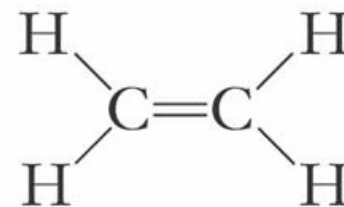


Compounds Containing Double Bonds



- Ethene or ethylene, C₂H₄, is the simplest organic compound containing a double bond.

Lewis dot formula

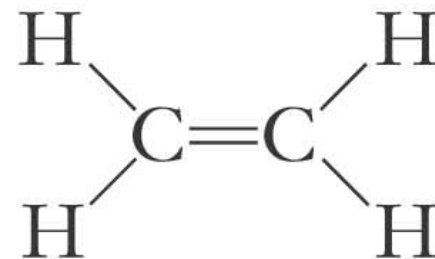
$$N = 2(8) + 4(2) = 24$$

$$A = 2(4) + 4(1) = 12$$

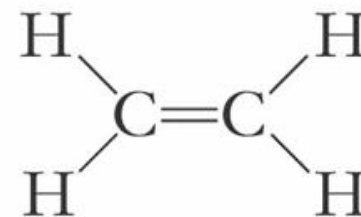
$$S = 12$$

- Compound must have a double bond to obey octet rule.

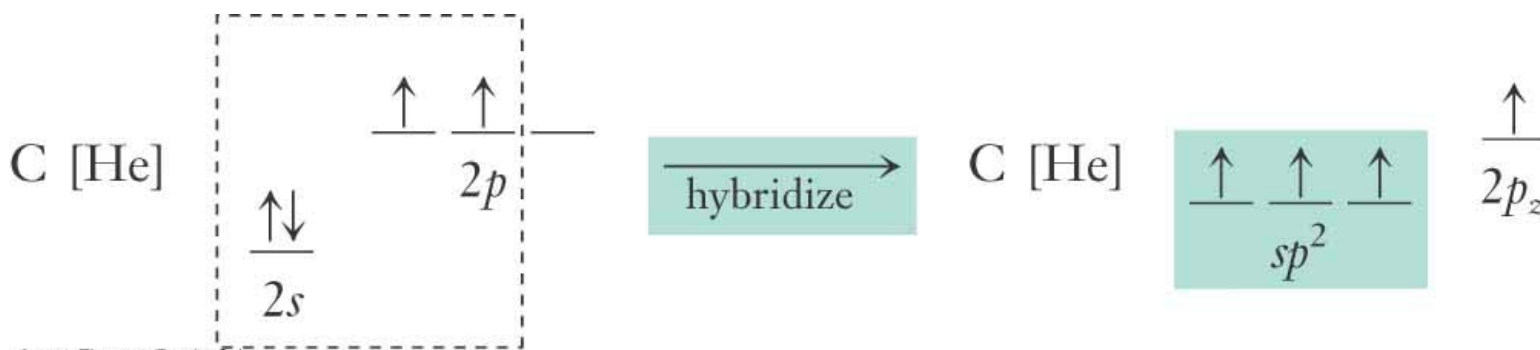
$$\begin{aligned} S &= N - A \\ &= 24 - 12 = \underline{12e^- \text{ shared}} \end{aligned}$$



