry

All elements are made of atoms. While the atoms may have different weights and organization, they are all built in the same way, with electrons, protons and neutrons.

The particles of matter can be broken down into the following chemical types:

- Atoms
- Elements
- Molecules
- Macromolecules
- Compounds

There are over 100 elements in the **periodic table**. The number of electrons, protons, and neutrons differ in each element. The protons and neutrons are always in the center of the atom called the **nucleus**. The electrons are moving around the center in areas called orbitals.

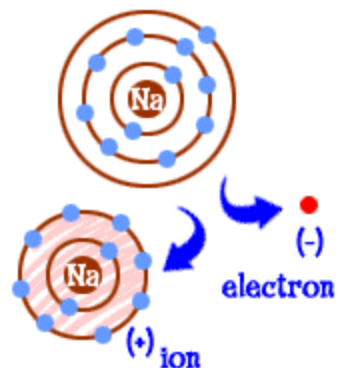


You can also see that each piece has either a "+", "-", or a "0" charge. The electron always has a negative charge. The proton always has a "+" positive charge. If the total charge of an entire atom is "0", that means there are equal numbers of positive and negative pieces, equal numbers of electrons and protons. The third particle is the neutron. It has a neutral charge (a charge of zero).

Electrons are always moving around the nucleus of an atom. Not all orbits hold the same number of electrons. For the first eighteen elements, there are some easy rules. The first orbit only holds two electrons. The next two only hold eight electrons (for the first eighteen elements). The third orbit can actually hold up to 18 electrons, the fourth 32, and the fifth 50.

Ions are atoms with either extra electrons or missing electrons. A normal atom is called a neutral atom. That term describes an atom with a number of electrons equal to the **atomic number** (the charge of the proton).

A sodium (Na - 11) atom has eleven electrons, one too many to have only the second orbit filled. Another element is needed to take that electron away such as chlorine (Cl - 17). Chlorine (Cl) will take that electron away and leave 10 electrons inside of two filled orbits. The atom has two filled orbits but since there is one electron missing it becomes a sodium ion (Na<sup>+</sup>), with one less electron than its atomic number of 11.

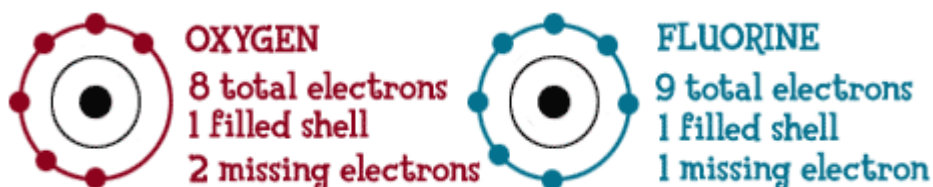


Some examples:



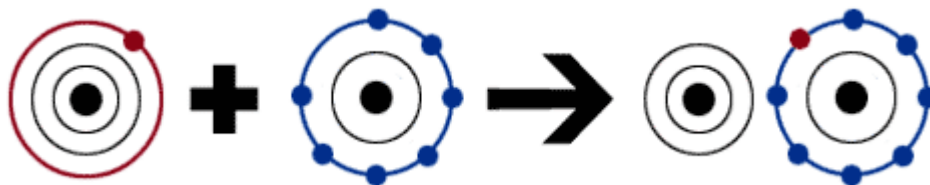
Starting with the atoms with atomic numbers between 1 and 18, there is a 2-8-8 rule for these elements. The first shell (orbit) is filled with 2 electrons, the second is filled with 8 electrons, and the third houses the rest. You can see that sodium (Na - 11) and magnesium (Mg - 12) have a couple of extra electrons. To balance their charge they can either (1) get eight electrons to fill up their third orbit; or (2) give up electrons to have a filled second orbit. For them it's easier to give up a few electrons.

Many other atoms are interested in gaining a few extra electrons.



Oxygen (O - 8) and fluorine (F - 9) are two good examples. Each of those elements is looking for a couple of electrons to make a filled orbit. They have one filled orbit with two electrons but their second shell needs to have eight. There are a couple of ways they can get the electrons. (1) They can share electrons, making a covalent bond. Or (2) they can just borrow them, and make an ionic bond (also called electrovalent bond).

So a sodium (Na) atom with an extra electron can bond with a fluorine (F) atom that is looking for one.



Sodium (Na) gives up its extra electron. The sodium (Na) has a full second shell and the fluorine (F) has a full second shell. The two atoms are now balanced.

Compounds are groups of two or more elements that are bonded together. There are two main types of bonds that hold those atoms together, covalent and electrovalent/ionic bonds.

**Covalent** compounds happen when the atoms share the electrons, and **ionic** compounds happen when electrons are donated from one atom to another.

<http://webmineral.com/chemical.shtml>

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