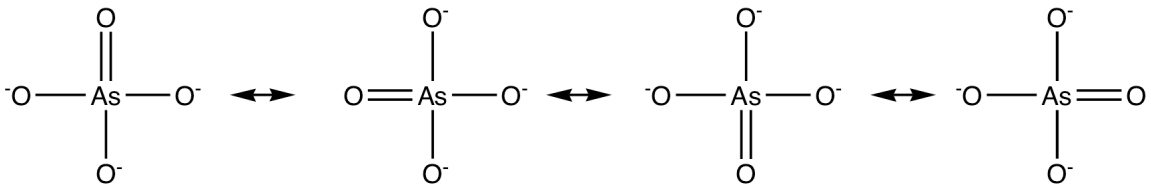
What is the charge (x) on AsO_4^x?

1) -3
2) -2
3) -1
4) 0
5) +1
6) +2
7) +3

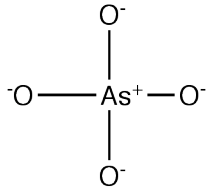
What is the charge (x) on AsO_4^x?

1) -3
2) -2
3) -1
4) 0
5) +1
6) +2
7) +3



Which resonance structure is lowest in energy?

1)



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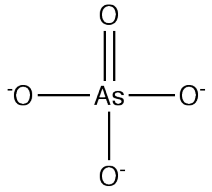

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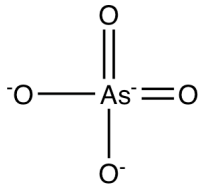
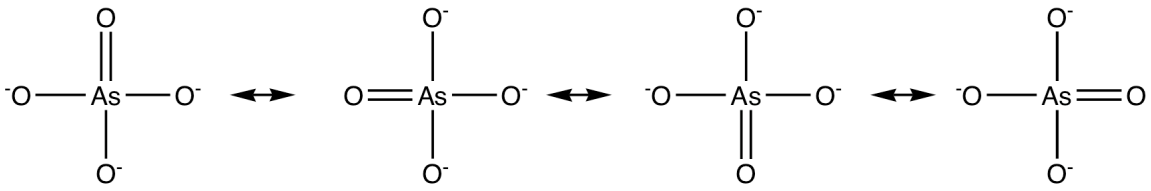
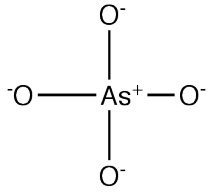




Which resonance structure is lowest in energy?

1)



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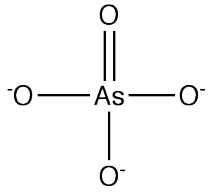
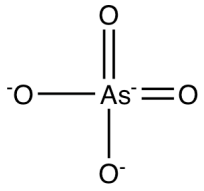
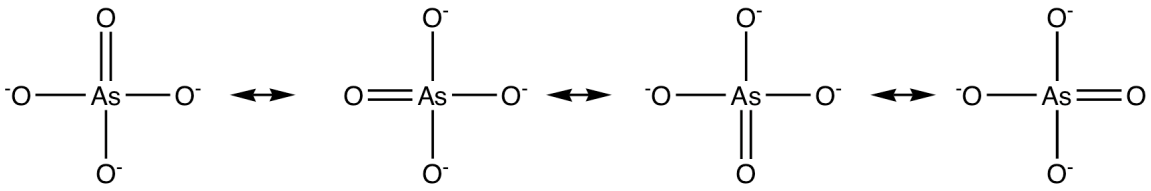


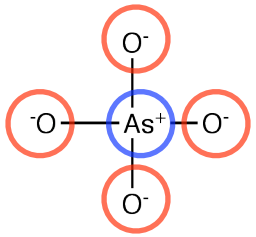
3)





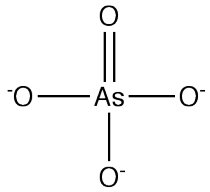
Which resonance structure is lowest in energy?

1)



Too much charge separation

2)



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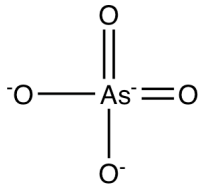
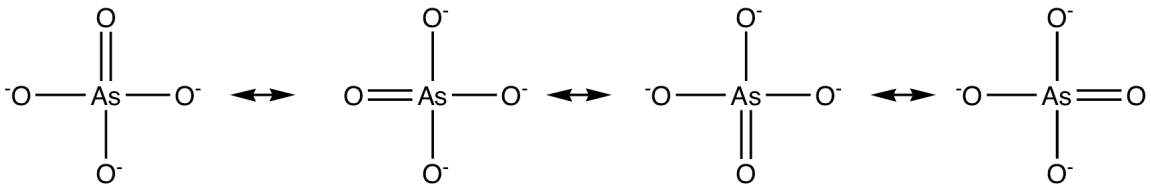
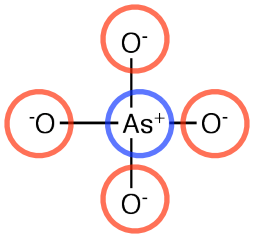




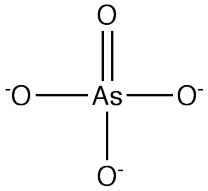
Which resonance structure is lowest in energy?

1)



Too much charge separation

2)



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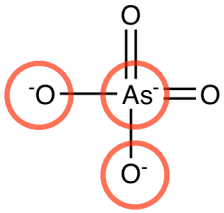
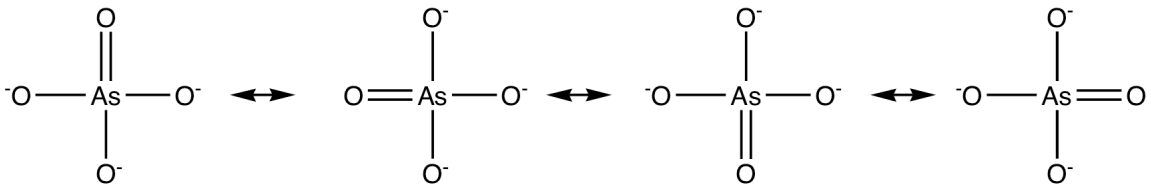
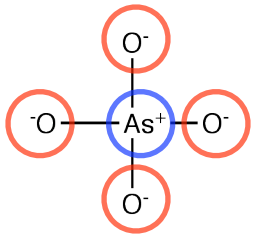


Charge on a less electronegative element



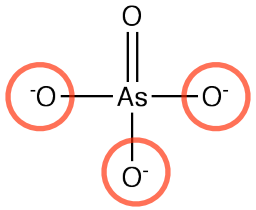
Which resonance structure is lowest in energy?

1)

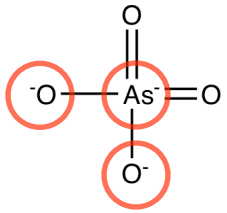


Too much charge separation

2)

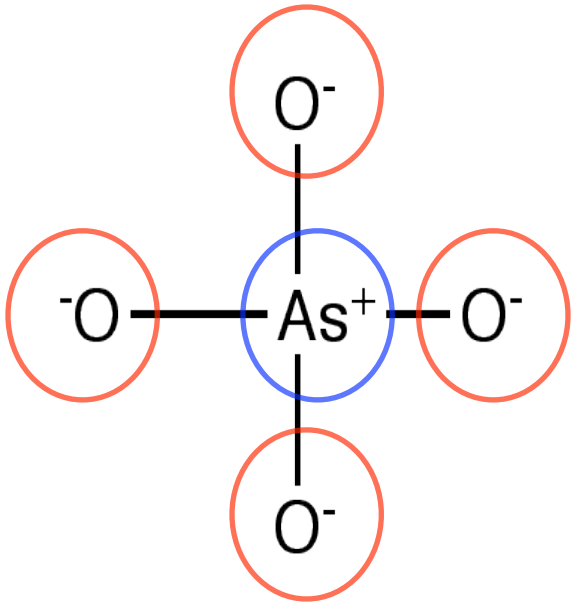


3)

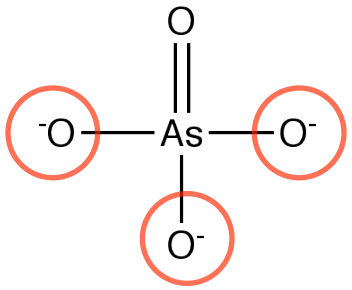


Charge on a less electronegative element

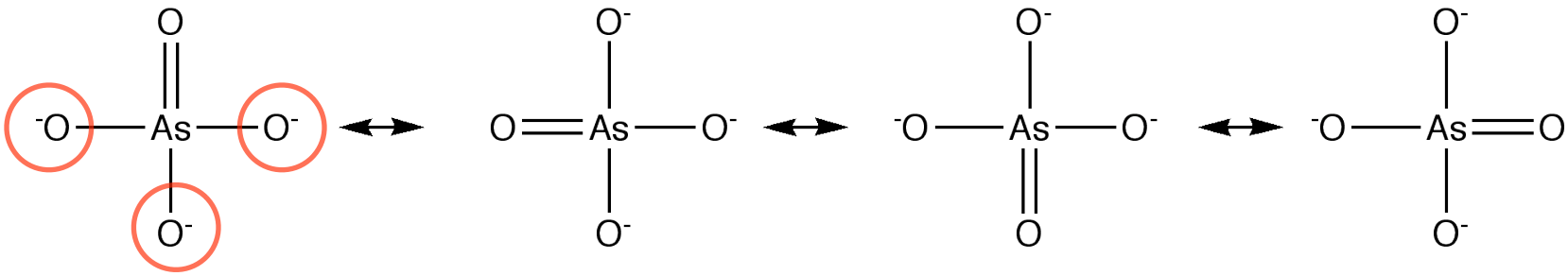
How many equal energy resonance structures?



How many equal energy resonance structures?

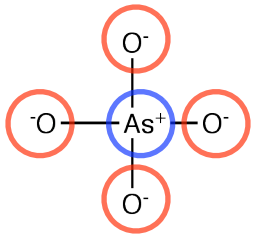


How many equal energy resonance structures?

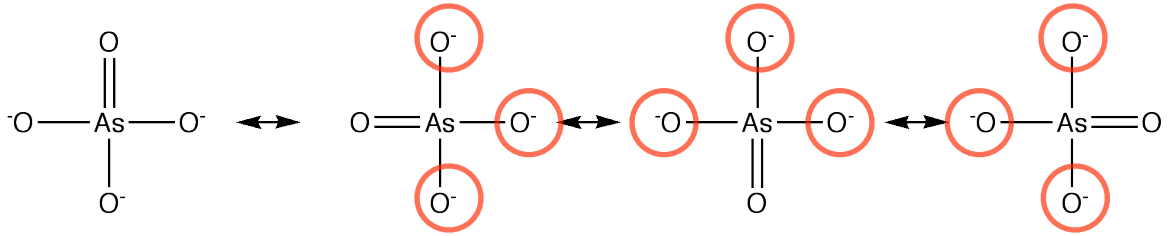


How many equal energy resonance structures?

