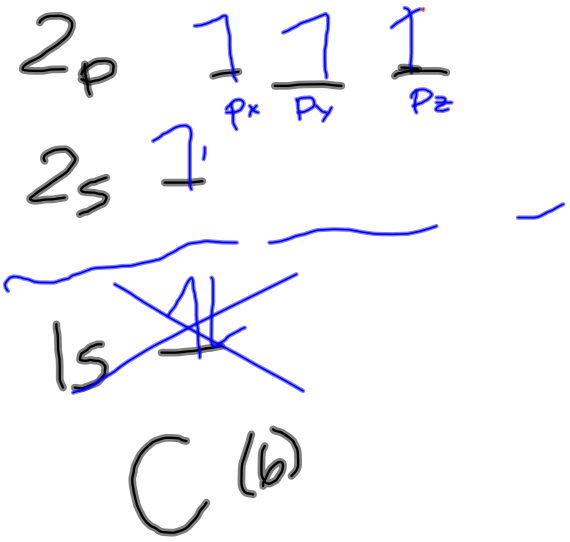
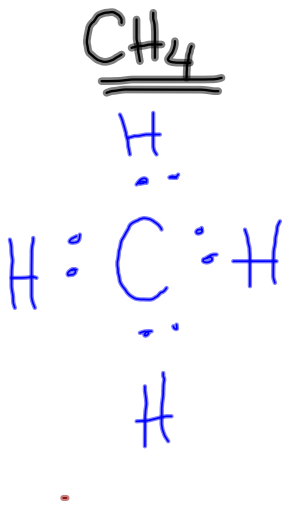
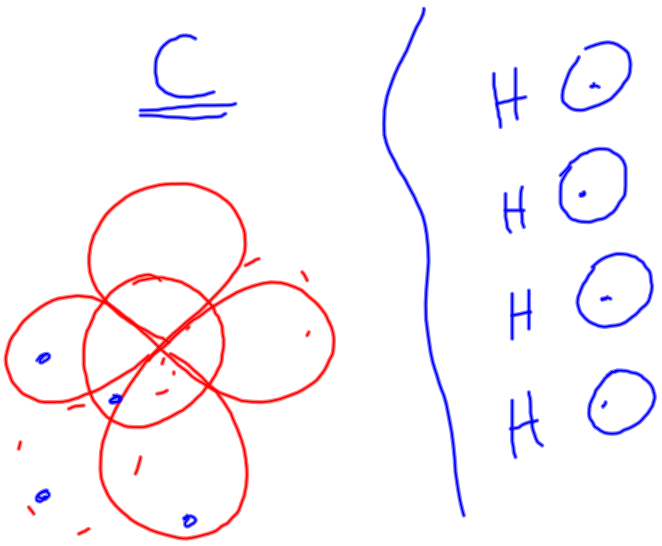

2p
px
py
pz
2s
1s
C (6)


CH4
H
H
C
H
H

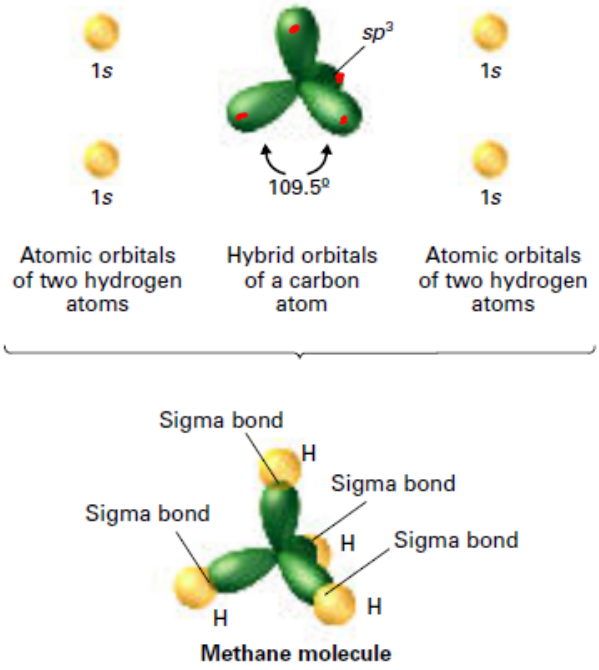

C
H
H
H
H

Hybridization Involving Single Bonds

In **hybridization**, atomic orbitals mix to form the same total number of equivalent hybrid orbitals.

Ex. CH_4

The one *2s* orbital and three *2p* orbitals of a carbon atom mix to form four sp^3 hybrid orbitals.



CH_4

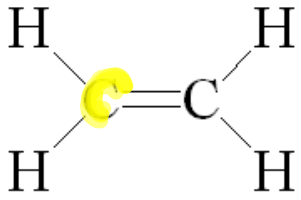
A.O. M.O.

