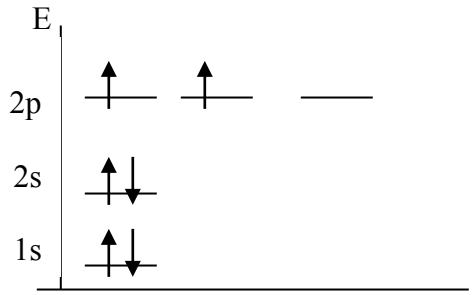
Electronic configuration of carbon (C):

- Atomic number = 6
- Atomic weight = 12

Carbon (C)



- Carbon needs to gain or lose $4e^-$ to get an inert gas configuration, but this would result in unfavourable charge buildup:

- C^{4+} is isoelectronic with He

- C^{4-} is isoelectronic with Ne

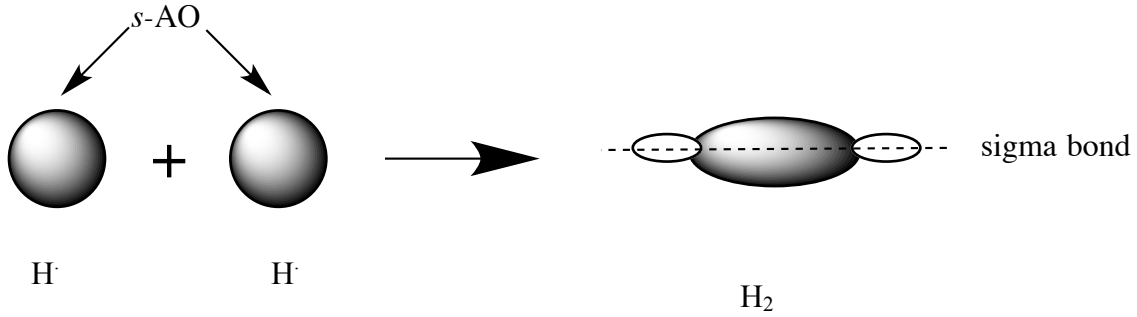
- So, carbon makes up to 4 bonds to <u>share</u> $4e^-$ (covalent bonding)

<u>Energetics of Forming Bonds</u>

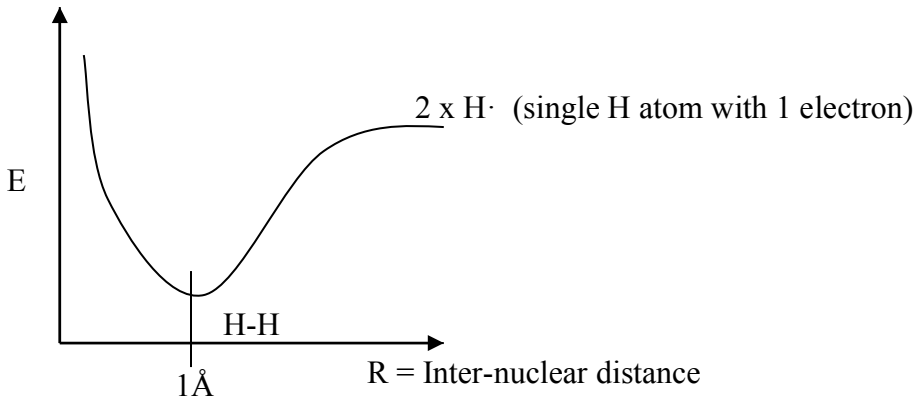
As two hydrogen atoms come together, molecular hydrogen (H_2) is formed

$H^{\cdot} \longrightarrow H{:}H \longleftarrow {}^{\cdot}H$

Orbital representation:

