

Ch 334 – Supplementary Problems for Chapter 1 (answers on the back)

1. Make clear drawings of the three-dimensional structures of the following, basing your predictions on the VSEPR rules. Name the geometry created by the atomic nuclei.

- a) O_3 b) H_2CNH c) AsH_3 d) BH_4^- e) NO_3^-

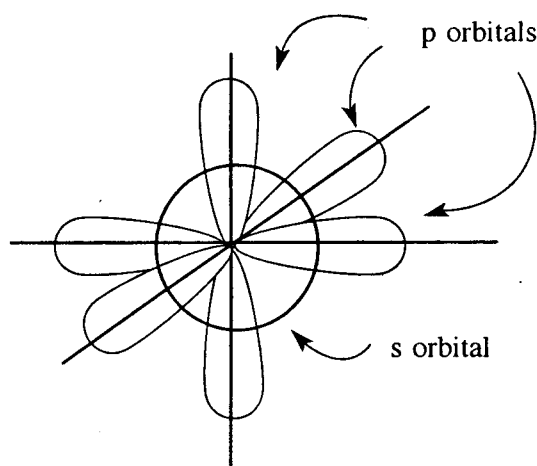
2. Draw two atomic orbital models, of the type demonstrated in lecture, for H_2S . Use

a) non-hybridized sulfur for one model, and b) sp^3 hybridized sulfur. Based on the known bond angle of 92.1° in this molecule, which is the better model?

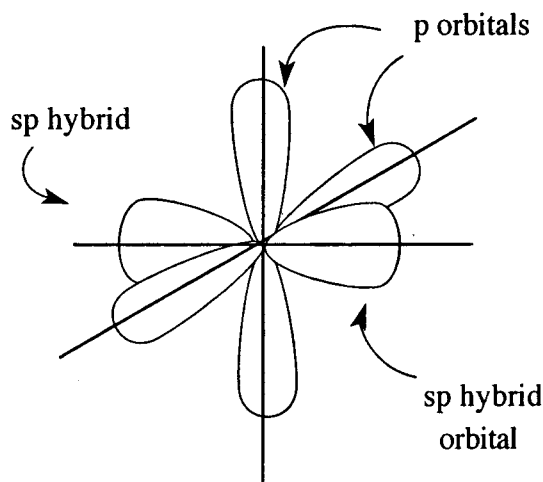
3. Draw atomic orbital models, of the type demonstrated in lecture, for the following. Label the orbitals used, and show all valence electrons, including unshared pairs.

- a) BH_3 b) NH_2Cl c) CH_3OH d) BeI_2 (assume covalent bonds)

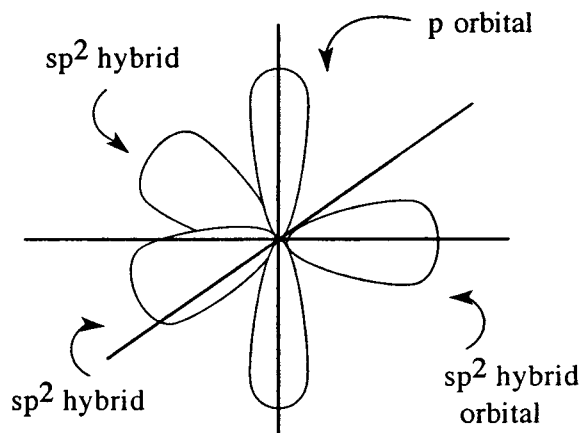
Common hybridization states involving s and p orbitals (the minor lobes of hybridized orbitals are not shown)



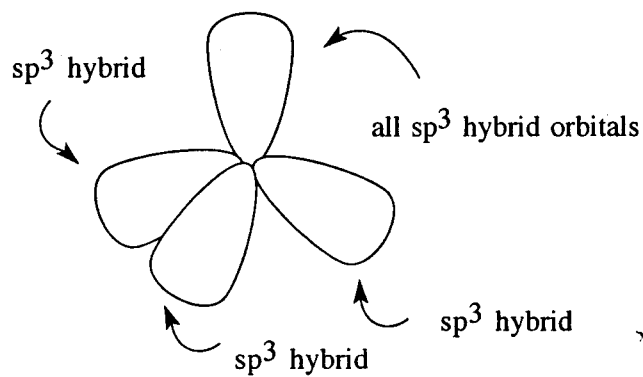
unhybridized atom
(makes 90° bond angles)



atom with sp hybridization
(makes 180° bond angles)

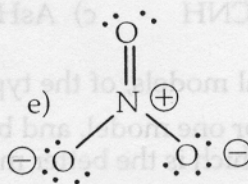
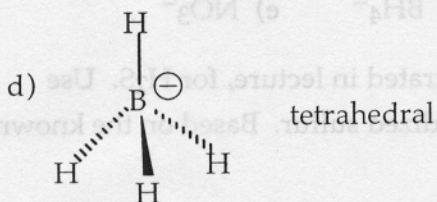
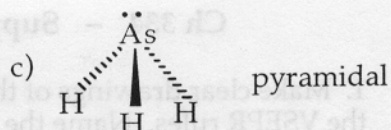
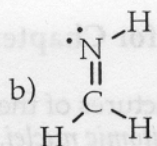
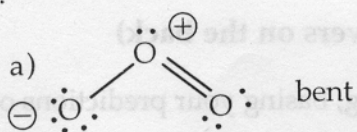


atom with sp^2 hybridization
(makes 120° bond angles)