1)



2)



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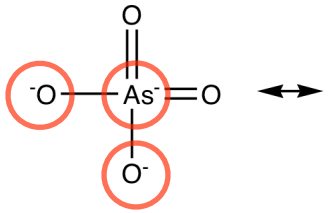


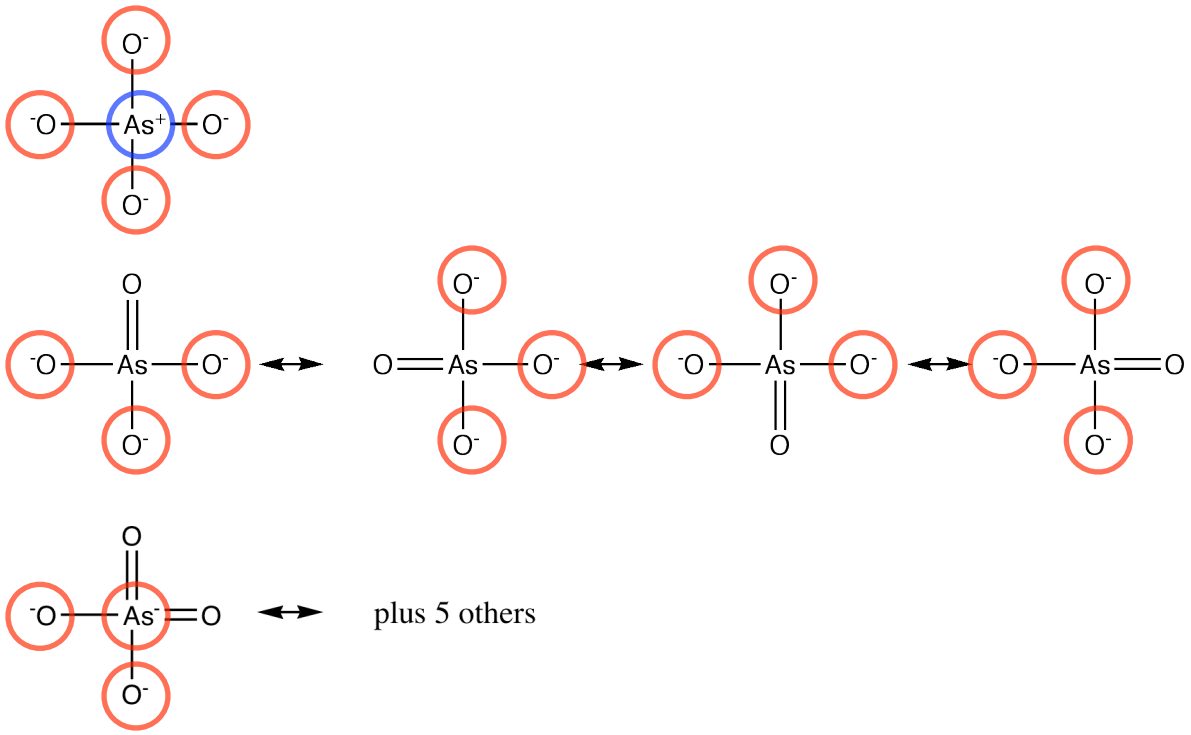
plus 5 others

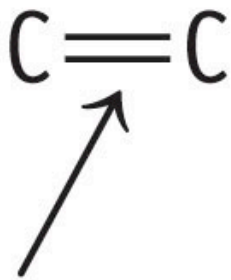
How many equal energy resonance structures?

1)

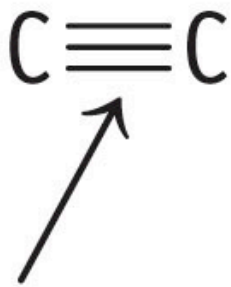
2)

3)

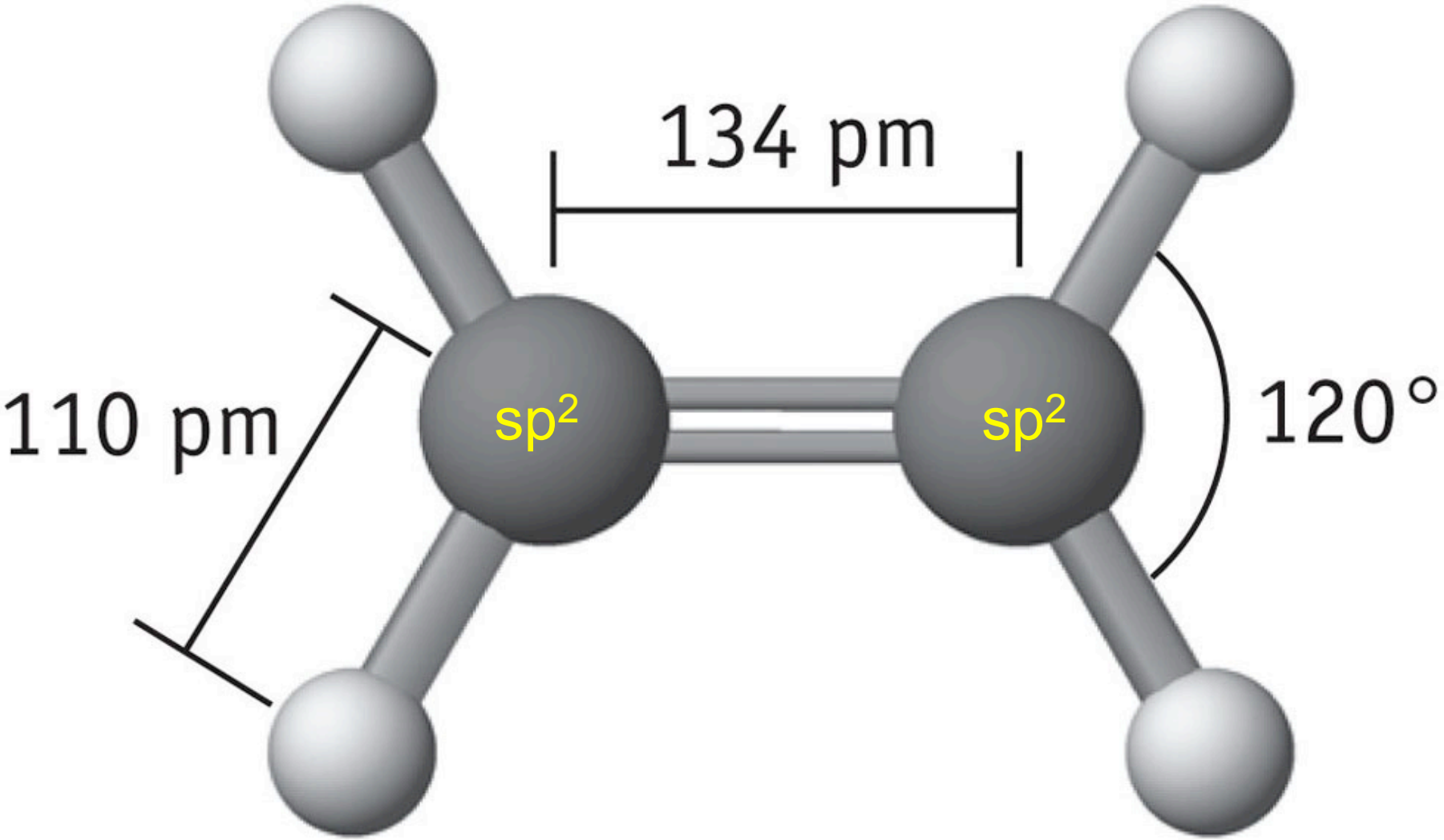




Double bond requires two sets of overlapping orbitals and two pairs of electrons.

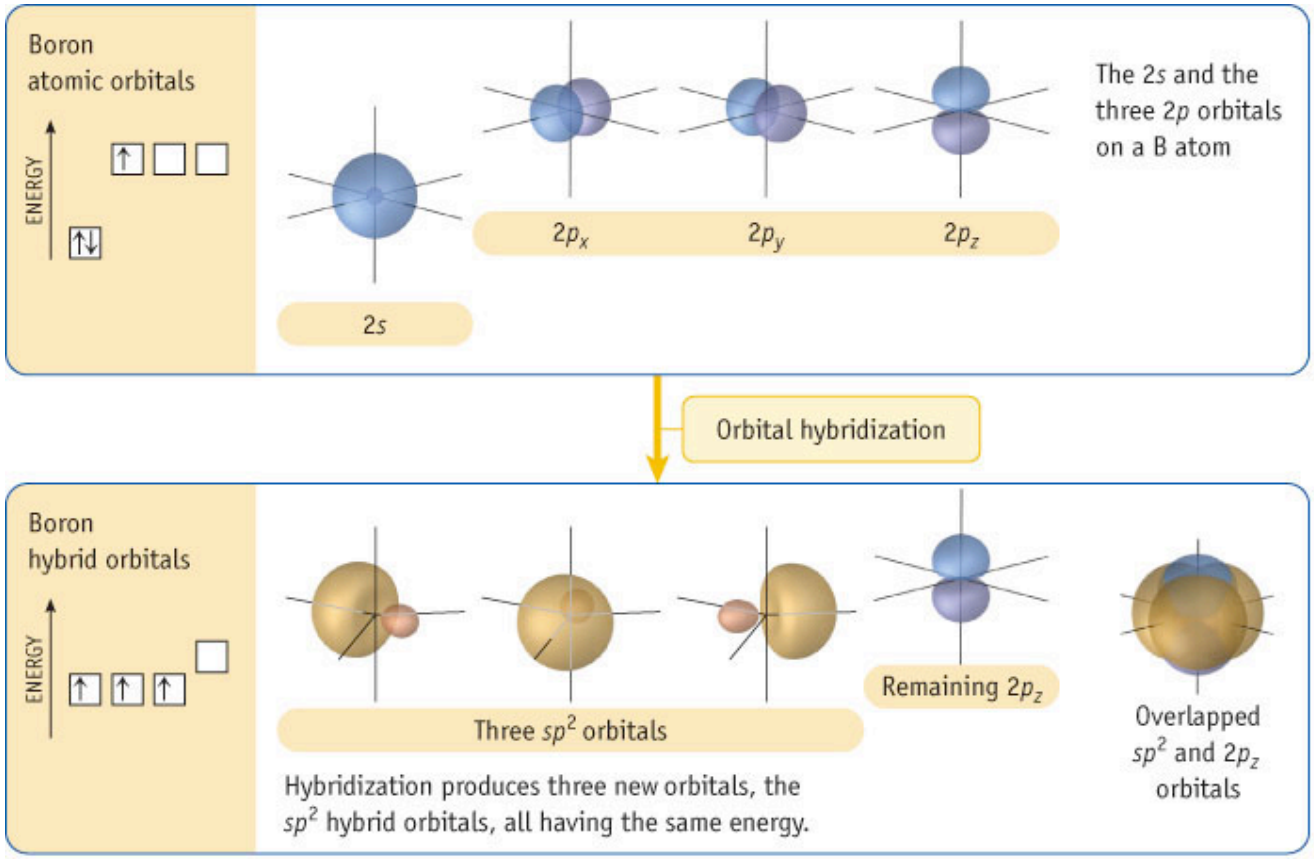


Triple bond requires three sets of overlapping orbitals and three pairs of electrons.