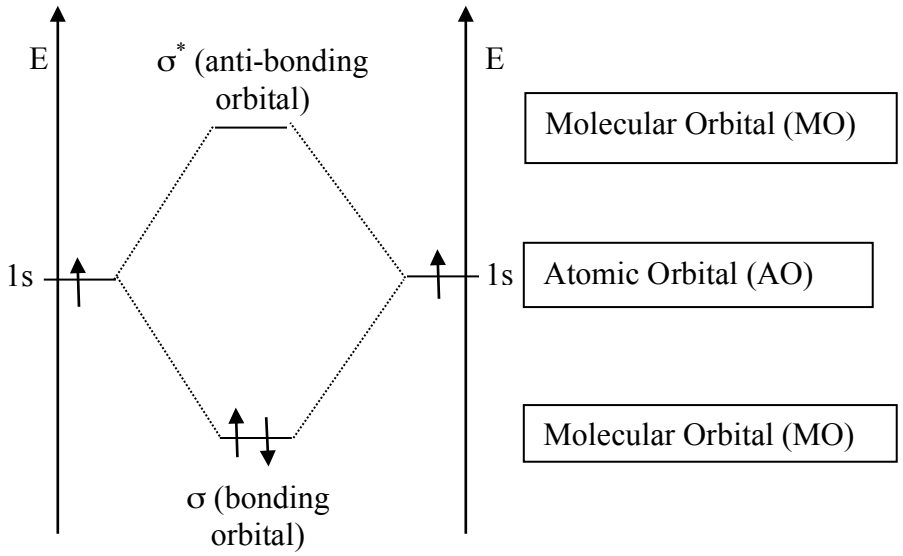


Energy diagram of two hydrogen atoms interacting to form a bond:



1Å is the average H-H bond distance

e.g. H_2

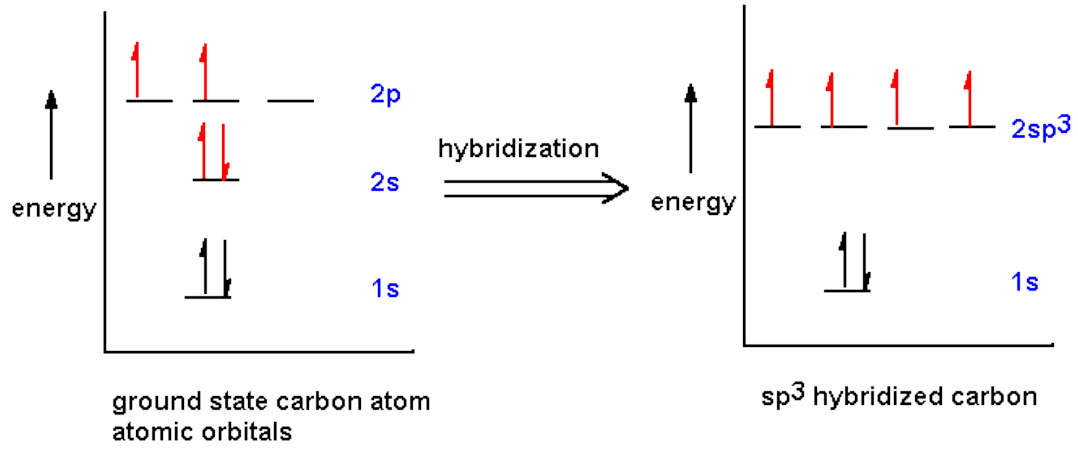


LCAO

- Linear combination of atomic orbitals
- Combination of atomic orbitals of s- character gives molecular orbital called sigma molecular orbital (σ)

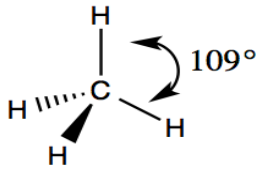
Hybridization:

- Mixing of atomic orbitals (with the wrong geometry for bonding) to form hybrid orbitals with the correct geometry for bonding

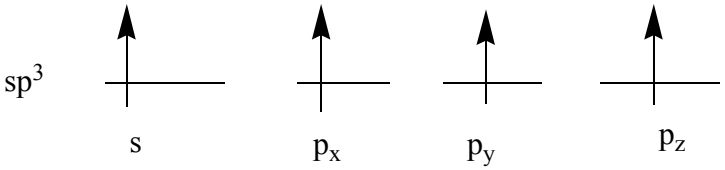


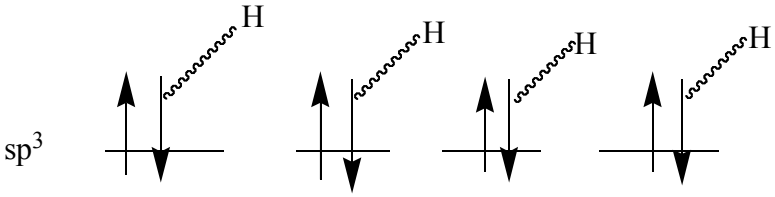
sp^3 Hybridization

- Single bonds
- Tetrahedral geometry
- Angle between two H atoms in methane: 109°, close to that with other elements
- Often free rotation around single bonds
- Overlap of atomic orbitals with s component gives sigma molecular orbital (bond)



CH_4 - Methane





- Each line in a structure represents 2 e^-
- Solid wedge ( ): Toward you / out of the page
- Dashed wedge ( ): Away from you / into the page