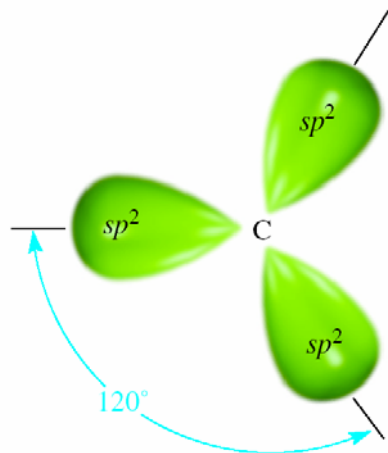
Compounds Containing Double Bonds



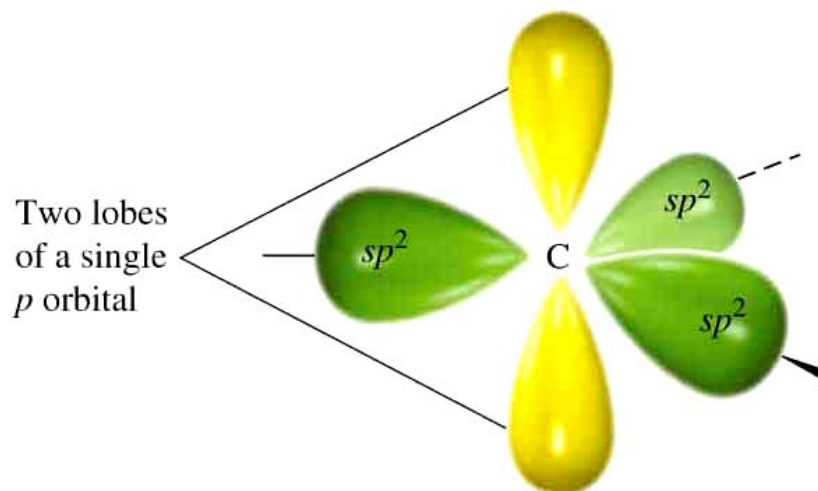
Valence Bond Theory



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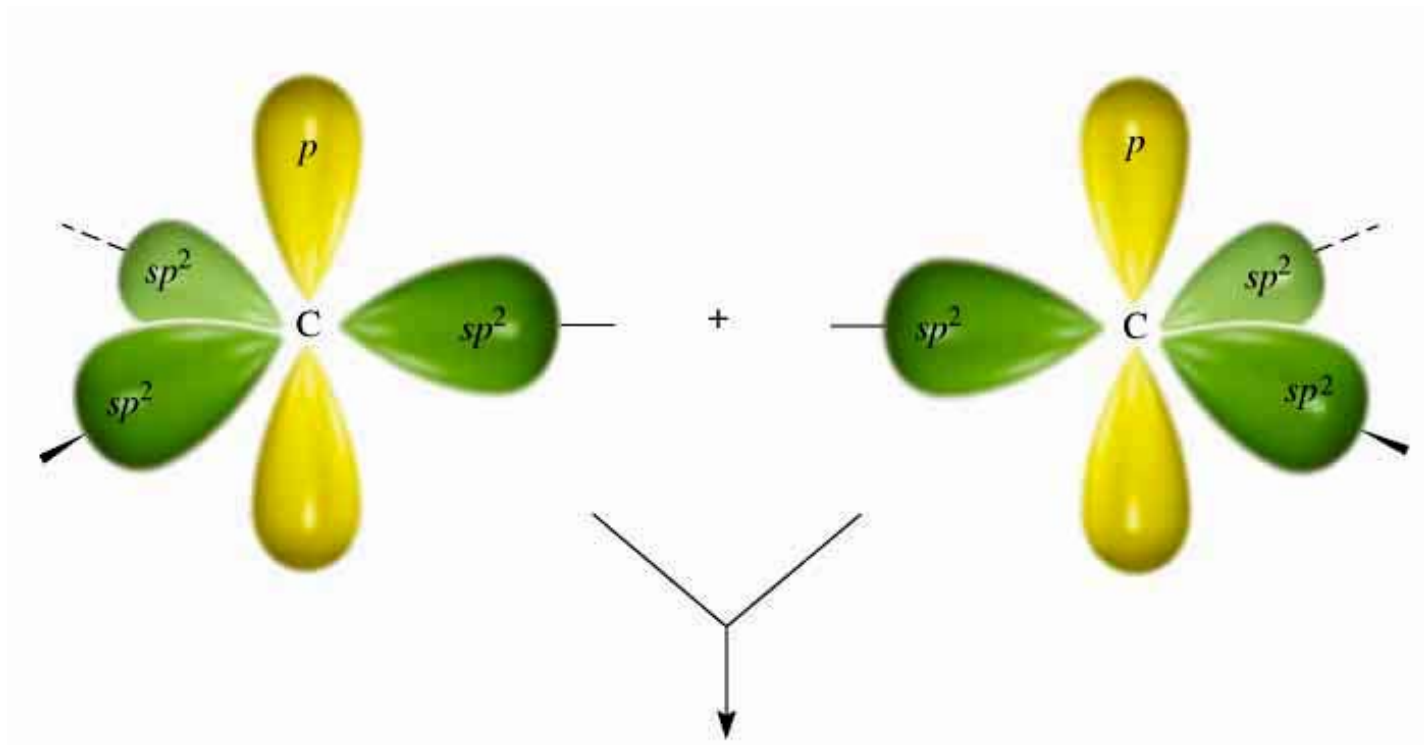


2



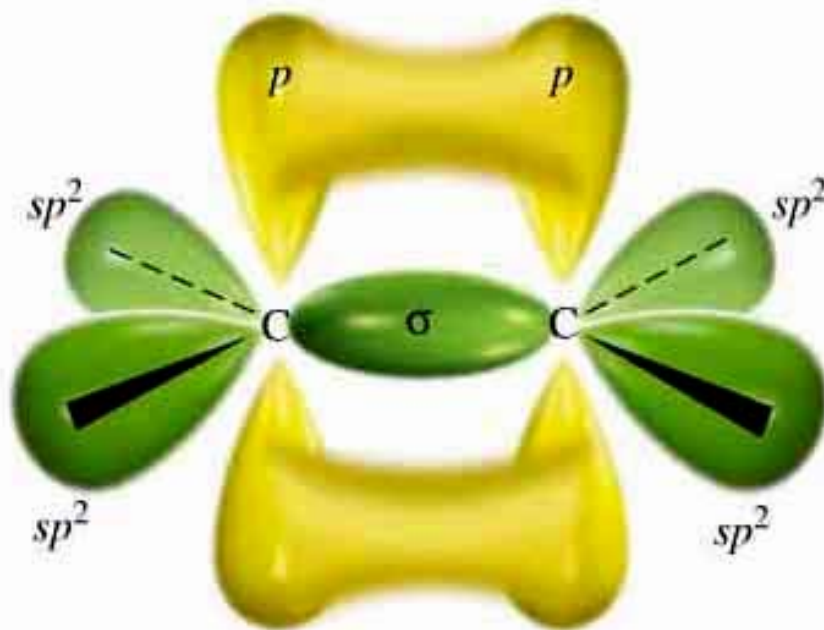
Compounds Containing Double Bonds

- Two sp^2 hybridized C atoms plus p orbitals in proper orientation to form C=C double bond.