Ethylene, C_2H_4

sp^2 hybridization



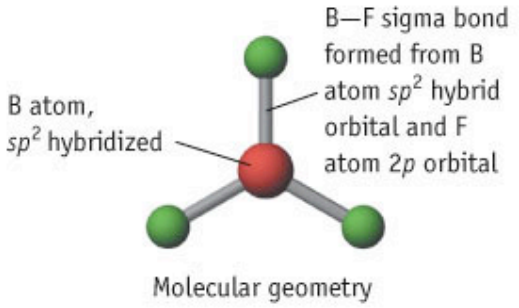
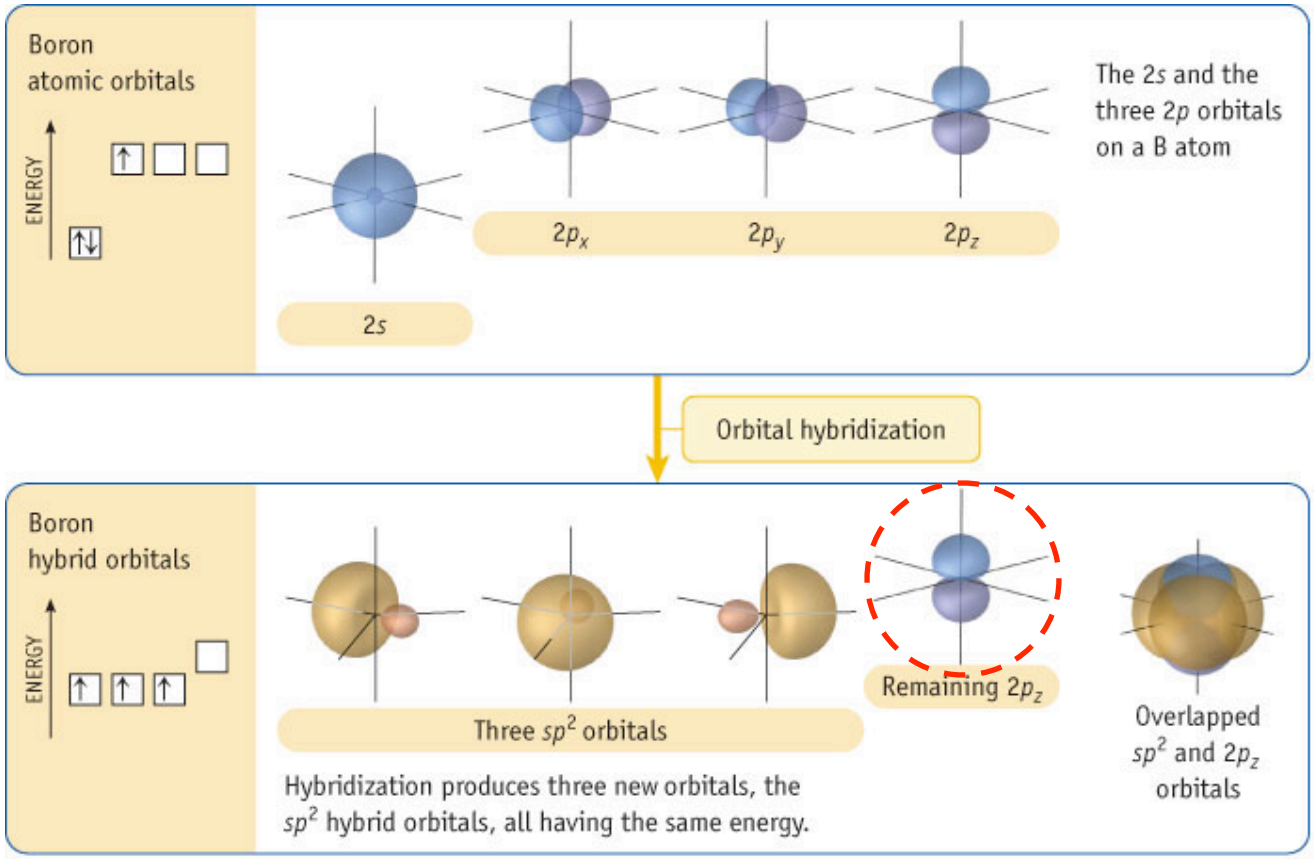


Fig. 9-8, p. 414

sp^2 hybridization



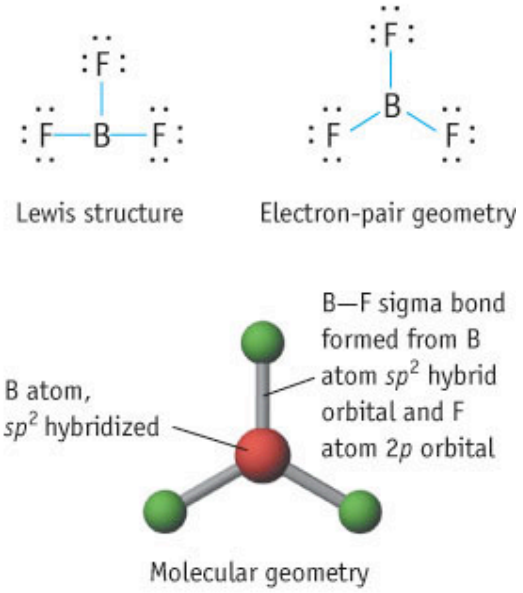
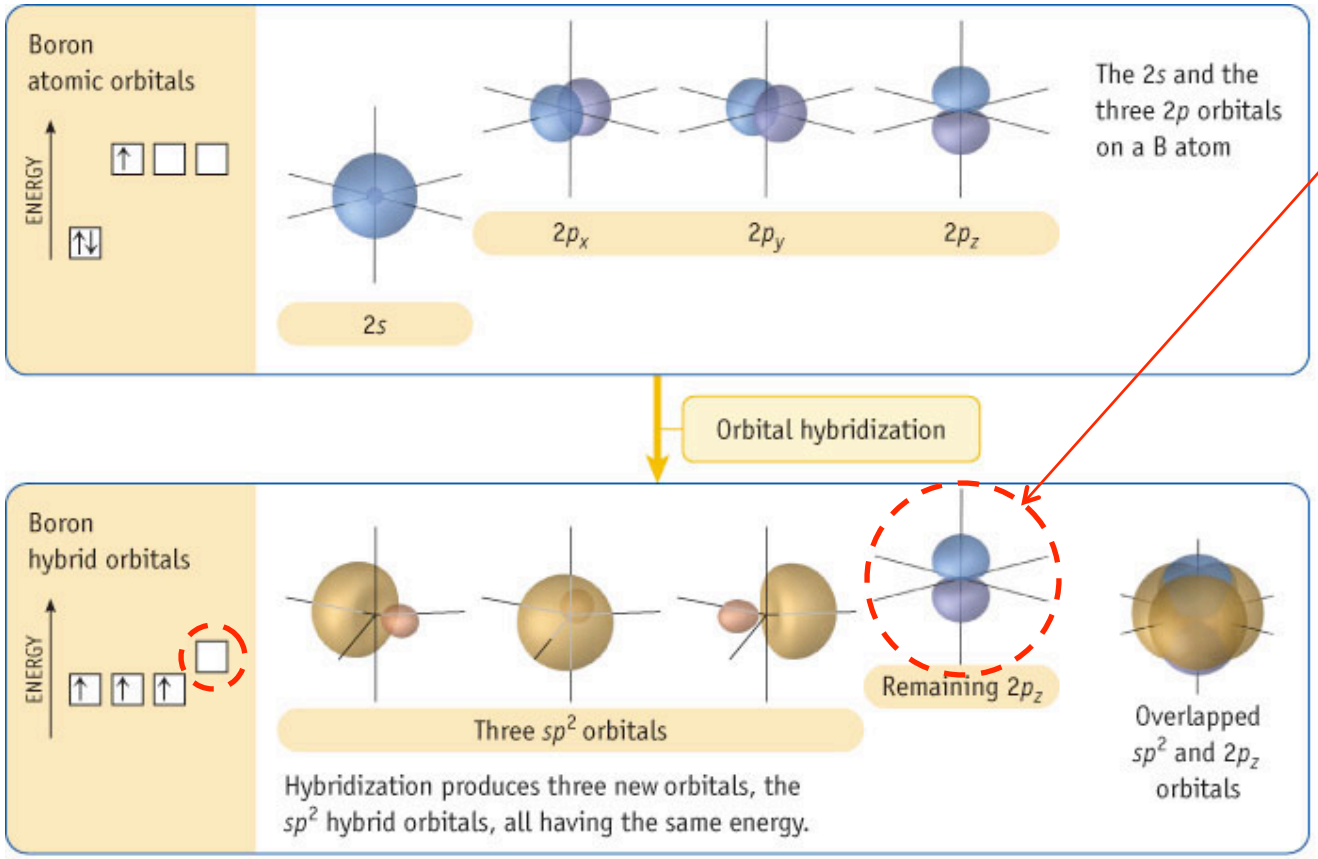
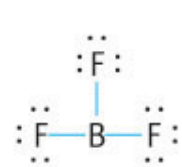


Fig. 9-8, p. 414

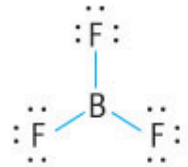
sp^2 hybridization



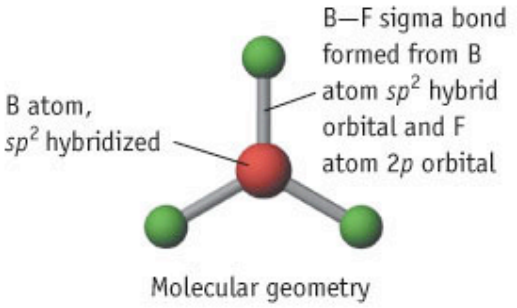
Left over (unused) atomic orbital



Lewis structure



Electron-pair geometry

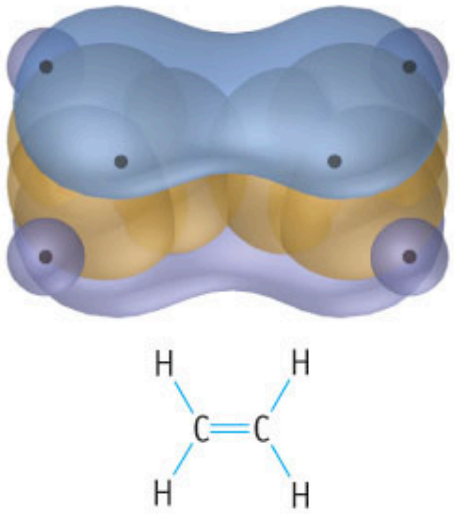


Molecular geometry

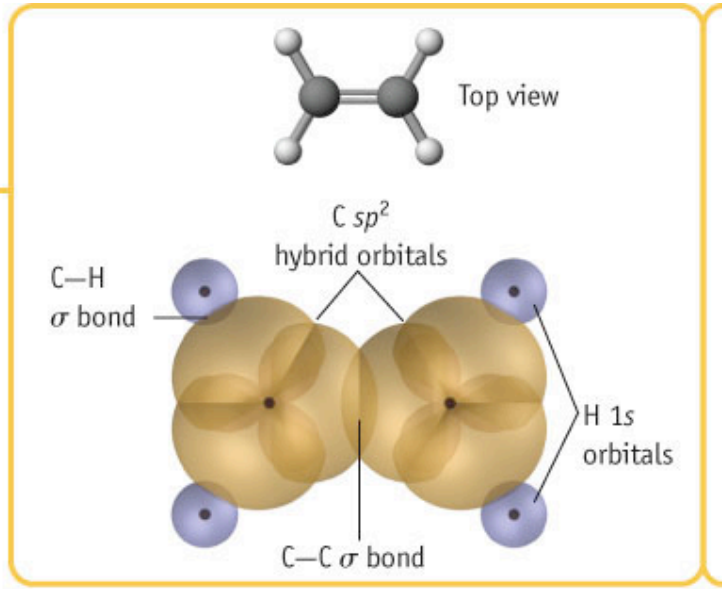
Fig. 9-8, p. 414

Unhybridized *p* orbital. Used for π bonding in C_2H_4.