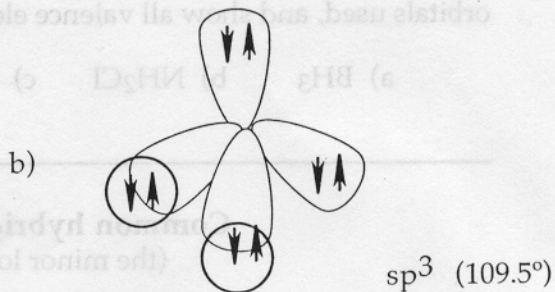
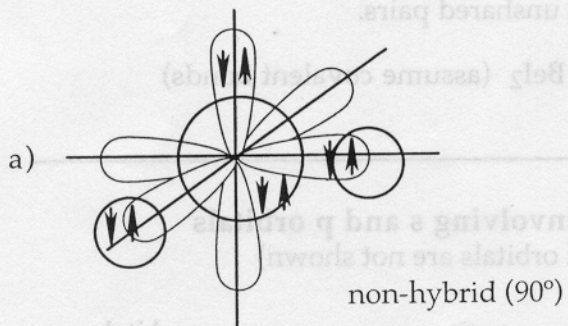


atom with sp^3 hybridization
(makes 109° bond angles)

1.

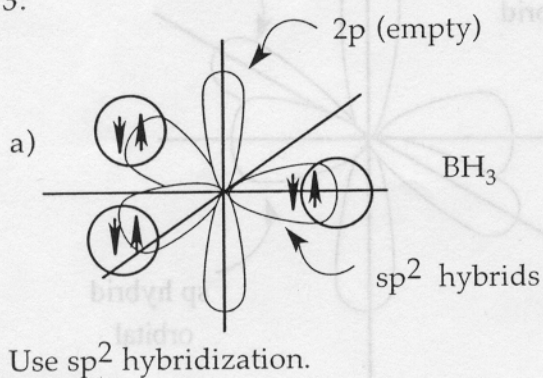


2.

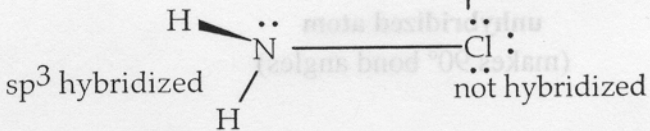
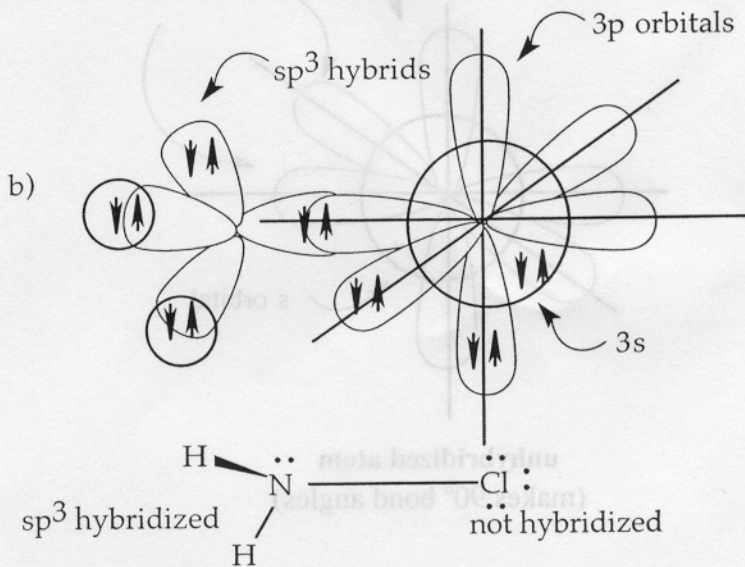


The 92.1° bond angle is better represented using non-hybridized sulfur.

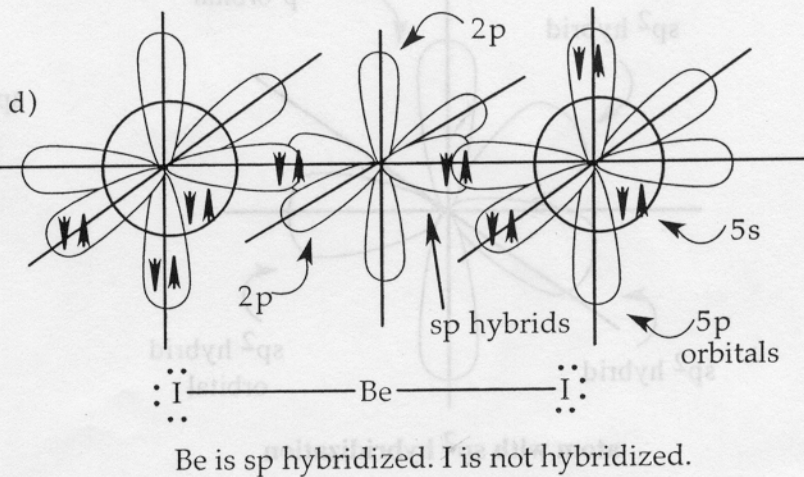
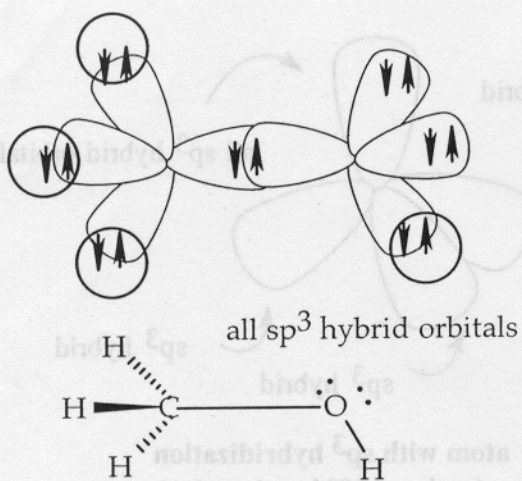
3.



Use sp² hybridization.



c)



Be is sp hybridized. I is not hybridized.