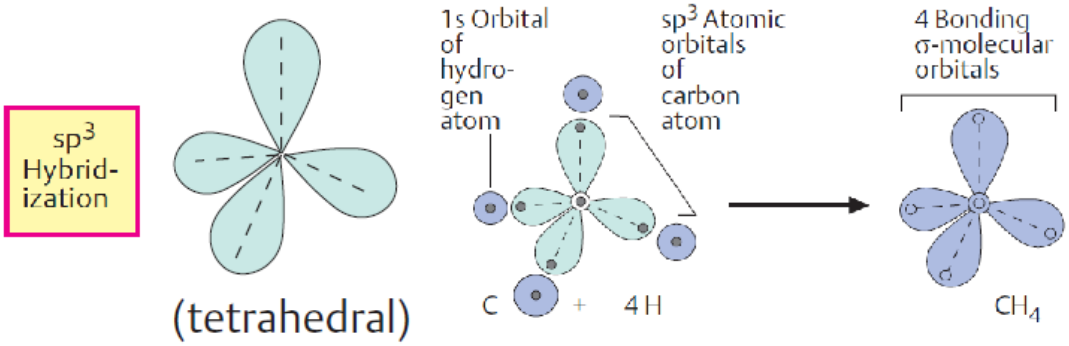
Stable, covalent bonds between nonmetal atoms are produced when orbitals of the two atoms form molecular orbitals that are occupied by one electron from each of the atoms.

The four bonding electrons of the carbon atom occupy 2s and 2p atomic orbitals. Combination of the s and the three p orbitals of carbon gives rise to four equivalent, tetrahedrally arranged **sp^3 atomic orbitals**. When these overlap with the **1s orbitals of H atoms**, four equivalent σ-molecular orbitals are formed. For this reason, carbon is capable of forming four bonds (it has a valency of four)



A second common type of orbital hybridization involves the 2s orbital and only *two* of the three 2p orbitals. The result is three equivalent **sp^2 hybrid orbitals** lying in one plane at an angle of 120° to one another. The remaining $2p_x$ orbital is oriented perpendicular to this plane. In contrast to their sp^3 counterparts, sp^2-hybridized atoms form two *different* types of bond when they combine into molecular orbitals. The three sp^2 orbitals enter into σ-bonds, as described above. In addition, the electrons in the two $2p_x$ orbitals, known as **π electrons**, combine to give an additional, elongated π molecular orbital, which is located above and below the plane of the σ-bonds. Bonds of this type are called **double bonds**. Double bonds that are common in biomolecules are C=C and C=O