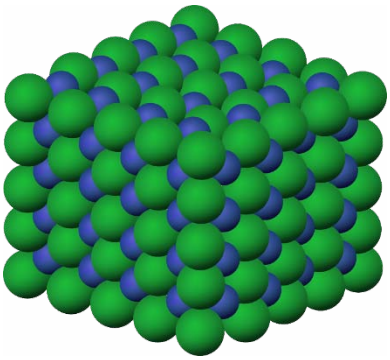
Ionic Bonds

A single shell of any atom can only hold a particular number of electrons. 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.

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*. If the outer shell of an atom is mostly empty, that atom will tend to give up electrons. If the outer shell of an atom is mostly full, it will want to pick up whatever more electrons it needs in order to have 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*. If an atom does not have a spare electron to complete a shell, then one atom can act as two by moving in a figure eight around both atoms. Ionic bonding differs from *covalent bonding*, in which atoms share electrons so that both will have a full outer shell.



Ionic bonding happens between a metal and a non-metal, with the metal atom losing one or more of its electrons to the non-metal atom. The metal then becomes a positively charged ion (atom) called a cation, and the non-metal becomes a negatively-charged ion called an anion. Ionic bonding produces common table salt when single atoms of the metal sodium (Na) bond with single atoms of the non-metal chlorine (Cl) to form NaCl. Ionic bonds can also be formed by complex groups rather than single atoms, such as the carbonate in calcium carbonate.

Ionic bonds form three-dimensional structures called an ionic lattice, and they can be dissolved in water. When ionic bonds are in a solid state they do not conduct electricity, but they do conduct electricity well when they are dissolved in water because the ions are then free to move.