

Chem 162A

Chapter 14. Covalent Bonding: Orbitals

Hybridization and the LE Model of Bonding

- Lewis structures of molecules
- prediction of geometry of molecules
- hybrid orbitals (sp^3 , sp^2 , sp , dsp^2 , d^2sp^3)
- interpretation of structure and bonding

Molecular Orbital Model of Bonding in Molecules

- molecular orbital diagrams
- bond order
- magnetism

Molecular Spectroscopy

- Electronic Spectroscopy
- Vibrational/Rotational Spectroscopies
- Nuclear Magnetic Resonance (NMR) Spectroscopy

14.1 Hybridization and the LE Model of Bonding

- Atomic bonding involves only valence orbitals
- Methane, CH_4



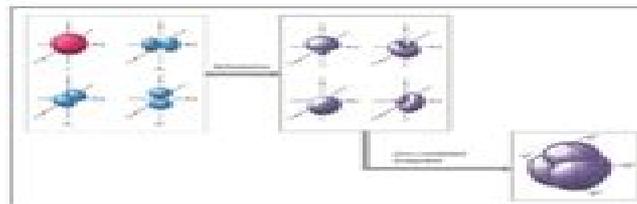
- H atoms in CH_4 will use 1s orbitals
- Of the two types of orbitals (2s and 2p) which will C atoms use for bonding in CH_4 ?
 - If both are used: 2 different types of C-H bonds (Contrary to experimental facts)
 - Neither of the "native" atomic orbitals of C atoms are used; instead, new hybrid orbitals are used.

Hybridization of atomic orbitals

- The mixing of the "native" atomic orbitals to form special orbitals for bonding is called **hybridization**.
- The 4 new **equivalent** orbitals formed by mixing the one 2s and three 2p orbitals are called sp^3 orbitals.
- The carbon atom is said to undergo sp^3 hybridization, i.e. is sp^3 hybridized.
- Energy-level diagram showing the sp^3 hybridization.



Figure 14.3: native 2s and three 2p atomic orbitals characteristic of a free carbon atom are combined to form a new set of four sp^3 orbitals.



General Chemistry 2 Chapter Covalent Bonding Orbitals Study Guide

A Gutmann



General Chemistry 2 Chapter Covalent Bonding Orbitals Study Guide:

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