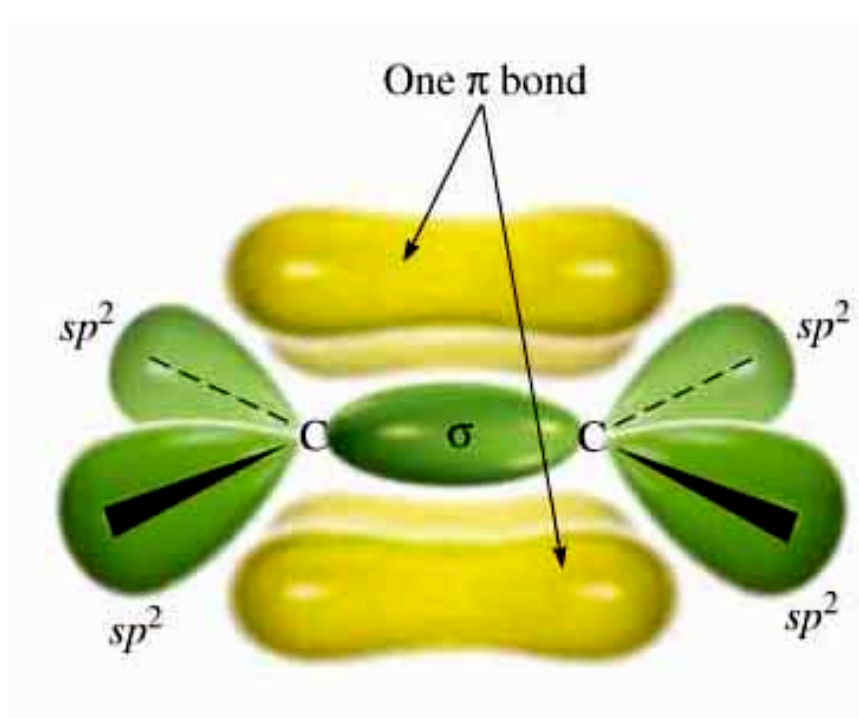
Compounds Containing Double Bonds

- The portion of the double bond formed from the head-on overlap of the sp^2 hybrids is designated as a σ bond.



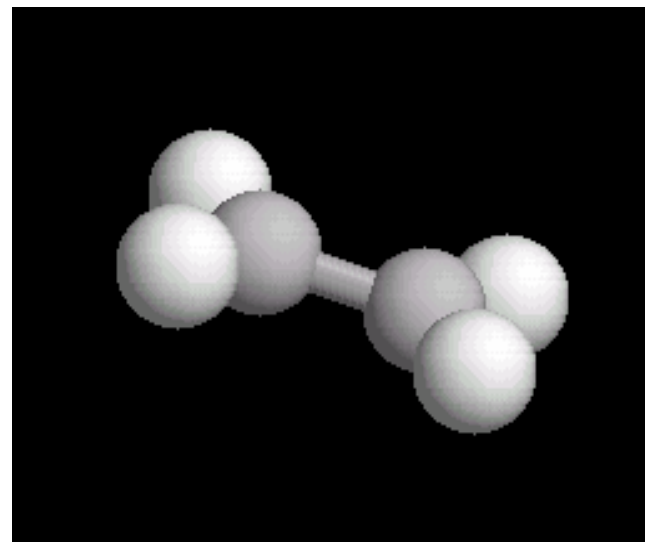
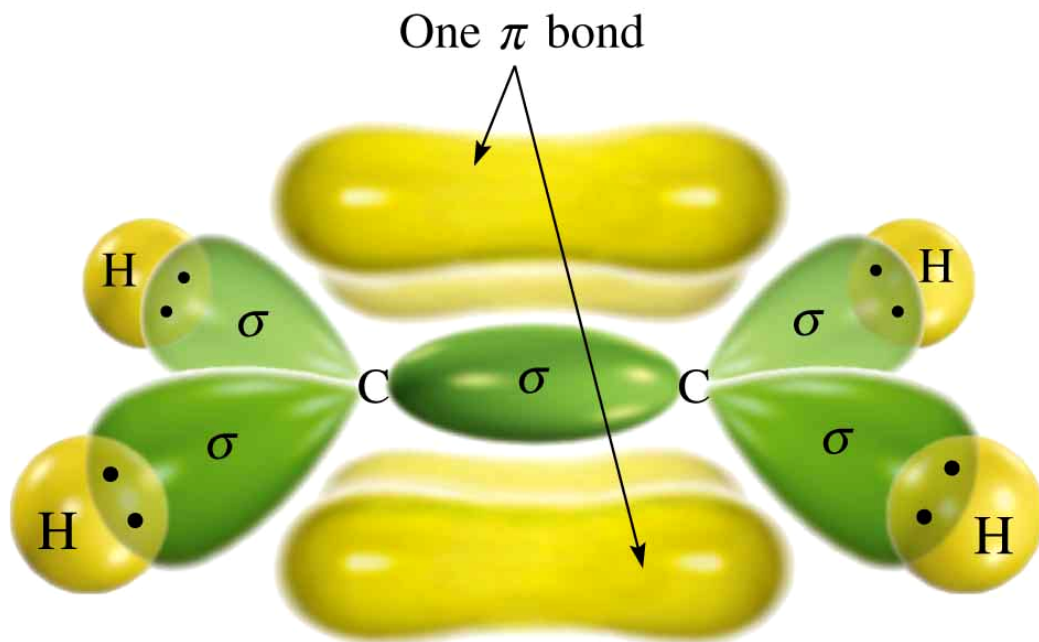
Compounds Containing Double Bonds