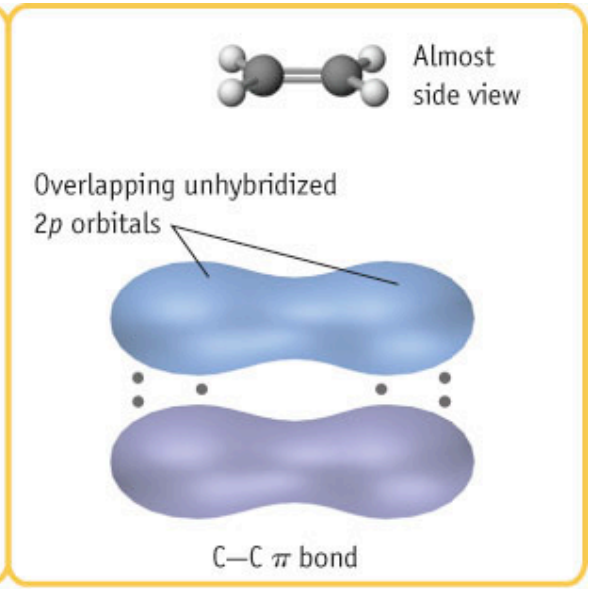
Three sp^2 hybrid orbitals. Used for C—H and C—C σ bonding in C_2H_4.



(a) Lewis structure and bonding of ethylene, C_2H_4.

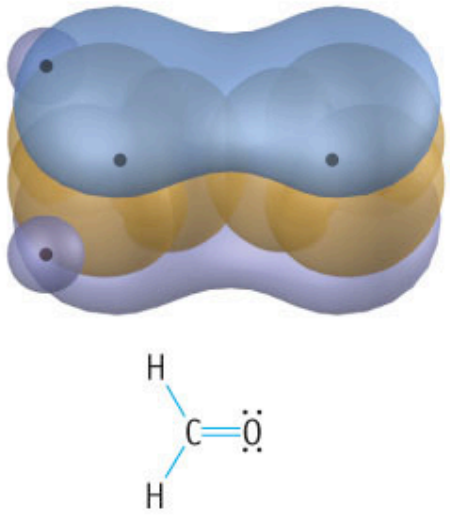


(b) The C—H σ bonds are formed by overlap of C atom sp^2 hybrid orbitals with H atom 1s orbitals. The σ bond between C atoms arises from overlap of sp^2 orbitals.

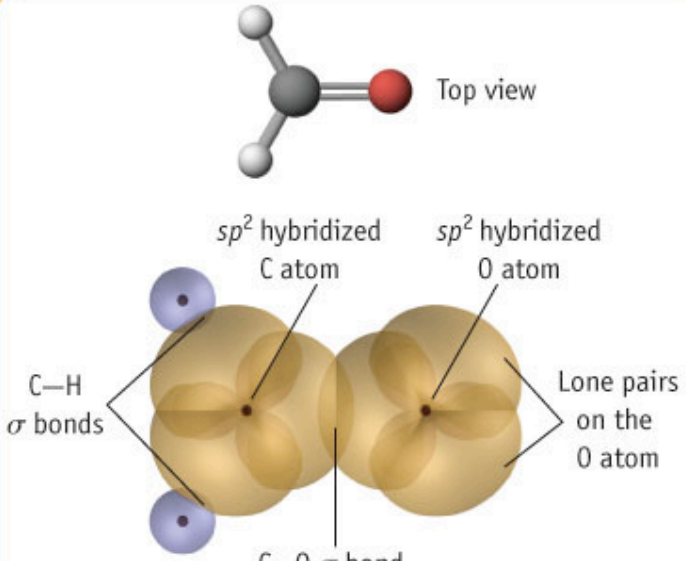


(c) The carbon–carbon π bond is formed by overlap of an unhybridized 2p orbital on each atom. Note the lack of electron density along the C—C bond axis from this bond.

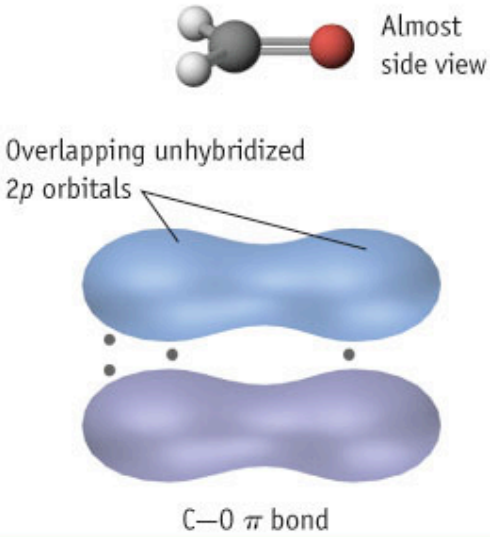
Fig. 9-10, p. 417



(a) Lewis structure and bonding of formaldehyde, CH_2O.

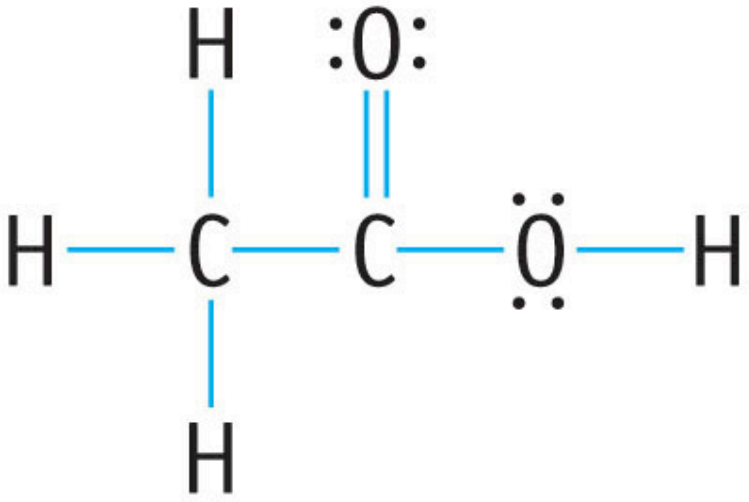


(b) The C—H σ bonds are formed by overlap of C atom sp^2 hybrid orbitals with H atom 1*s* orbitals. The σ bond between C and O atoms arises from overlap of sp^2 orbitals.

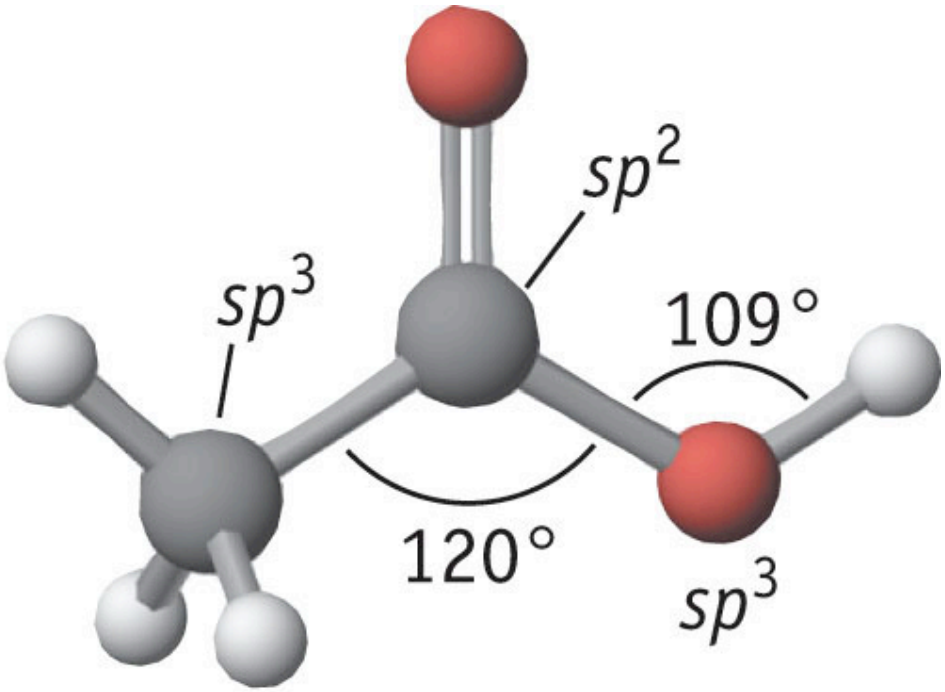


(c) The C—O π bond comes from the side-by-side overlap of *p* orbitals on the two atoms.