$$S + p_x + p_y + p_z \longrightarrow sp^3 + sp^3 + sp^3 + sp^3$$

4σ

Hybridization Involving Double Bonds

Ex. C_2H_4

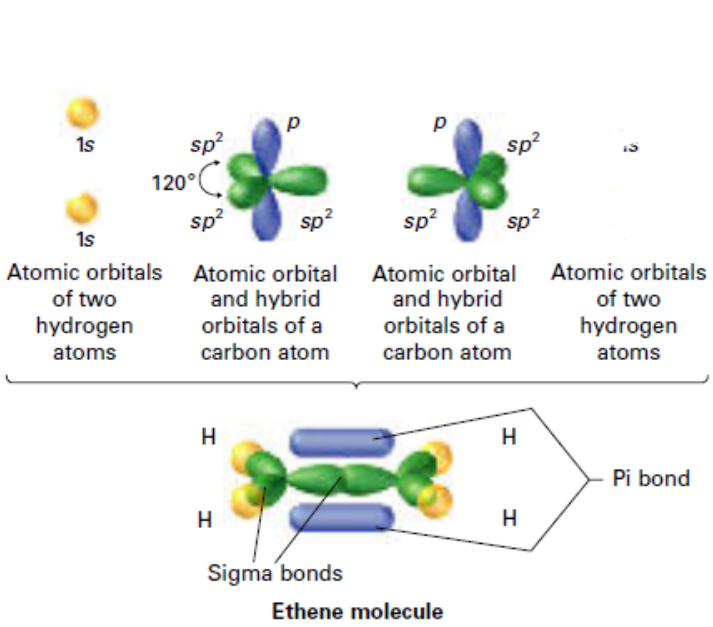


The one *2s* orbital and two *2p* orbitals of each carbon atom mix to form three sp^2 hybrid orbitals.

Two of the sp^2 orbitals overlap with the *1s* hydrogen orbital to form carbon-hydrogen sigma bonds.

The third sp^2 orbital overlaps with an sp^2 orbital from the other carbon to form a carbon-carbon sigma bond.

The non-bonding *2p* orbitals overlap side-by-side to form a carbon-carbon pi bond.



A.O. M.O.

$S + p_x + p_z \longrightarrow \underbrace{sp^2 + sp^2 + sp^2}_{3\sigma}$

p_y p_y

$\curvearrowright \pi$

Hybridization Involving Triple Bonds

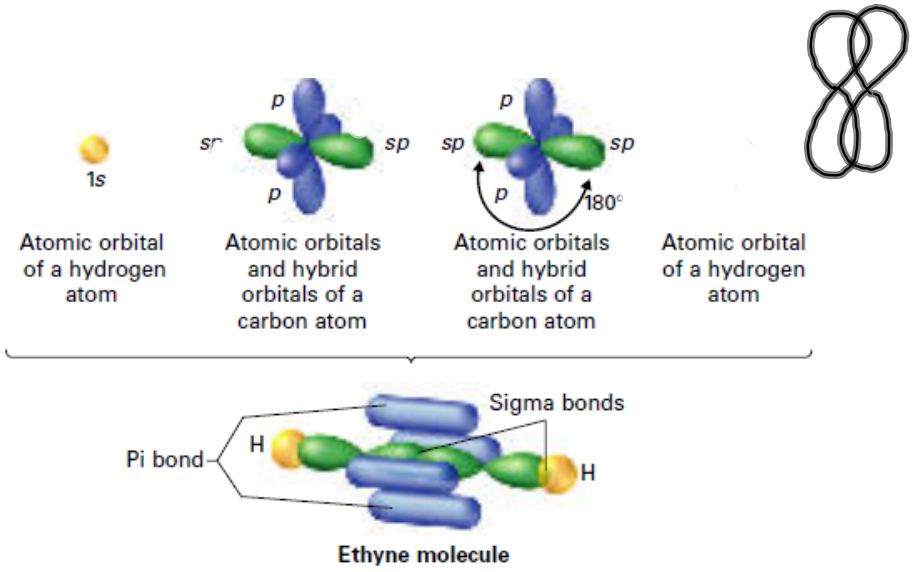
Ex. C_2H_2

The one *2s* orbital and one *2p* orbitals of each carbon atom mix to form two *sp* hybrid orbitals for each carbon.

One of the *sp* orbitals overlap with the *1s* hydrogen orbital to form carbon-hydrogen sigma bonds.

The second *sp* orbital overlaps with the *sp* orbital from the other carbon to form a carbon-carbon sigma bond.

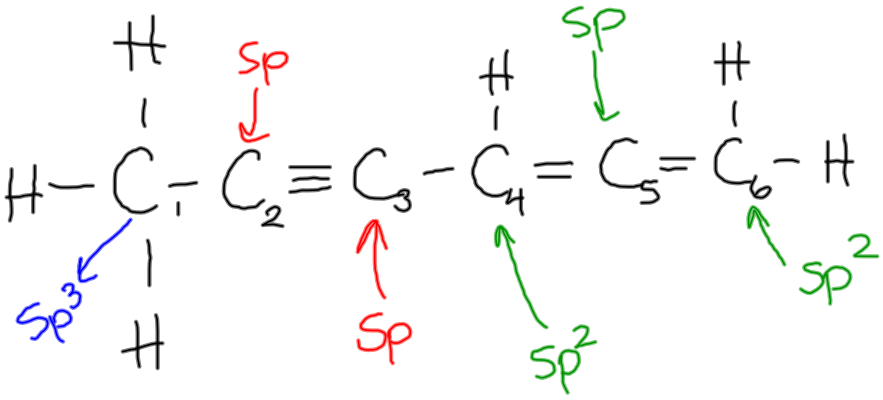
The non-bonding *2p* orbitals overlap side-by-side to form two carbon-carbon pi bonds.



A.O. M.O.

$S + p_x \longrightarrow \underbrace{sp + sp}_{2\sigma}$

$p_y, p_z \qquad \underbrace{p_y, p_z}_{2\pi}$



$S + p_x + p_y + p_z \rightarrow sp^3 + sp^3 + sp^3 + sp^3$

$S + p_y \rightarrow sp + sp$

$S + p_x + p_z \rightarrow sp^2 + sp^2 + sp^2$

Homework

Worksheet