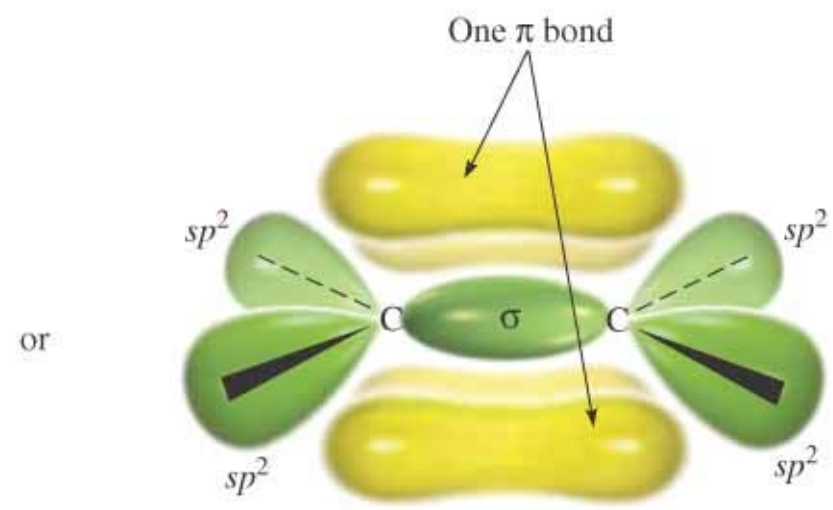
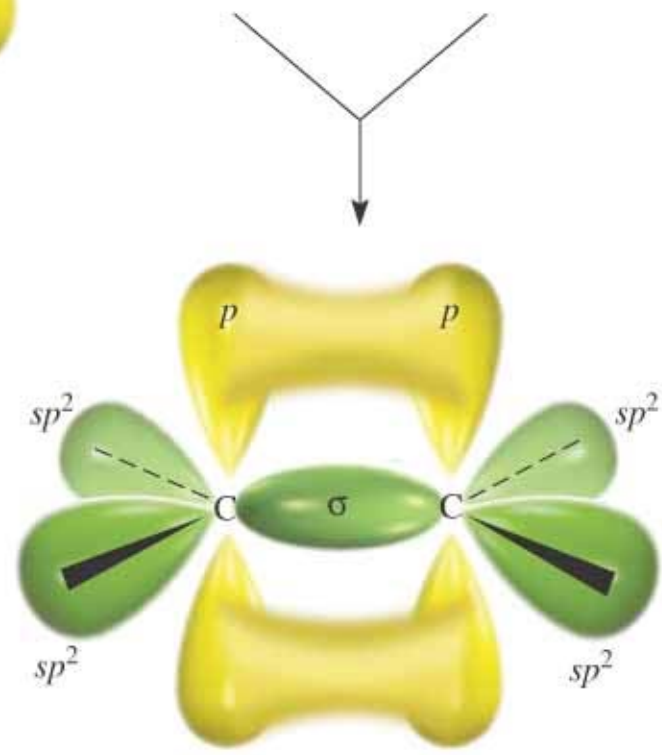
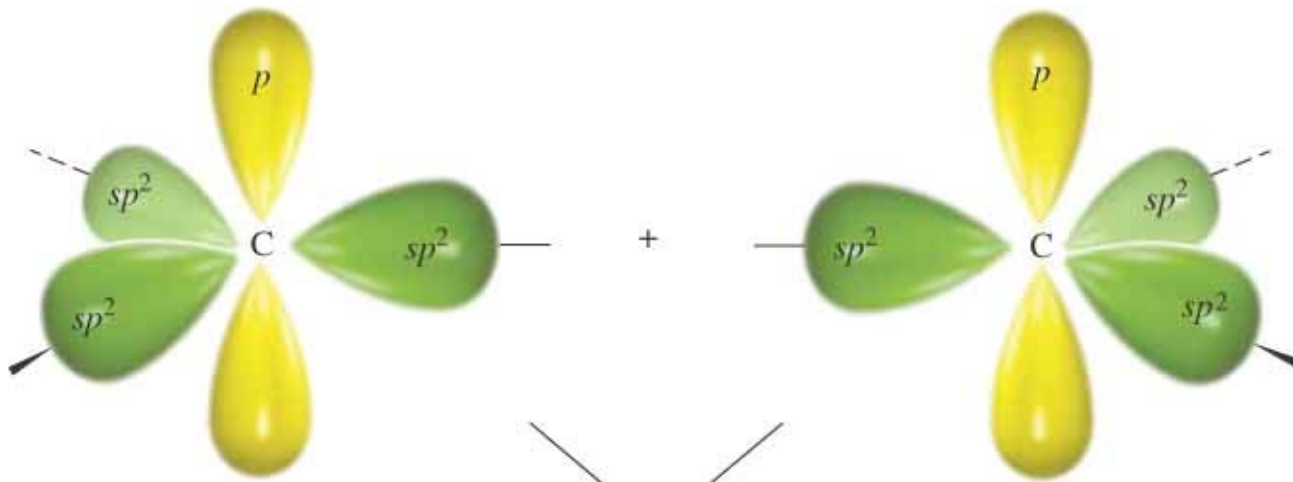
- The other portion of the double bond, resulting from the side-on overlap of the p orbitals, is designated as a π bond.



Compounds Containing Double Bonds

- Thus a C=C bond looks like this and is made of two parts, one σ and one π bond.







Compounds Containing Triple Bonds

- Ethyne or acetylene, C_2H_2 , is the simplest triple bond containing organic compound.

Lewis Dot Formula

$$N = 2(8) + 2(2) = 20$$

$$\underline{A = 2(4) + 2(1) = 10}$$

$$S = 10$$

- Compound must have a triple bond to obey octet rule.

