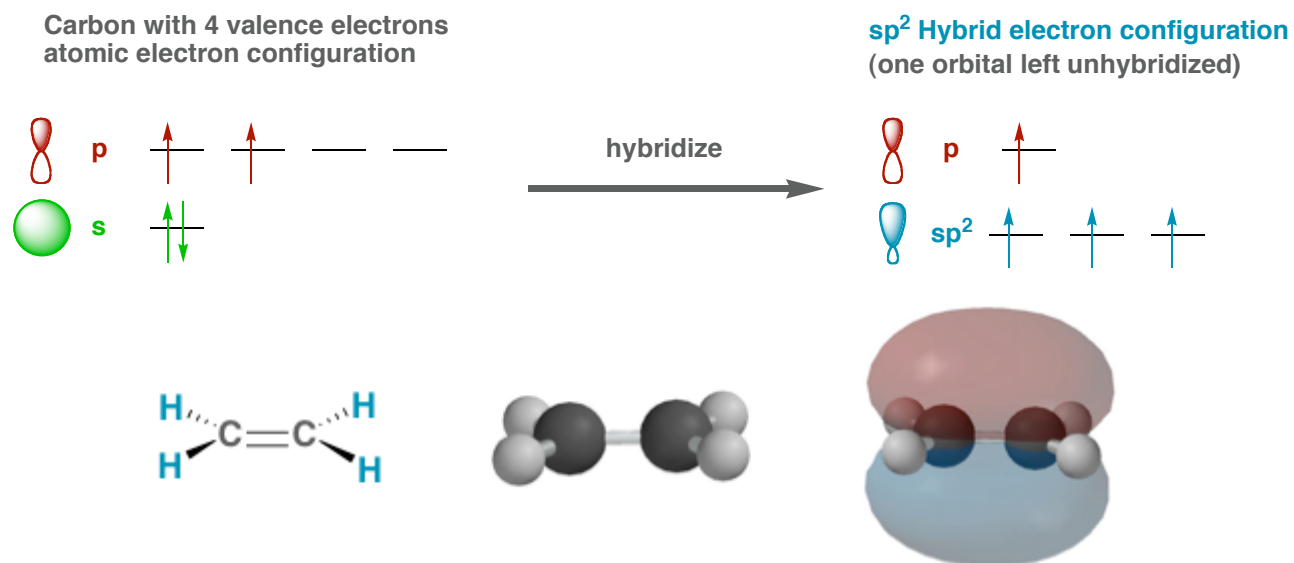


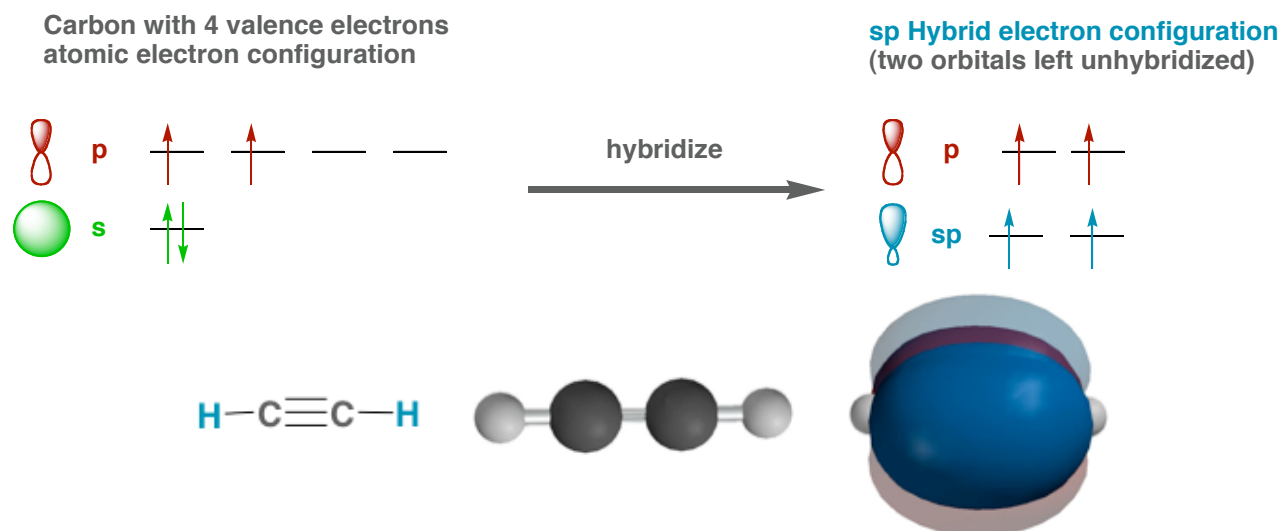
Chapter 1 - Structure and Bonding

Hybridization (cont)

Double bonds are formed by the side-to-side overlap of unhybridized p orbitals. This is called a pi (π) bond. If a p remains unhybridized, there are only 1 s and 2 p's left to form 3 equal hybrid sp^2 orbitals. This defines a plane and the molecule ethene has a planar geometry with 120° bond angles (each C is trigonal planar).



If there are two pi bonds to a carbon (as in a triple bond), then two p orbitals must remain unhybridized. The resulting two hybrids are sp and adopt a linear geometry with 180° bond angles.



Hybridization also occurs in other atoms such as oxygen, nitrogen, boron, etc. Water (H_2O) is a bent molecule because the two lone pairs reside in hybrid orbitals and defines the sp^3 hybridized tetrahedron. BF_3 , which has one empty orbital, is trigonal planar due to its sp^2 hybridization.

Note: Empty orbitals remain *unhybridized* p orbitals and lone pairs will occupy *hybridized* orbitals.