Fig. 9-11, p. 418

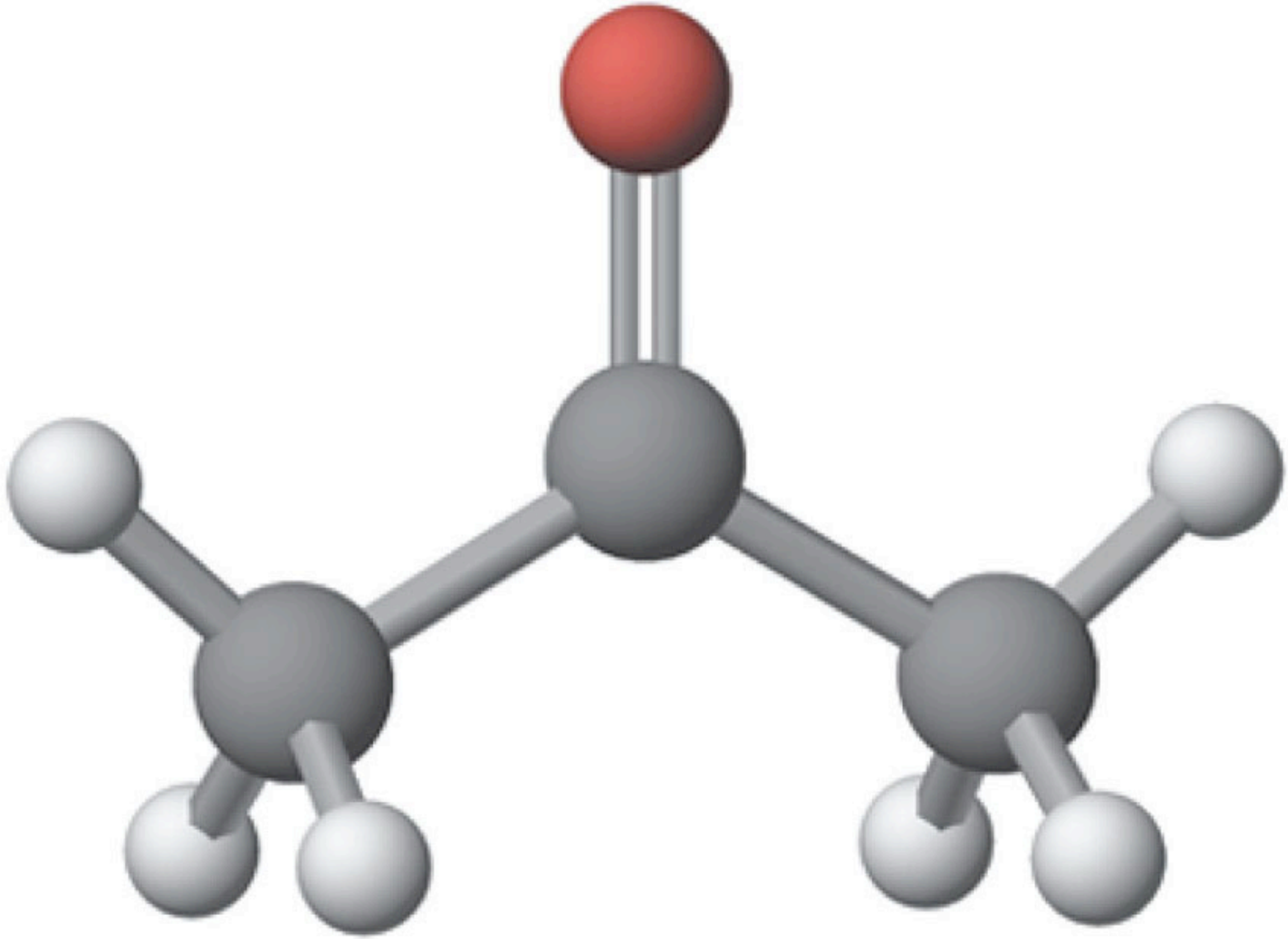


Lewis dot structure

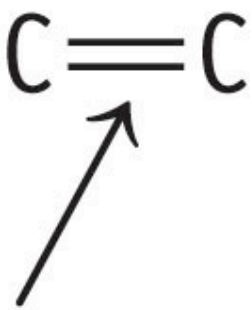


Molecular model

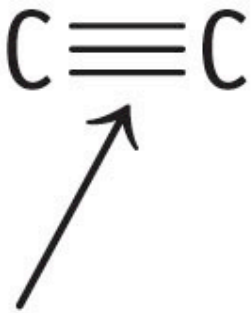
Example 9-5, p. 419



Acetone

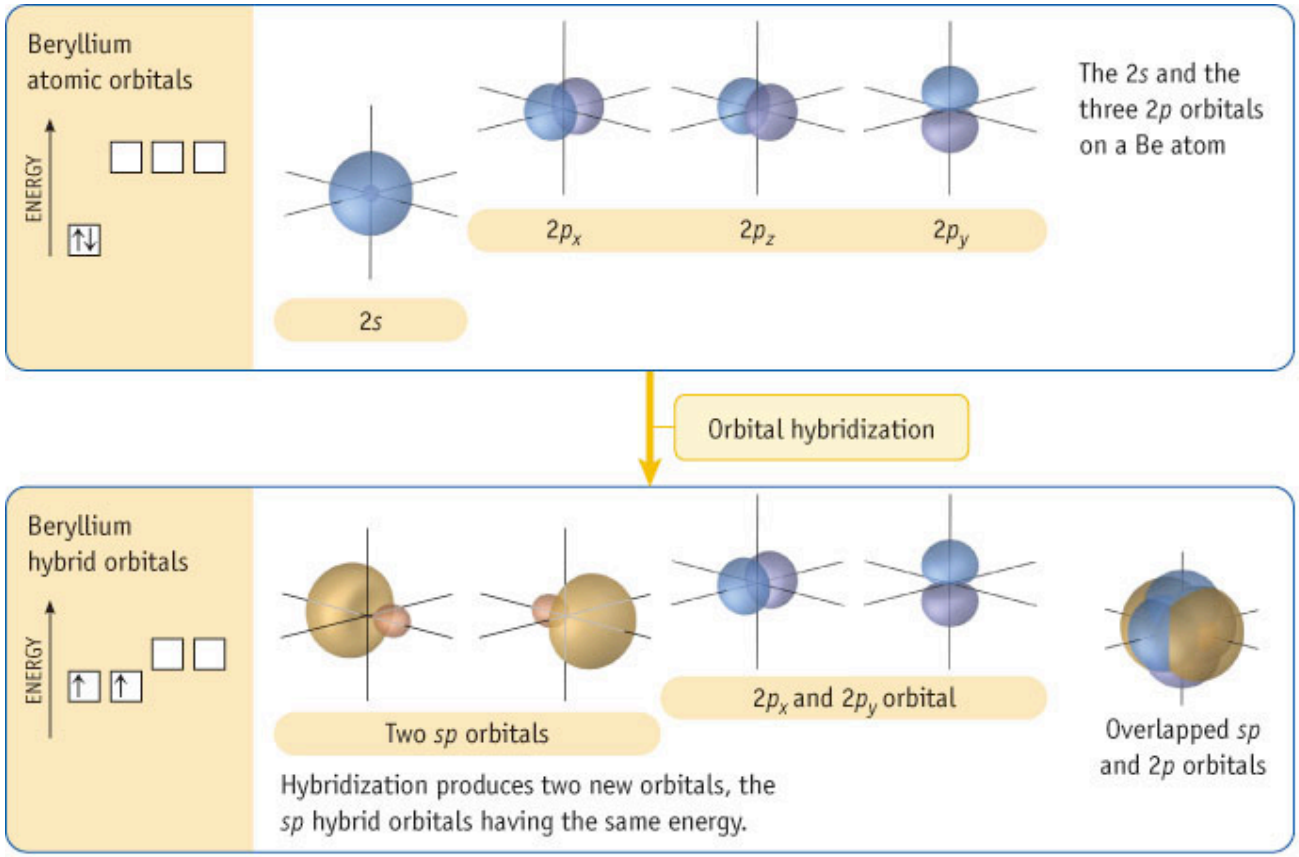


Double bond requires two sets of overlapping orbitals and two pairs of electrons.



Triple bond requires three sets of overlapping orbitals and three pairs of electrons.

sp hybridization



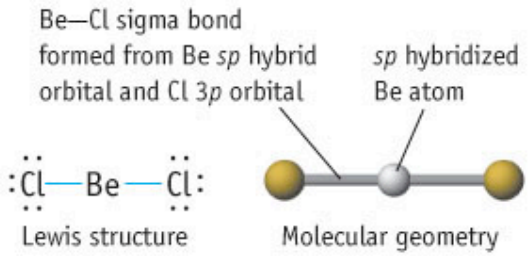
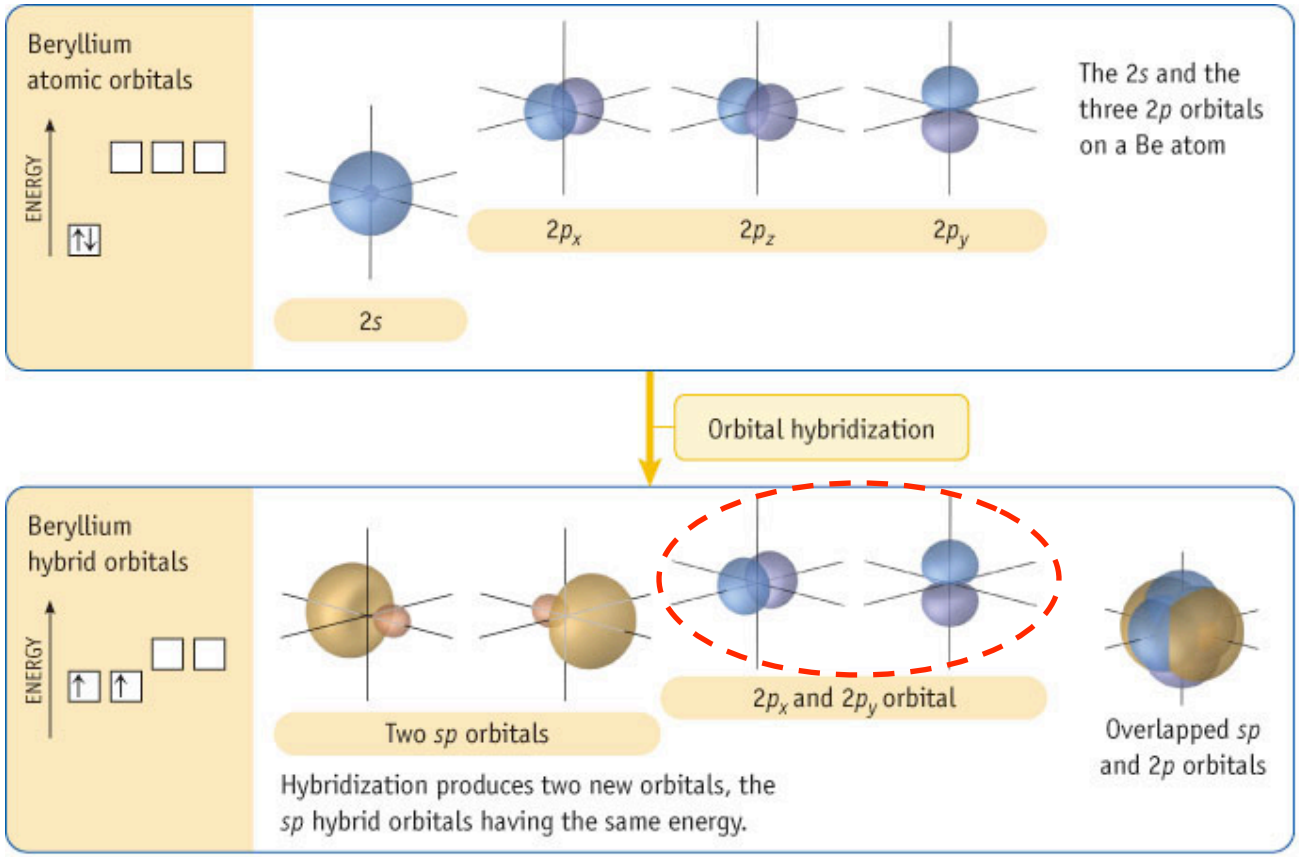


Fig. 9-9, p. 415

sp hybridization



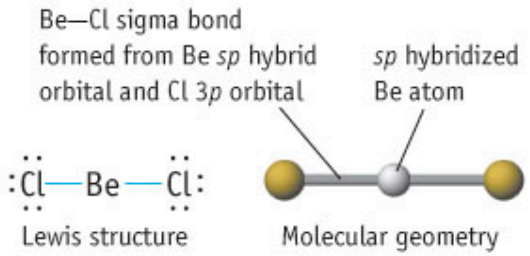
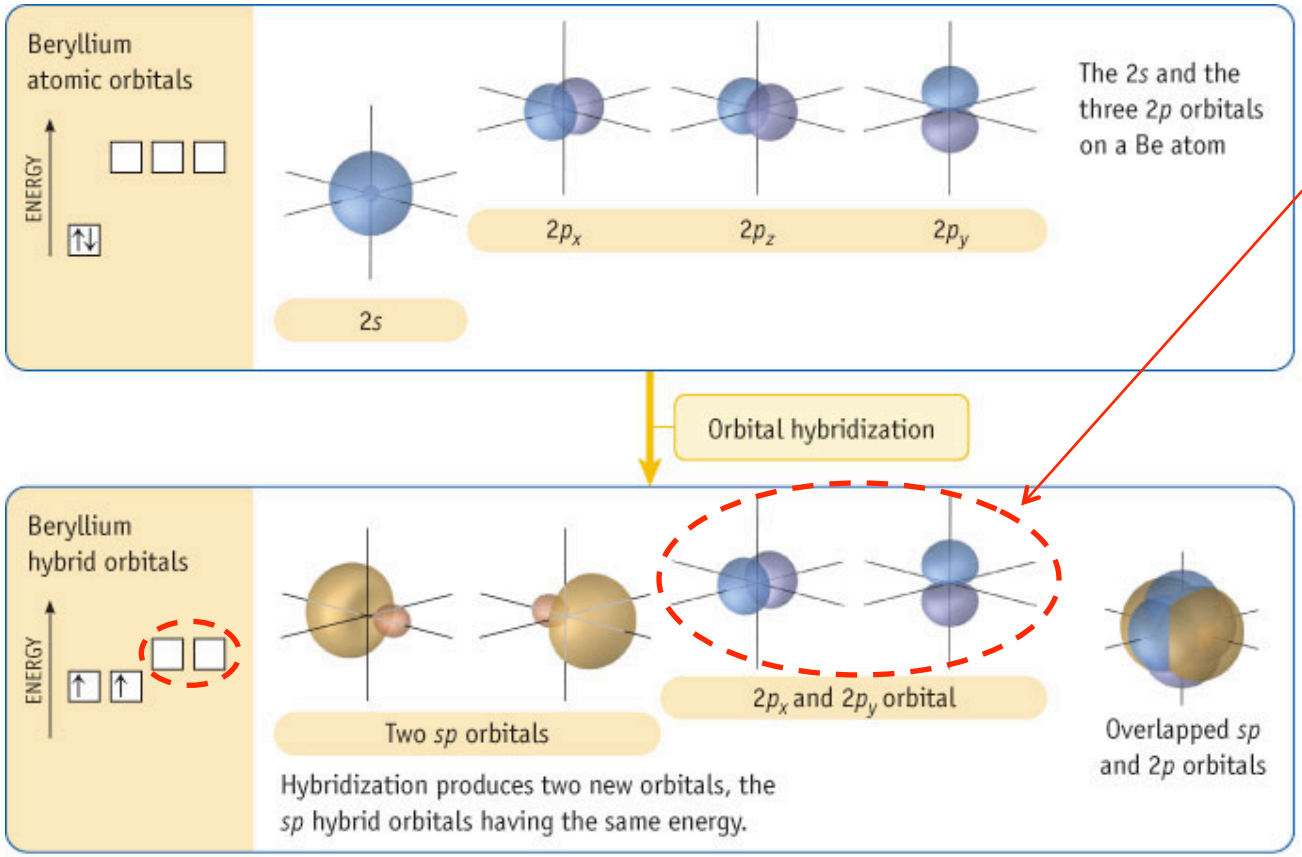


