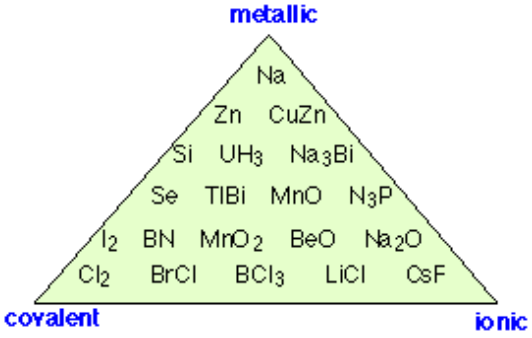
MORE ON POLAR COVALENCE

"Covalent, ionic or metallic" is an oversimplification!

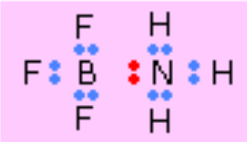
If there is no such thing as a "completely ionic" bond, can we have one that is completely covalent? The answer is yes, if the two nuclei have equal electron attracting powers. This situation is guaranteed to be the case with homonuclear diatomic molecules--molecules consisting of two identical atoms. Thus in Cl2, O2, and H2, electron sharing between the two identical atoms must be exactly even; in such molecules, the center of positive charge corresponds exactly to the center of negative charge: halfway between the two nuclei.



Categorizing all chemical bonds as either ionic, covalent, or metallic is a gross oversimplification; as this diagram shows, there are examples of substances that exhibit varying degrees of all three bonding characteristics.

Electron donor-acceptor bonds

In most covalent bonds, we think of the electron pair as having a dual parentage, one electron being contributed by each atom. There are, however, many cases in which both electrons come from only one atom.



This can happen if the donor atom has a non-bonding pair of electrons and the acceptor atom has a completely empty orbital that can accommodate them.

This is the case, for example, with boron trifluoride and ammonia. In BF3, one the 2p orbitals is unoccupied and can accommodate the lone pair on the nitrogen atom of ammonia. The electron acceptor, BF3, acts as a **Lewis acid** here, and NH3 is the **Lewis base**.

Bonds of this type (sometimes known as **coordinate covalent** or **dative** bonds) tend to be rather weak (usually 50-200kJ/mol); in many cases the two joined units retain sufficient individuality to justify writing the formula as a molecular **complex** or **adduct**.

Source: http://www.chem1.com/acad/webtext/chembond/cb04.html