

Hybridization

Elements in the second period have one s and three p orbitals in their valence shell. Before they combine with other atoms to make molecules, these atomic orbitals hybridize in one of the three following patterns.

sp^3 - all atomic orbitals are hybridized:

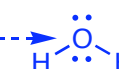
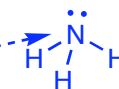
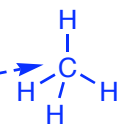


Atoms which have sp^3 hybridization:

atoms with 4 single bonds

atoms with 3 single bonds and one electron pair

atoms with 2 single bonds and two electrons pairs



sp^2 - one s and two p orbitals are hybridized, leaving one p orbital unhybridized:



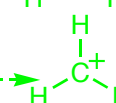
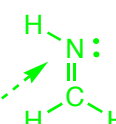
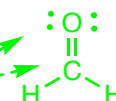
Atoms which have sp^2 hybridization:

atoms with two single bonds and one double bond

atoms with two lone pairs and one double bond

atoms with one single bond, one lone pair, and one double bond

atoms with three single bonds and an empty orbital



sp : one s and one p orbital are hybridized, leaving two p orbitals unhybridized

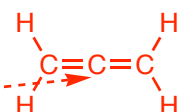


Atoms which have sp hybridization:

atoms with one single bond and one triple bond

atoms with two double bonds

atoms with one lone pair and one triple bond



Things that go into hybridized orbitals:

single bonds,

1st bond in a double bond

1st bond in a triple bond

unpaired electrons (unless are delocalized by resonance)

Things that go into unhybridized p orbitals:

2nd bond of a double bond

2nd and 3rd bonds of a triple bond

empty orbitals

unpaired electrons if delocalized by resonance

Note that " sp^3 " refers both to a single sp^3 orbital and to the entire sp^3 hybridization pattern.