Fig. 9-9, p. 415

sp hybridization

Left over (unused) atomic orbitals



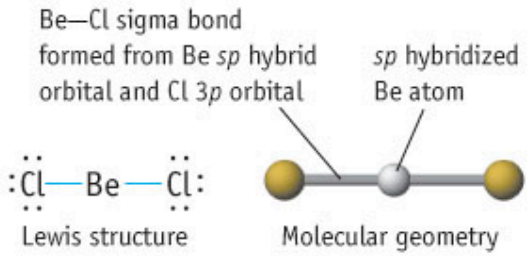
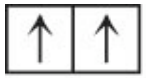
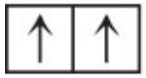


Fig. 9-9, p. 415



Two unhybridized *p* orbitals. Used for π bonding in C_2H_2.



Two *sp* hybrid orbitals. Used for C—H and C—C σ bonding in C_2H_2.

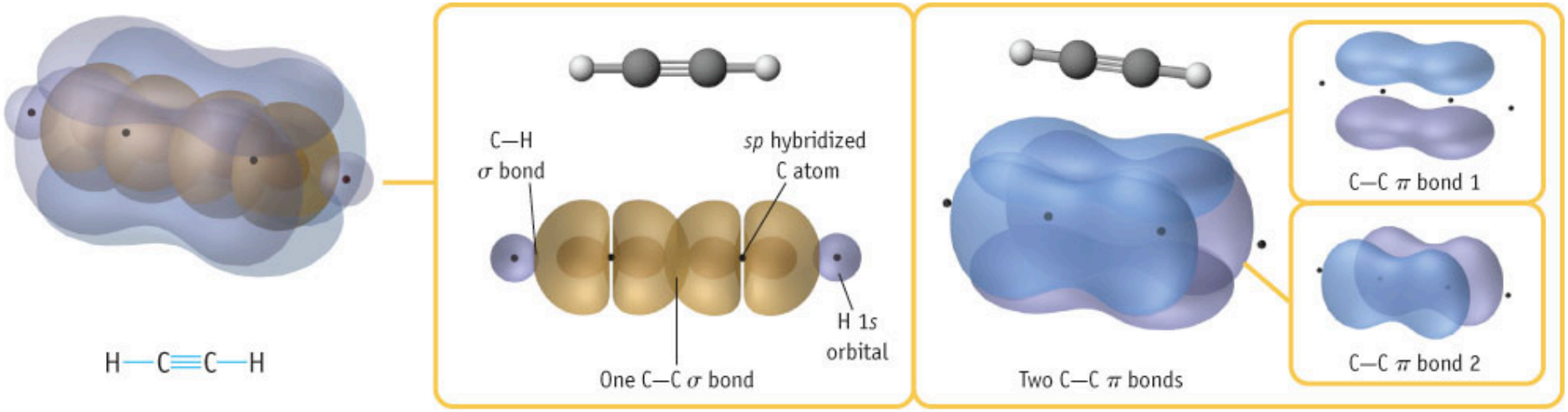
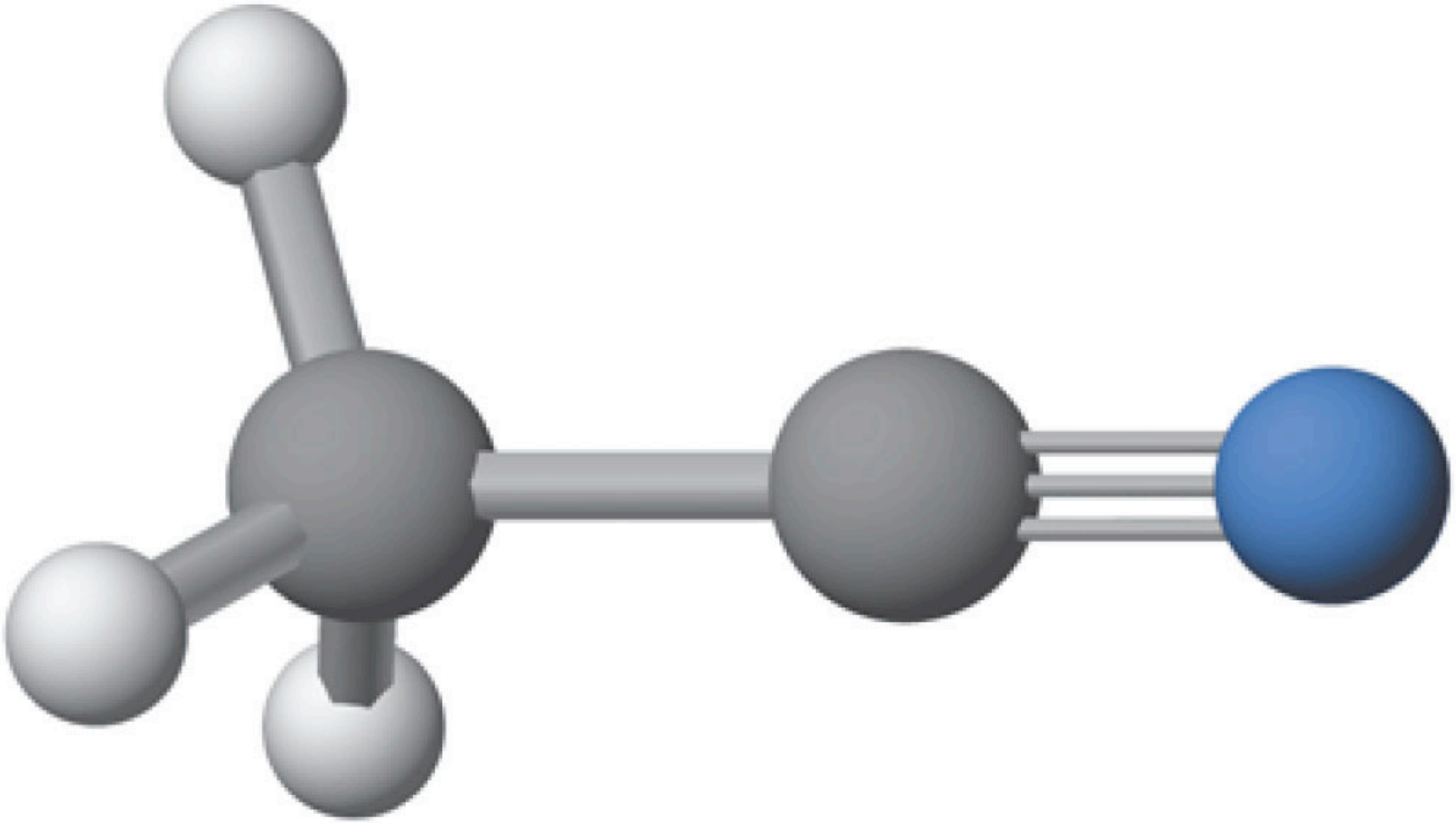
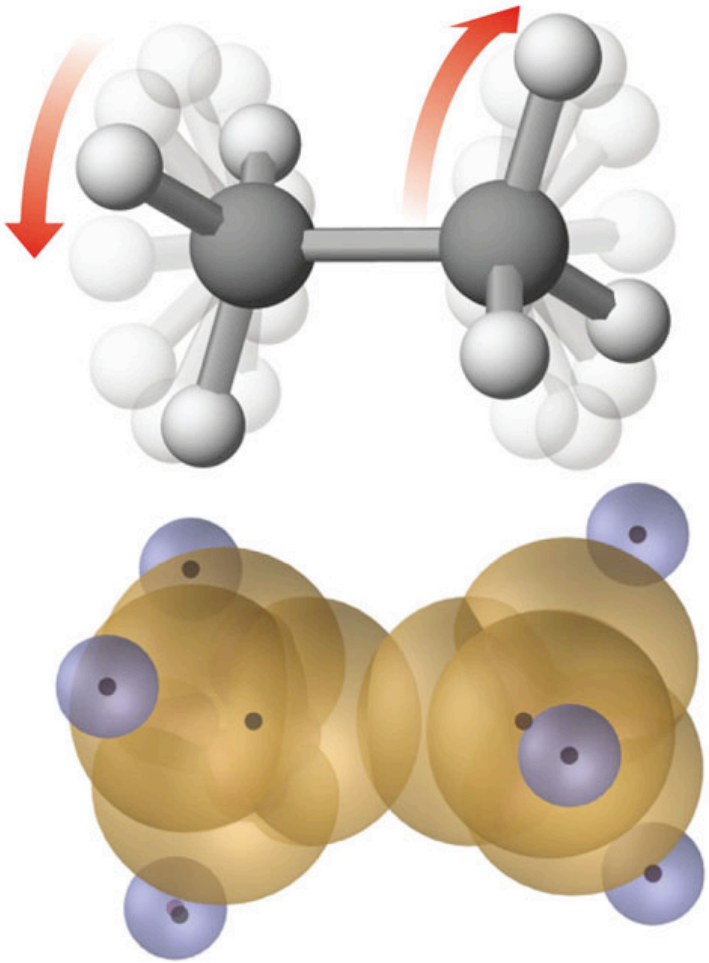


Fig. 9-12, p. 419



Acetonitrile, CH_3CN

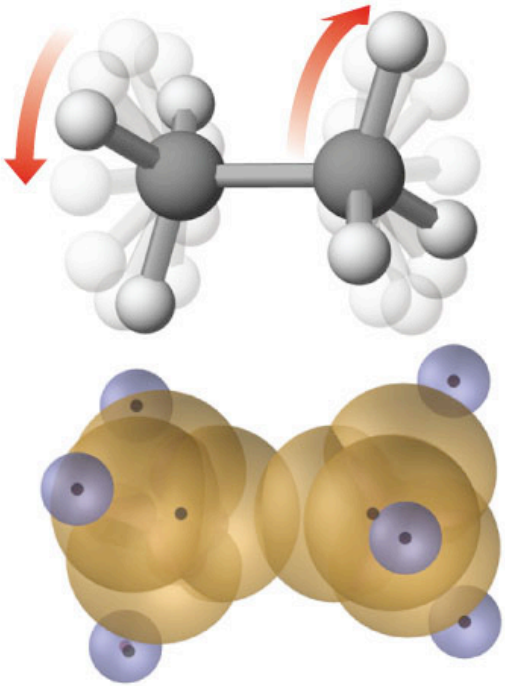
Free Rotation



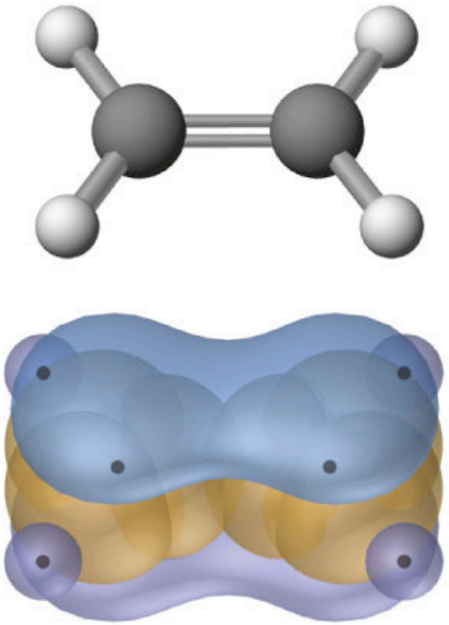
(a) In ethane nearly free rotation can occur around the axis of a single (σ) bond.

