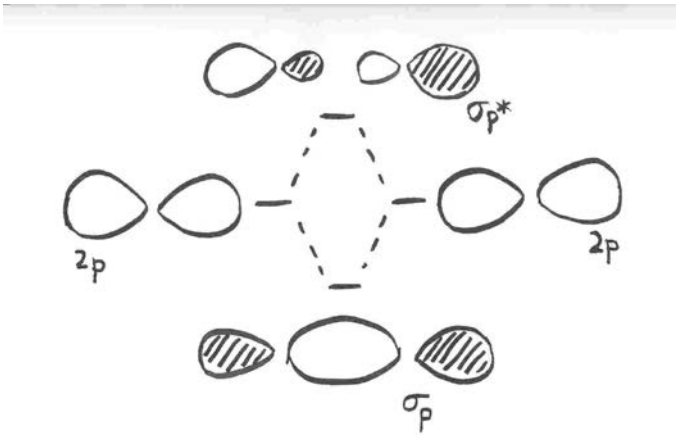
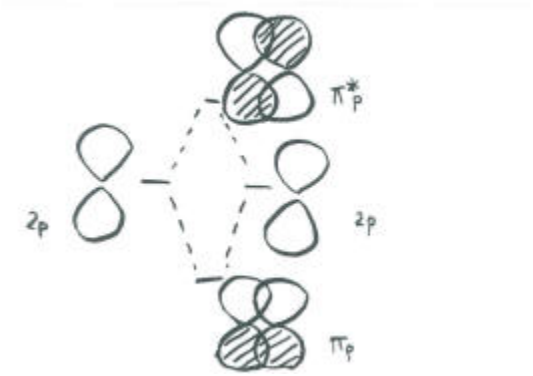
PI BONDING WITH P ORBITALS

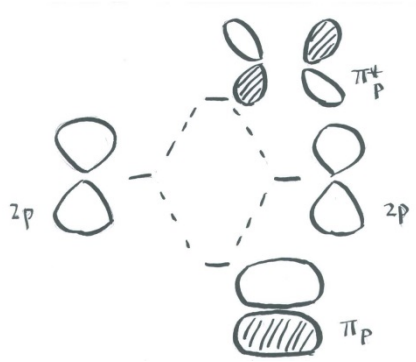
Earlier, we saw that p orbitals that lie along the same axis can interact to form bonds.



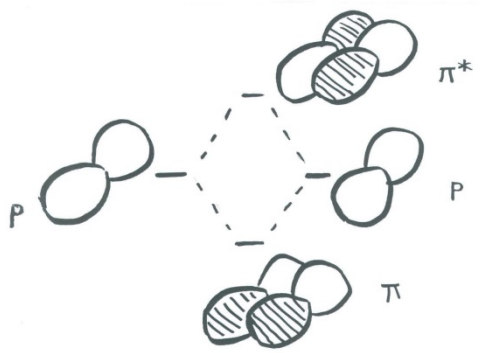
Parallel, but not collinear, p orbitals can also interact with each other. They can be close enough to each other to overlap, although they do not overlap as strongly as rbitals lying along the bond axis..

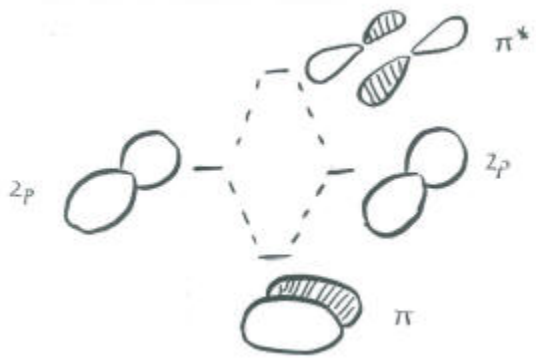
- parallel p orbitals can overlap to produce bonding and antibonding combinations.
- the resulting orbitals contain nodes along the bond axis.
- the electron density is found above and below the bond axis.
- this is called a π (pi) bond.





The illustration above is for one set of p orbitals that are orthogonal to the bond axis. A similar picture could be shown for the other set.

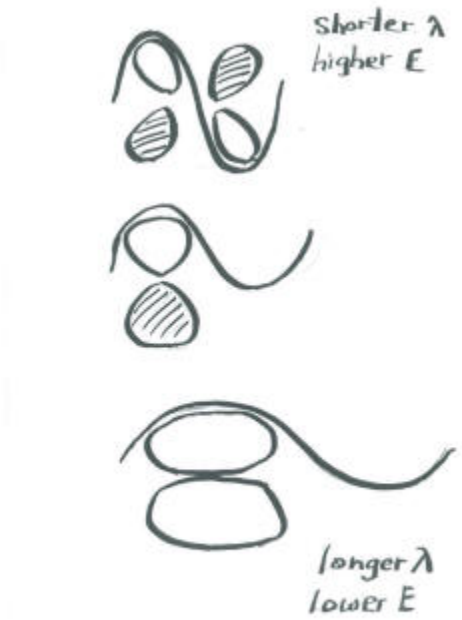




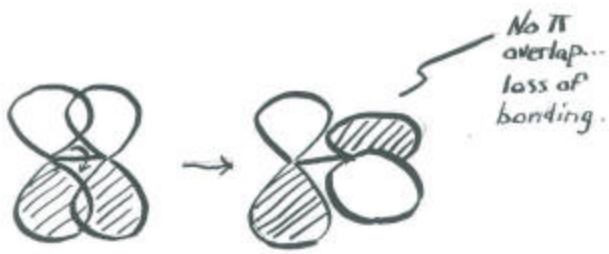
In a main group diatomic species like dinitrogen, one p orbital lying along the bond axis can engage in σ bonding. The two p orbitals orthoganol to the bond axis can engage in π bonding. There will be both bonding and antibonding combinations.

Just as the sigma-bonding orbitals display progressively shorter wavelengths along the bonding axis as they go to higher energy, so do the pi bonding

orbitals. In other words, there are more nodes in the higher-energy orbitals than in the lower-energy ones.



An important consequence of the spatial distribution or "shape" of a π orbital is that it is not symmetric with respect to the bond axis. A σ orbital is not affected when the atom at one end of the bond is rotated with respect to the other. A π orbital is affected by rotation. If one atom turns with respect to the other, the π orbital would have to stretch to maintain the connection. The orbitals would not be able to overlap, so the connection between the atoms would be lost.



Source : http://employees.csbsju.edu/cschaller/Principles%20Chem/mo/moppi.htm