Compounds Containing Triple Bonds

Valence Bond Theory (Hybridization)

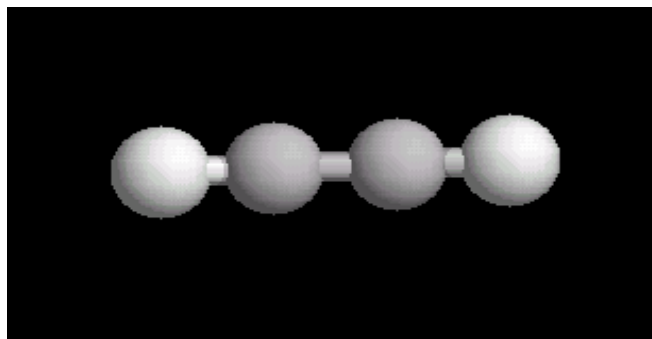
Carbon has 4 electrons.

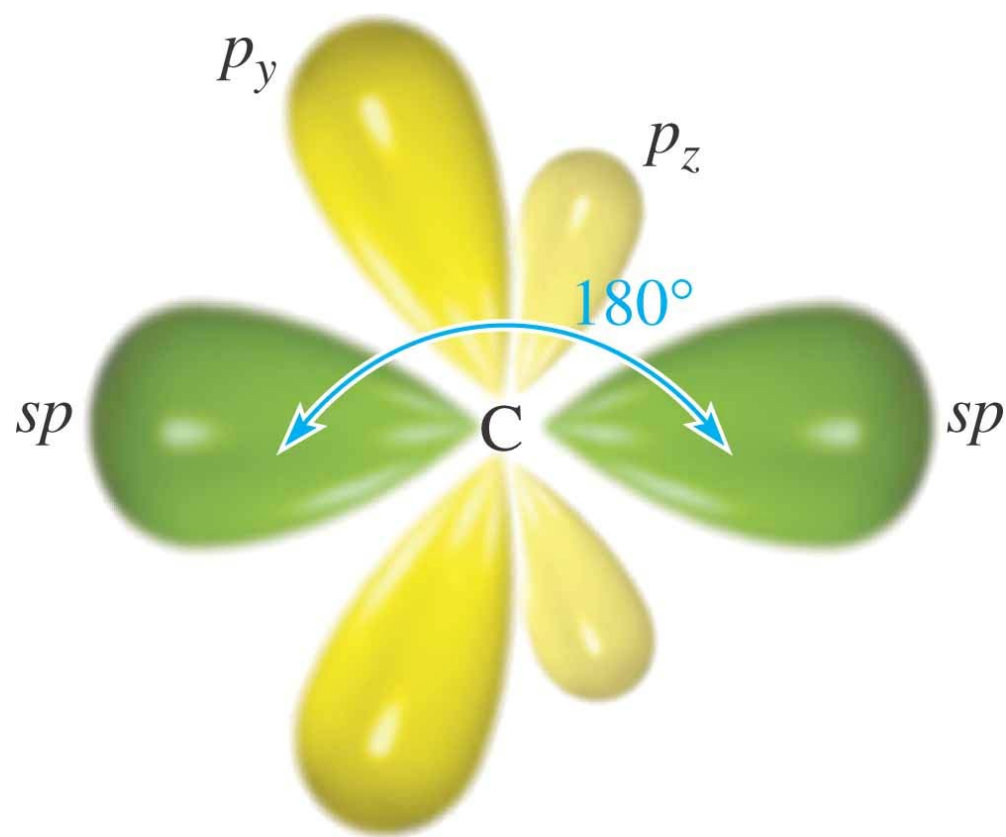
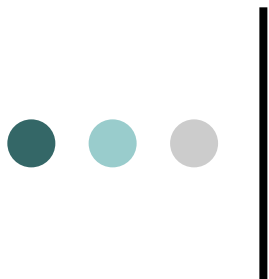
Two of the electrons are in sp hybrids.

Two electrons remain in unhybridized p orbitals.

