Course 343 Lecturer Sam Gellman

Day Wednesday Date 9-7-16

Notes Taken By Nels Gerstner Total # of Pages 2

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Bonding in organic molecules (Chapter 1)

Recommended problems: 1, 3-9, 11-13, 16-18, 20, 22-26, 30-32, 40, 41, 44, 45

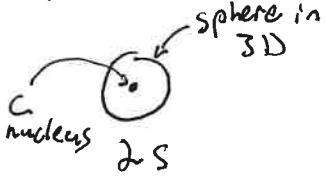
Carbon typically forms 4 bonds ("valence of 4")

Carbon atomic # = 6.

Carbon e^- distribution (ground state)

- $2e^-$'s in 1s orbital
- $4e^-$'s in 2s/2p orbitals ⇐ valence orbitals, these e^-'s form bonds.

Spatial features of valence orbitals



vs.

("Directional" along an axis)

How do we use these atomic orbitals (AOs) to form bonds?

Example 1 = Methane = CH_4

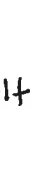
∴ C forms 4 equivalent bonds (C-H bonds)

∴ Must hybridize s and 3x p AOs to form 4 equiv AOs ("Hybrid AOs")

sp^3 (ie, 25% s + 75% p)

Ready for:

H· (x4) + ·Ċ· to form



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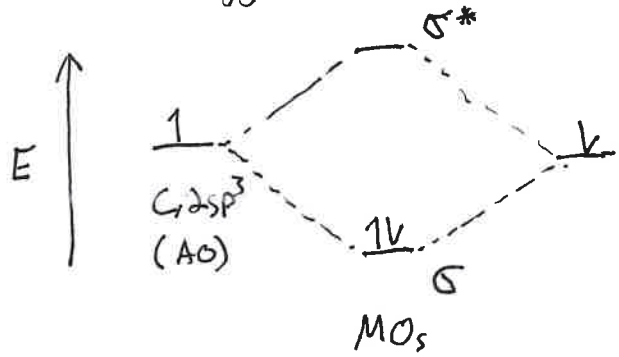
How do the AOs (on C and on H) combine to form bonds? (How do they move AOs to molecular orbitals (MOs)?)

Orbital energy diagram for a C-H bond.

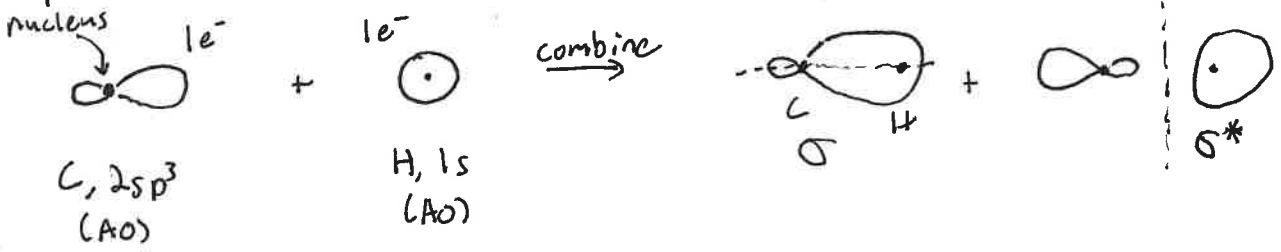


sigma

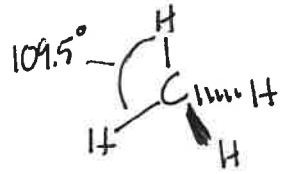
σ = bonding molecular orbital

σ* = antibonding Molecular orbital

Spatial distribution of e⁻'s in C-H bond.



3D structure of CH_4 ⇒ "tetrahedral"



Sp^3 C, in general, is tetrahedral

Example 2 = Ethane = C_2H_6