Restricted Rotation

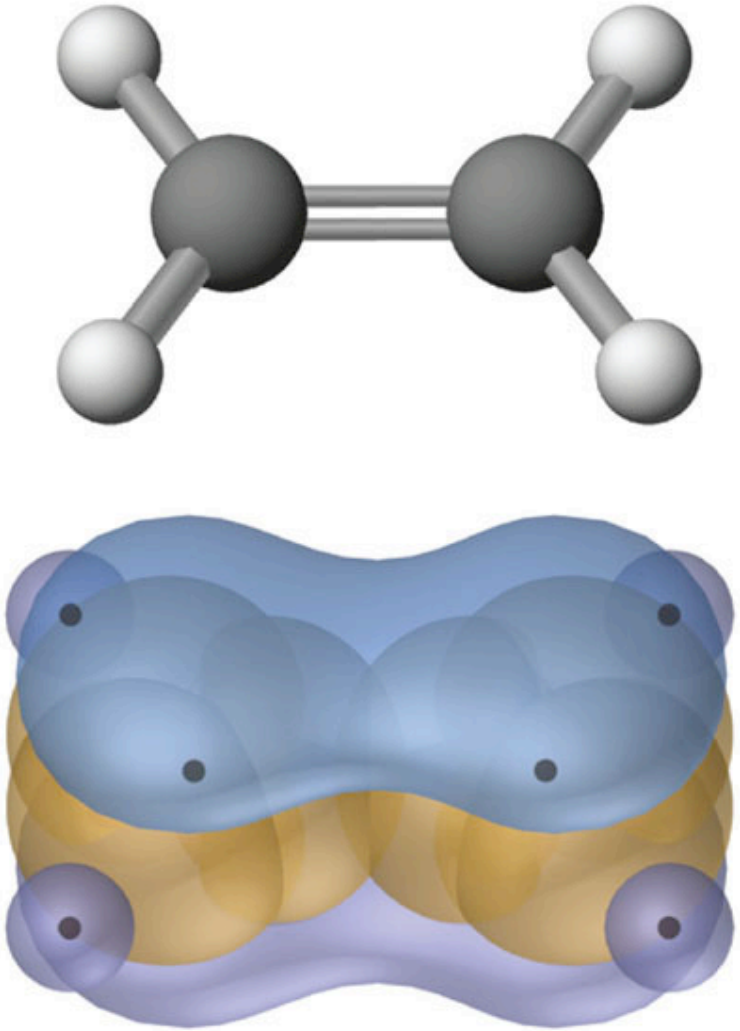
Formation of pi bonds requires good overlap



(a) In ethane nearly free rotation can occur around the axis of a single (σ) bond.



(b) Ethylene rotation is severely restricted around double bonds because doing so would break the π bond, a process generally requiring a great deal of energy.

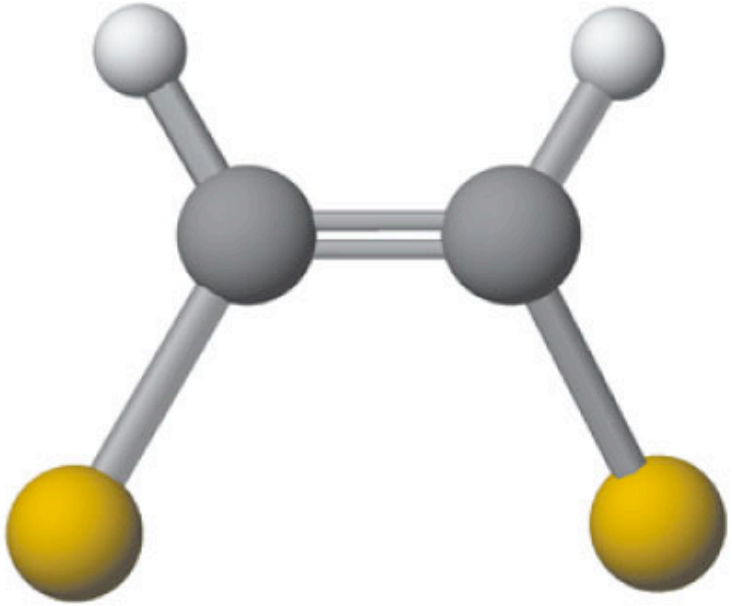


(b) Ethylene rotation is severely restricted around double bonds because doing so would break the π bond, a process generally requiring a great deal of energy.

