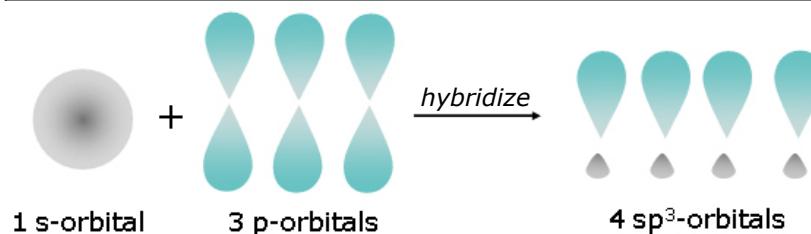
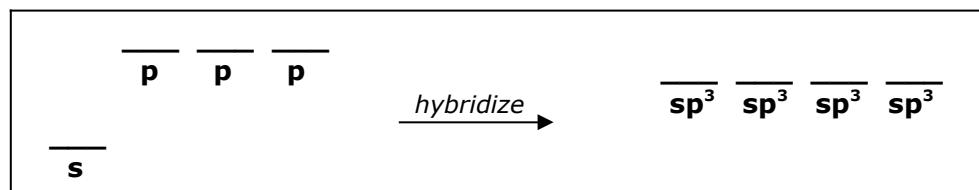


## Valence Bond Theory and Hybrid Atomic Orbitals

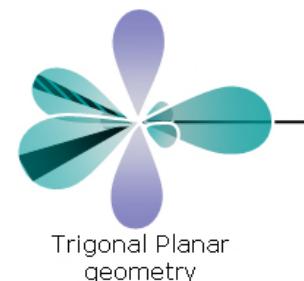
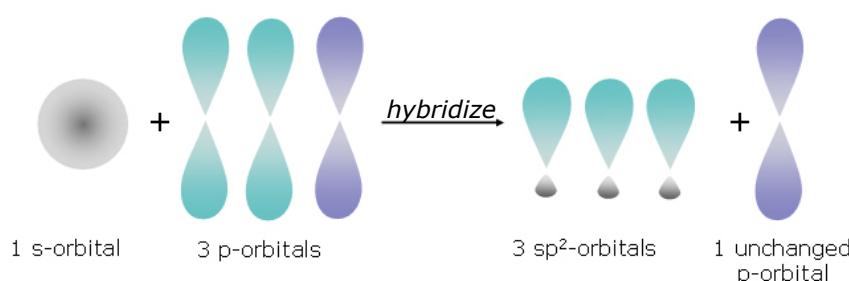
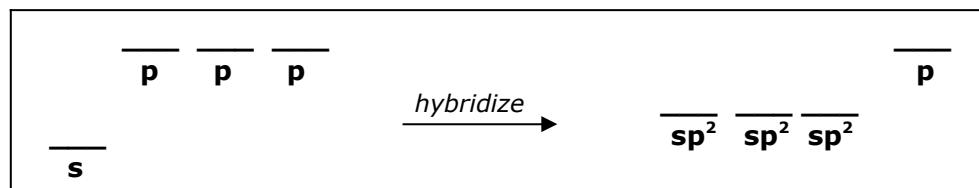
**4 e<sup>-</sup> domains around CBA**

We need four orbitals arranged in a tetrahedral shape (109.5°)



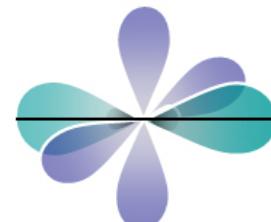
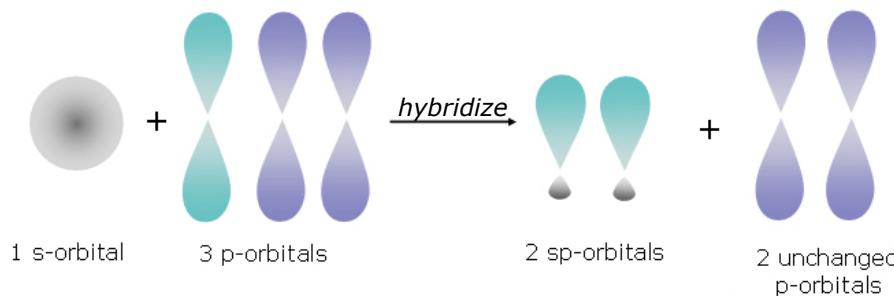
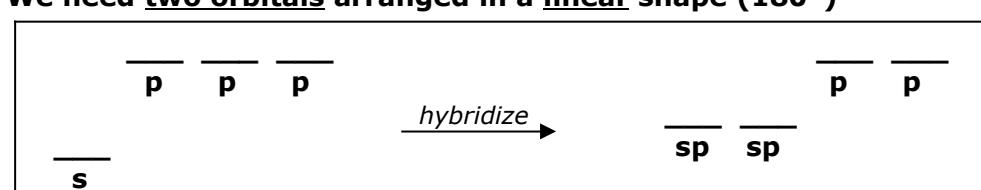
**3 e<sup>-</sup> domains around CBA**

We need three orbitals arranged in a trigonal planar shape (120°)

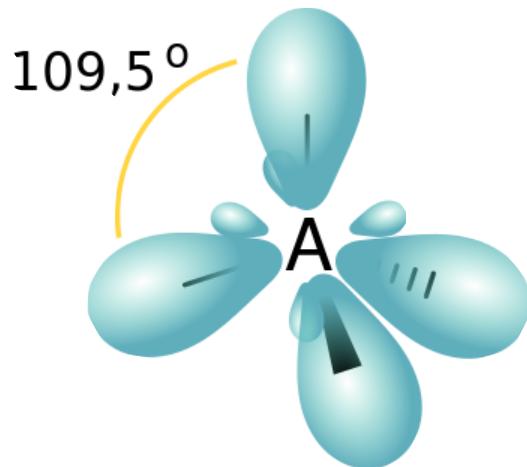


**2 e<sup>-</sup> domains around CBA**

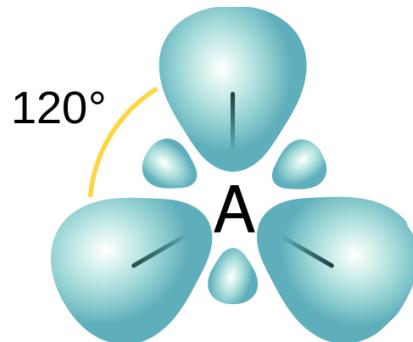
We need two orbitals arranged in a linear shape (180°)



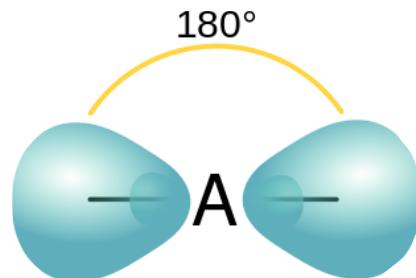
four  $sp^3$  orbitals



three  $sp^2$  orbitals



two  $sp$  orbitals



Practice: use valence bond theory to answer the following questions regarding the bonding in a caffeine molecule.  
(Structure shown at right).

a) What is the hybridization of atom A? \_\_\_\_\_

b) What is the hybridization of atom B? \_\_\_\_\_

c) Describe the bond labeled C in terms of orbital overlap.