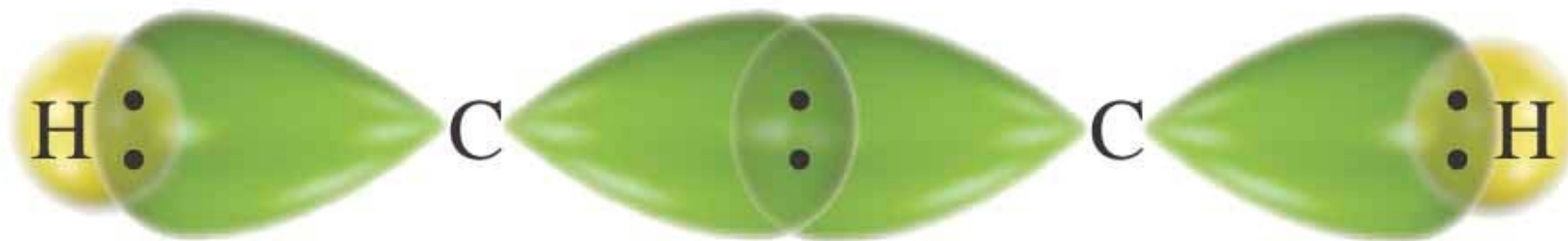


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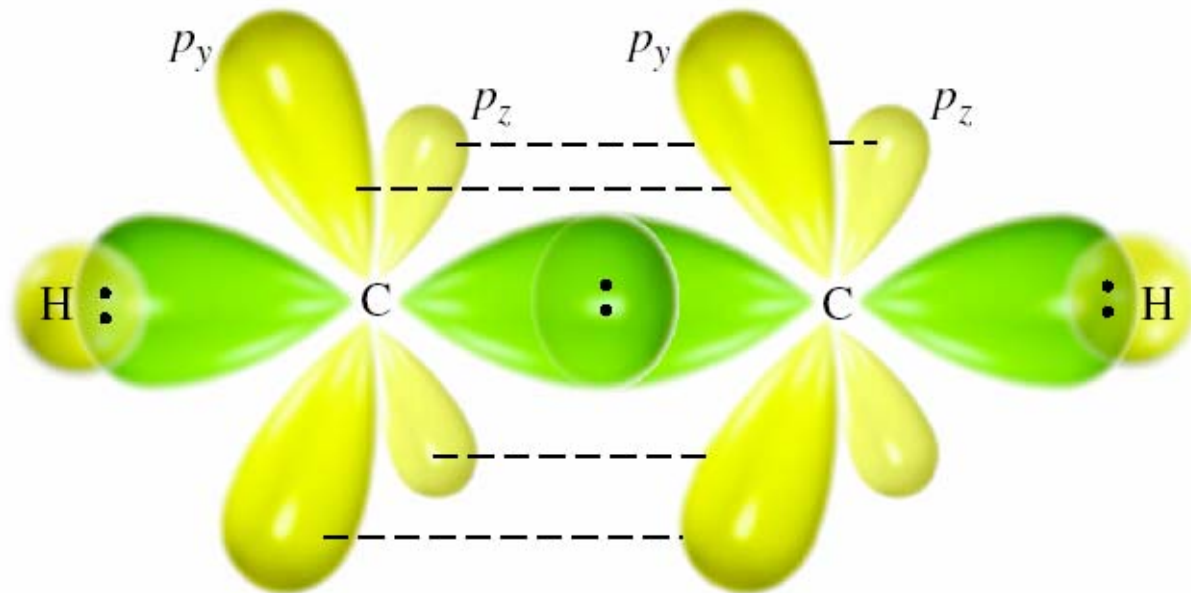
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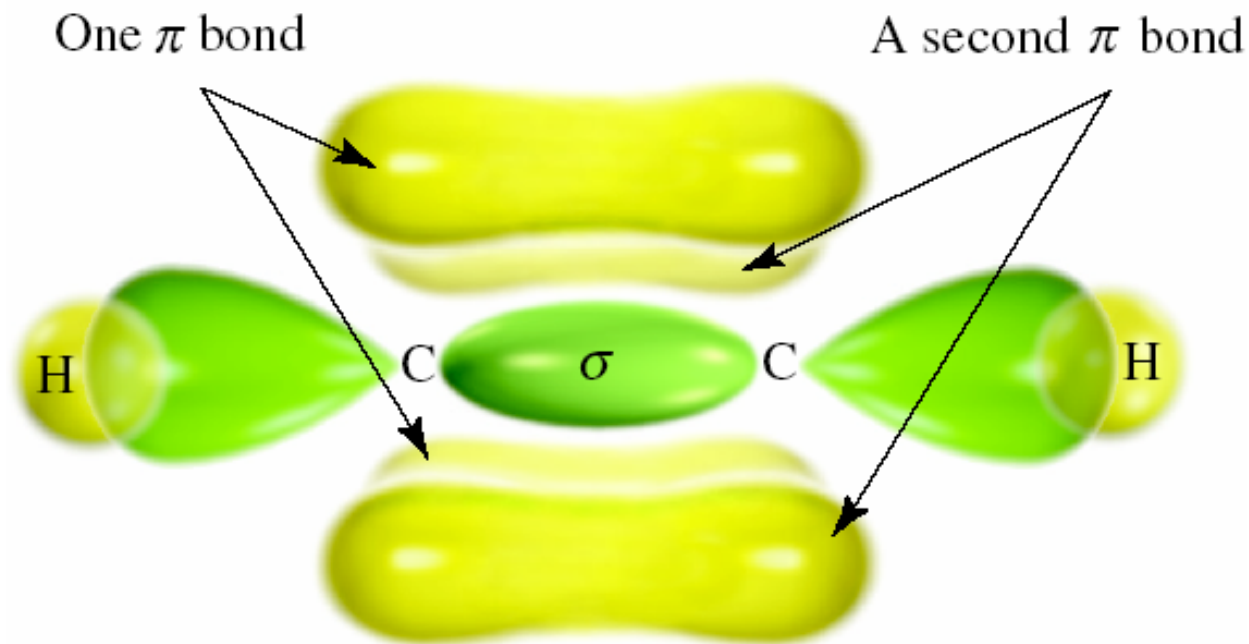
Compounds Containing Triple Bonds