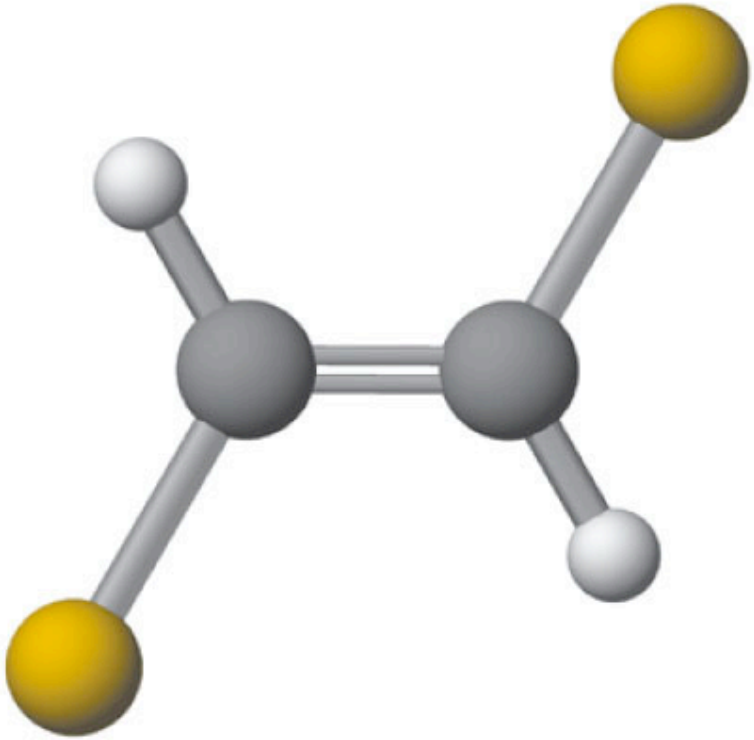
Fig. 9-13, p. 420

Restricted Rotation

cis-trans isomers do not interconvert readily



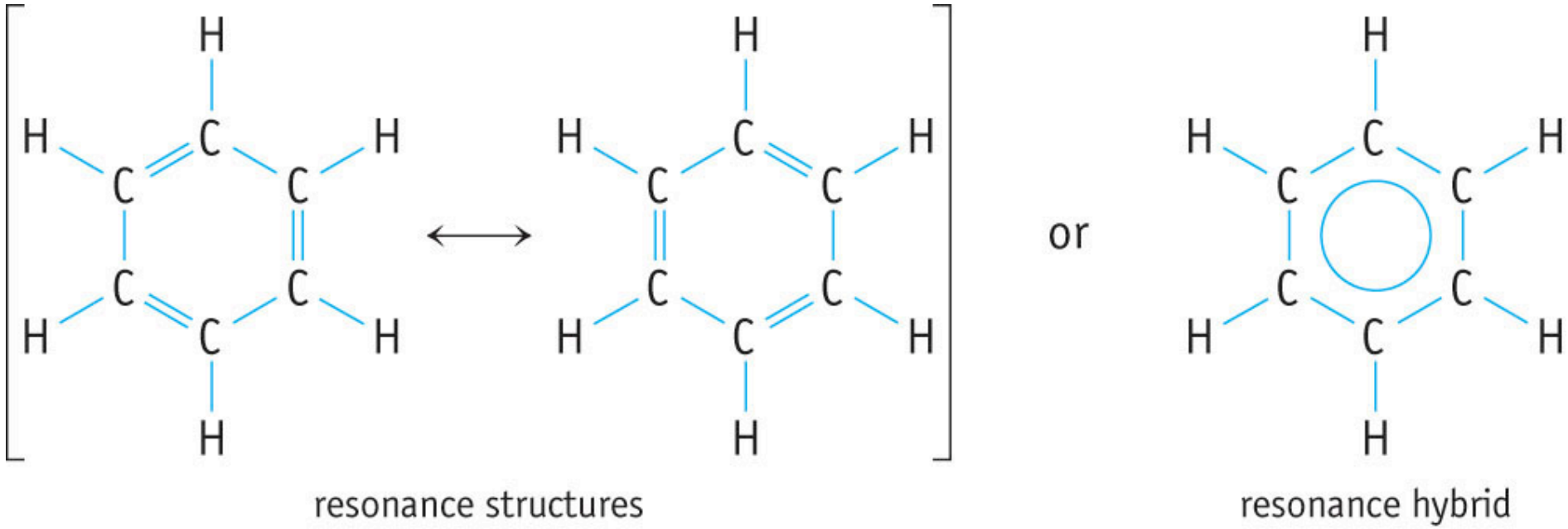
cis-1,2-dichloroethylene



trans-1,2-dichloroethylene

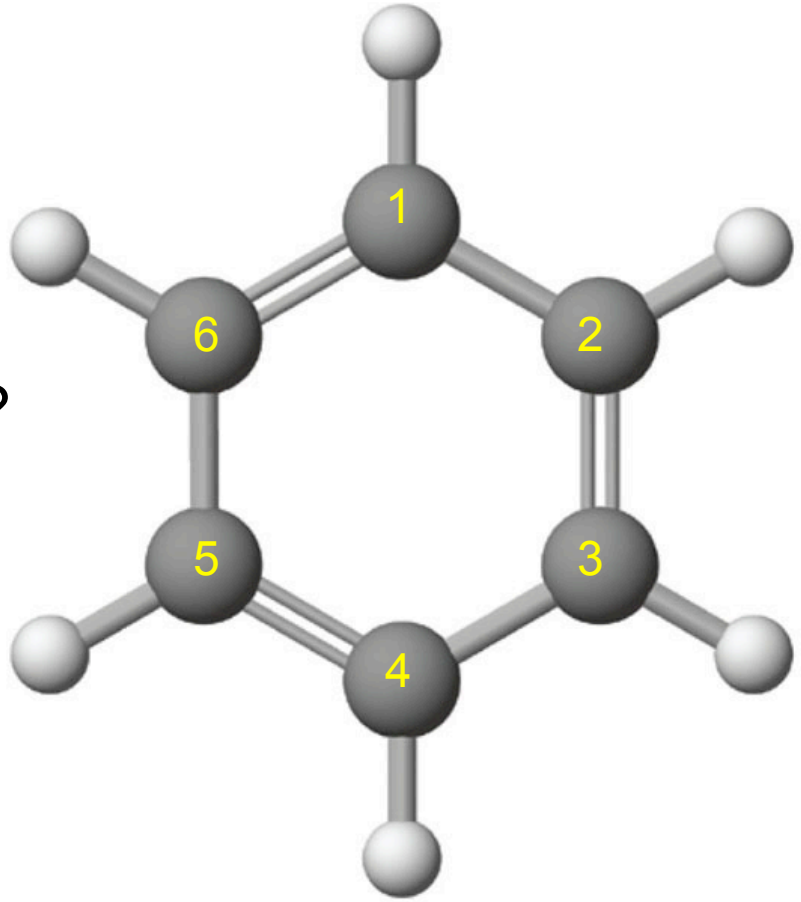
Benzene

Represented by two resonance structures

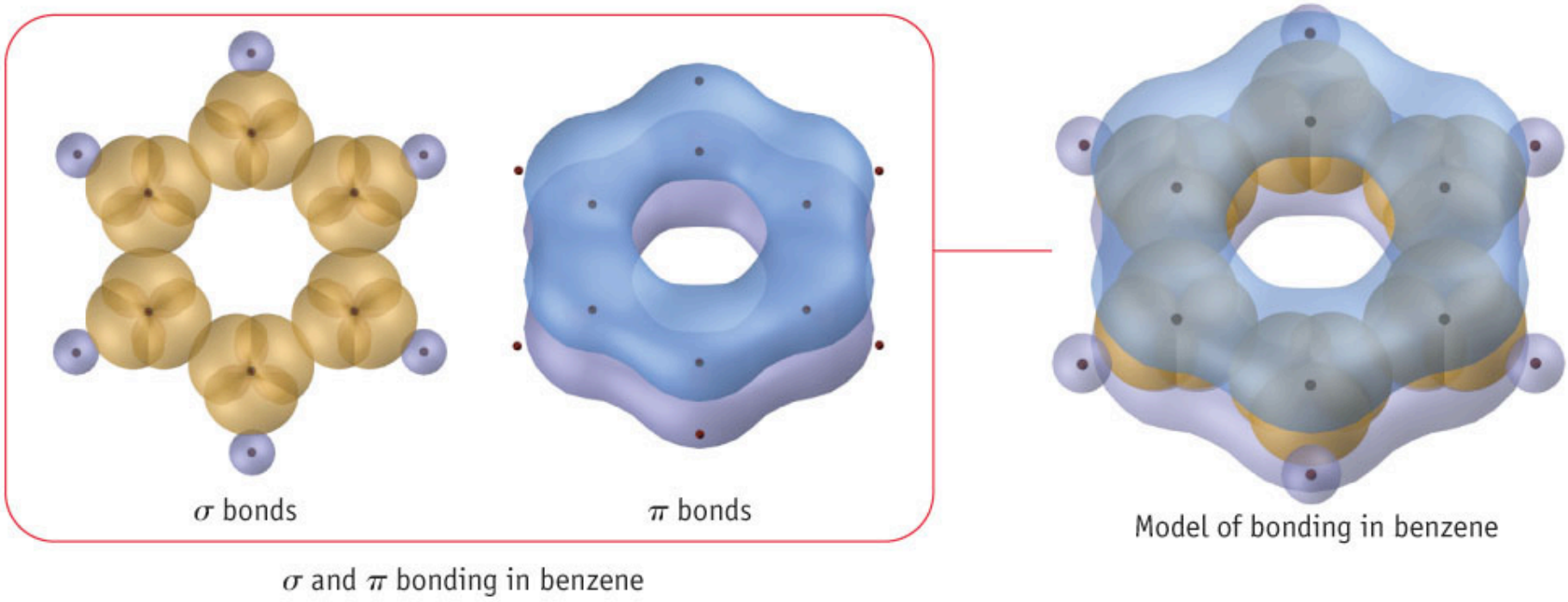


Which centers are sp^2 hybridized?

1) 1, 3, and 5
2) 2, 4, and 6
3) 1, 2, 3, 4, 5, and 6
4) None, they are all sp^3

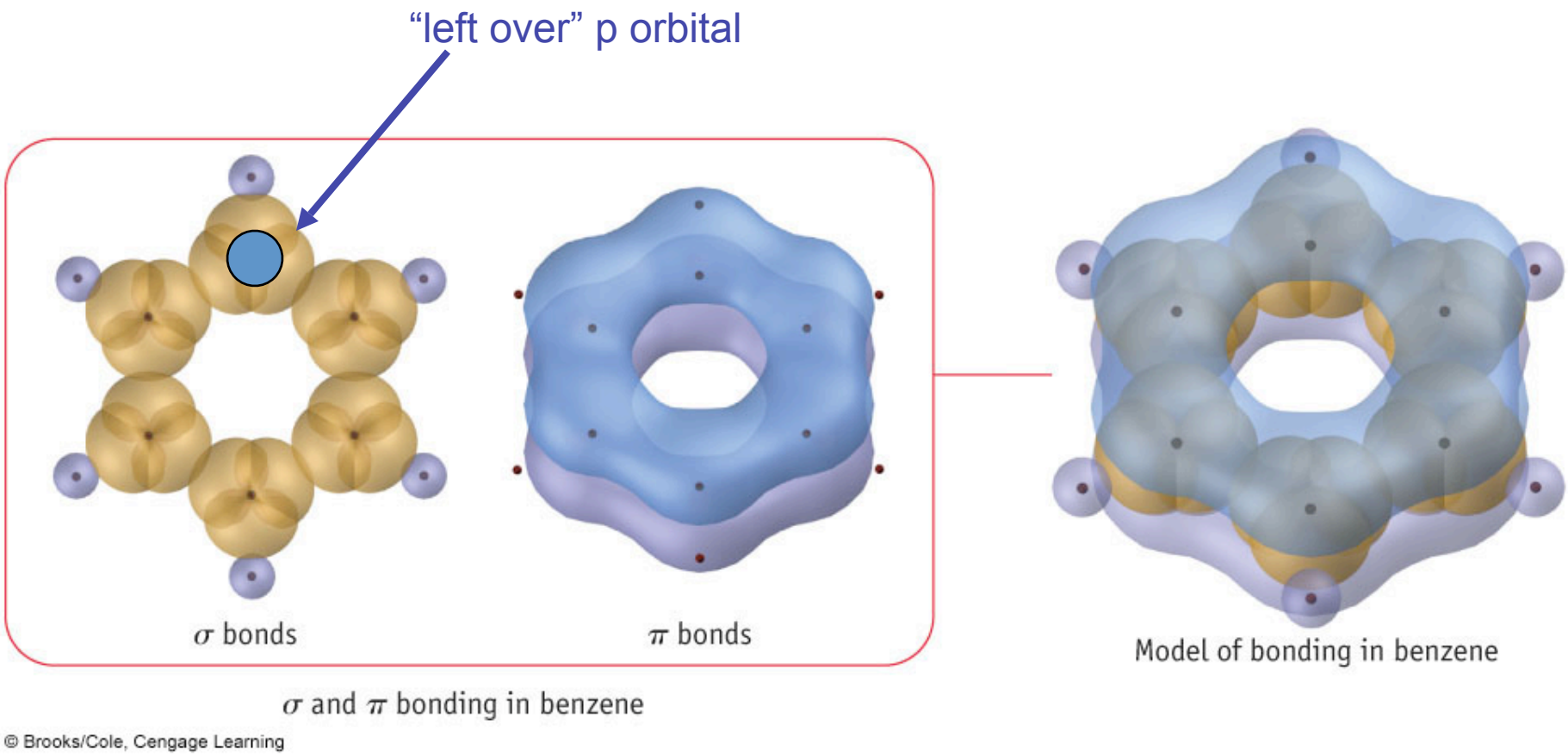


Benzene, C_6H_6



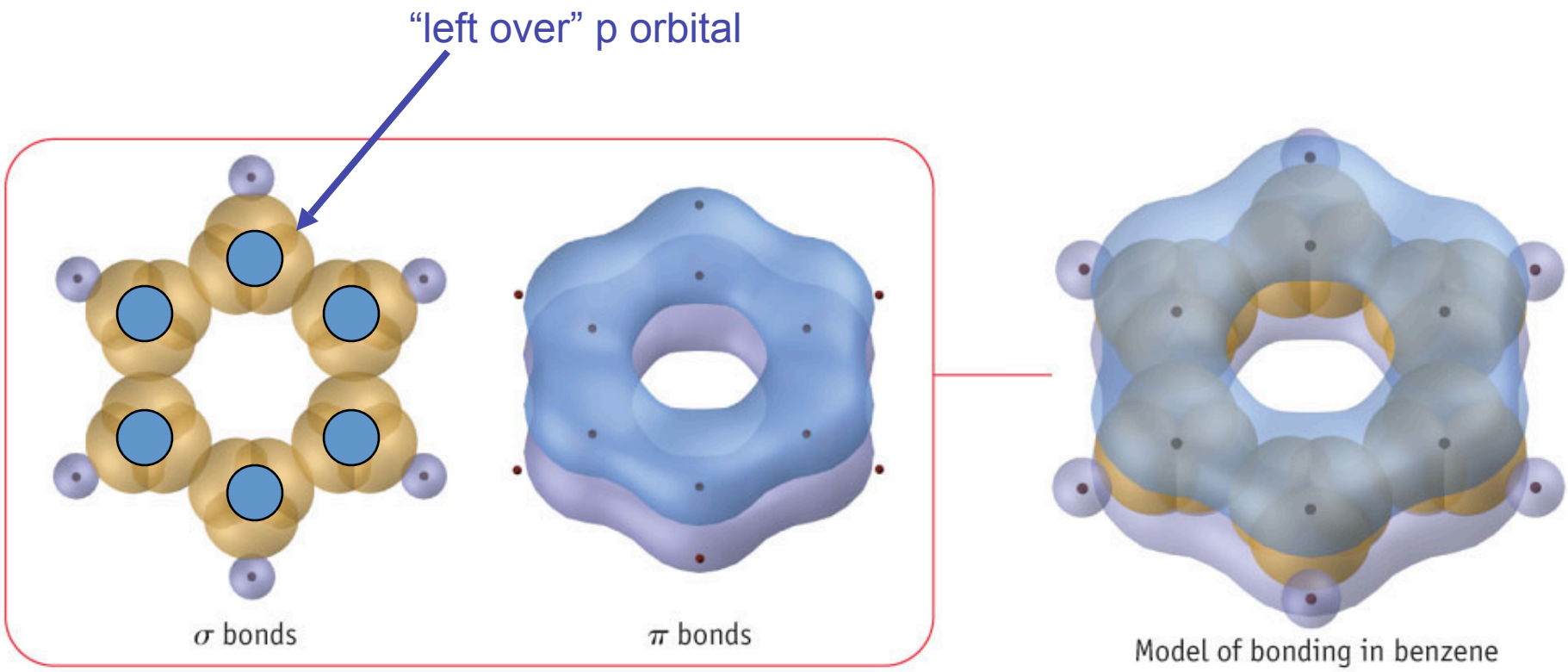
σ and π bonding in benzene

Fig. 9-14, p. 422



σ and π bonding in benzene

Fig. 9-14, p. 422



σ and π bonding in benzene

Fig. 9-14, p. 422