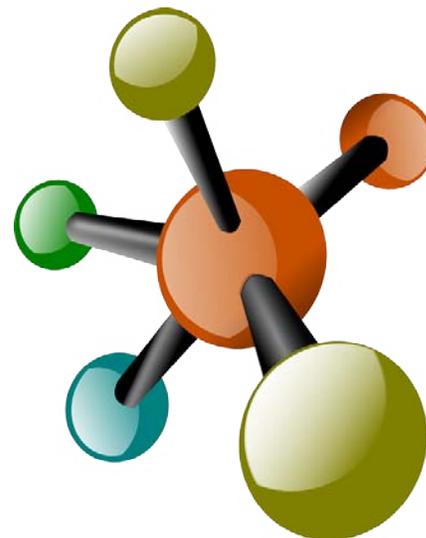


Covalent Bonds

A single shell of any atom can only hold a particular number of electrons. The first shell can hold up to two electrons. The second shell can hold up to eight electrons. The third shell can hold up to eighteen electrons, and so on.



The number of electrons in an atom's outer shell that are available to participate in the process of chemical bonding are called *valence electrons*. The number of valence electrons varies according to the type of atom. Atoms tend to want to have a full outer shell, so when atoms that don't have full outer shells come into contact with other atoms, their tendency is to give up or gain electrons in order to end up with a full outer shell. When the atom of one element donates electrons to another so that both will have a full outer shell, it is called *ionic bonding*. When atoms share electrons so that both will have a full outer shell, it is called *covalent bonding*. Covalent bonds are weaker than ionic bonds.

Unlike ionic bonds, which occur between a metal atom and a non-metal atom, a covalent bond is a chemical bond between two non-metal atoms. A good example of a covalent bond is when Hydrogen (H) and Oxygen (O) bond to create water (H₂O). Both are non-metals, so they both need to gain electrons. In order to do this, they share electrons so that the outer shell of each atom is full. In a molecule of water, the atom of Oxygen shares an electron with each Hydrogen atom, and the two Hydrogen atoms also share an electron. Each Hydrogen atom then has a full first outer shell with two electrons, and the Oxygen atom has a full second outer shell with eight.

There are two kinds of covalent bonds. Giant covalent bonds have high melting and boiling points because the bonds between molecules are very strong. Simple covalent bonds have low melting and boiling points because there are no bonds between the molecules.