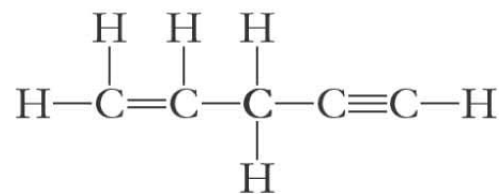
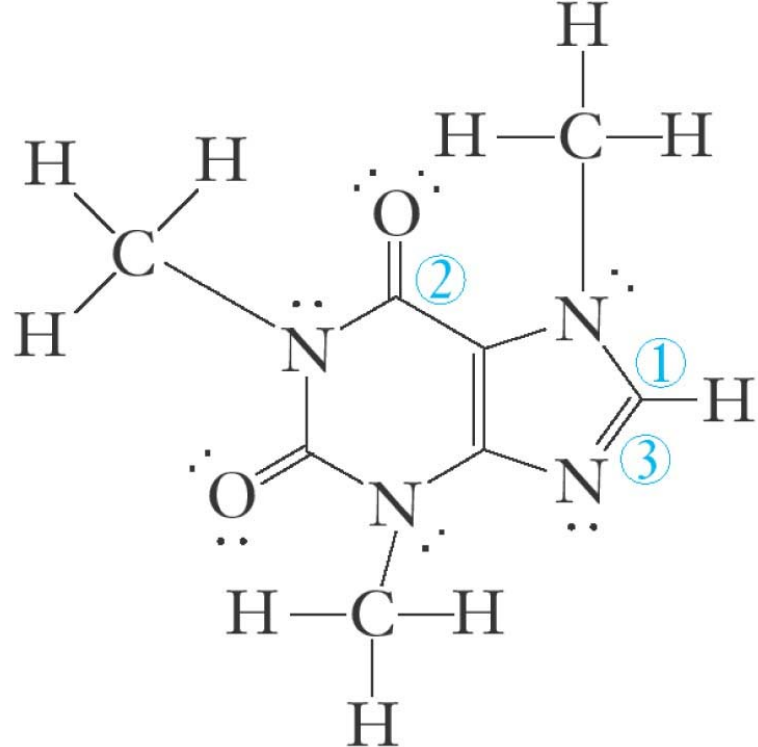
A σ bond results from the head-on overlap of two sp hybrid orbitals.



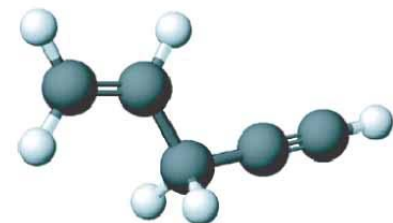
Compounds Containing Triple Bonds

- The unhybridized p orbitals form two π bonds.
- Note that a triple bond consists of one σ and two π bonds.

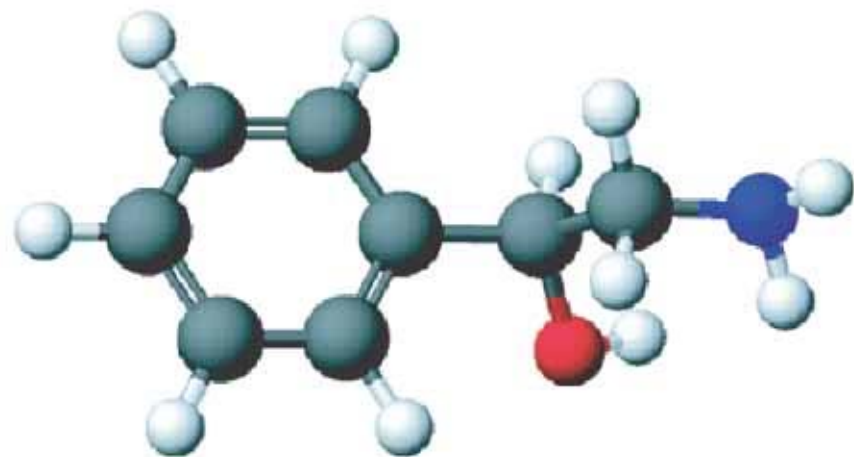
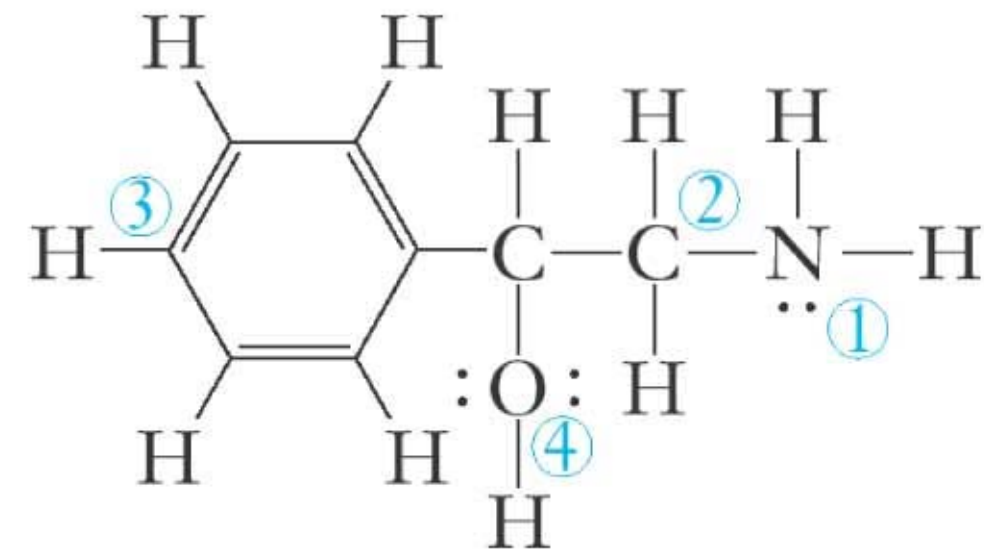




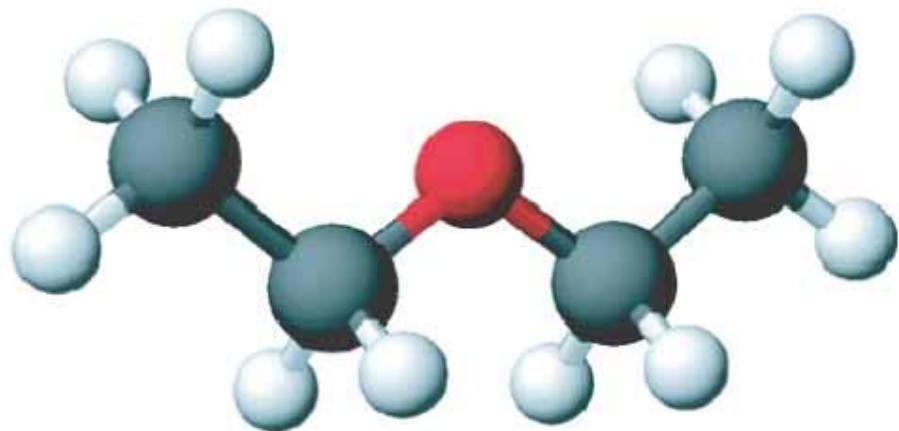
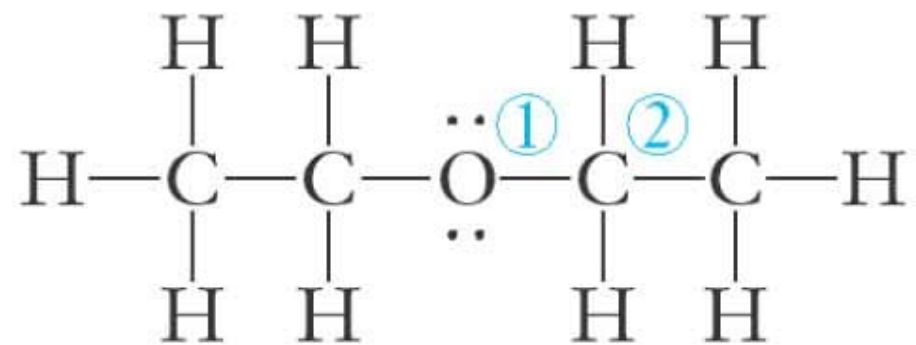
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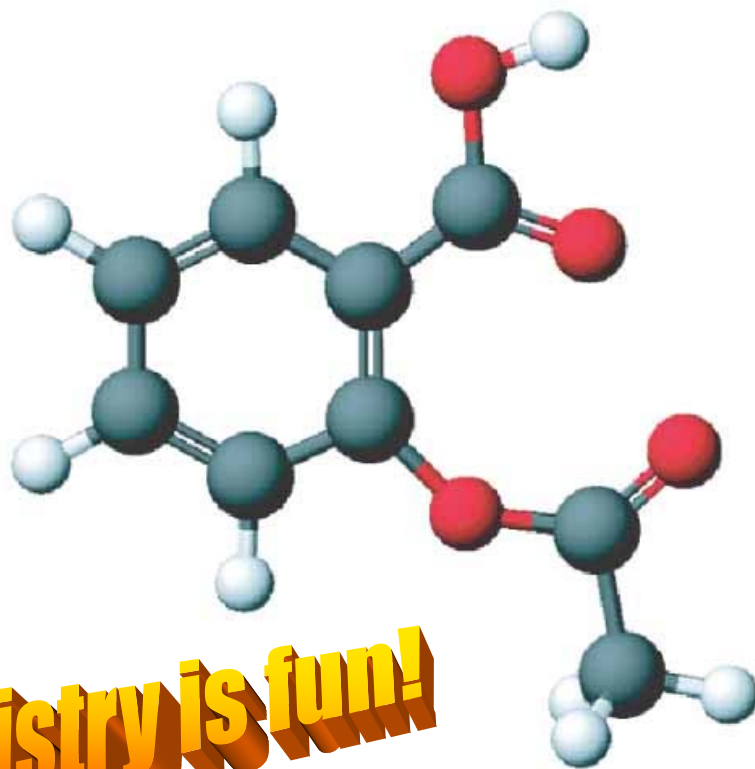
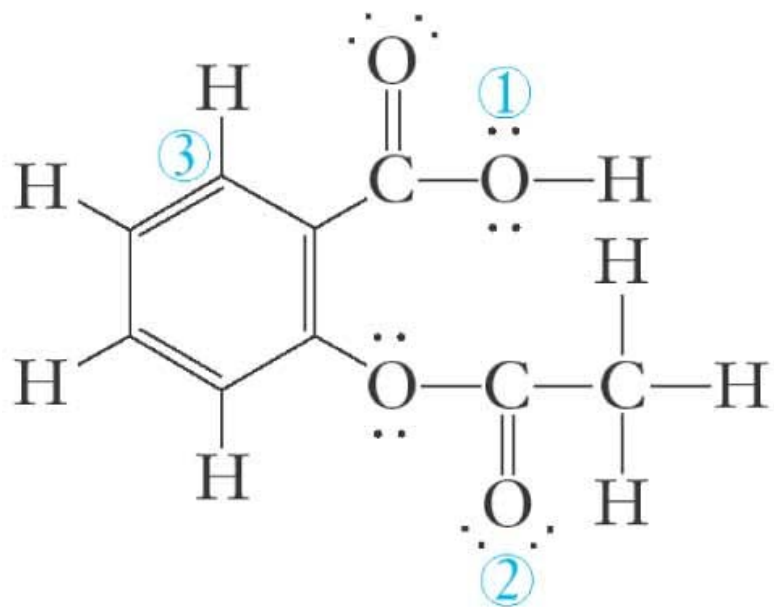
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Chemistry is fun!

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