Lecture 10

Stern - Gerlach:

→ Intrinsic Magnetic Moment :— Spin.

→ An additional quantisation : spin = $\pm \frac{1}{2}$

Why Silver was chosen?: Ag : $4s^1$

↳ zero orbital magnetum $l = 0$

↳ has intrinsic magnetic momentum.

* Electrons pair up such that spins are opposite.

→ All paired electrons do not contribute to deflection.

→ Deflection of Ag atom due to uncompensated force on unpaired $4s^1$ electron.

↳ Leads to Pauli's Exclusion principle:

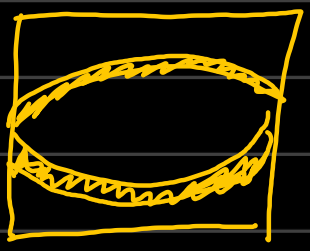
↳ Only two fermions { half integer spin quantization }

↳ No two fermions can have all quantum no to be exactly same.

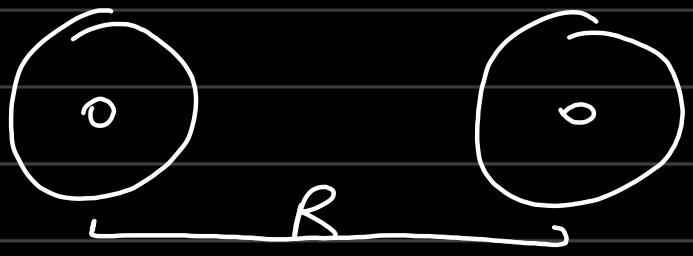
☆ Total no. of spin states = $\underline{\underline{2S+1}}$

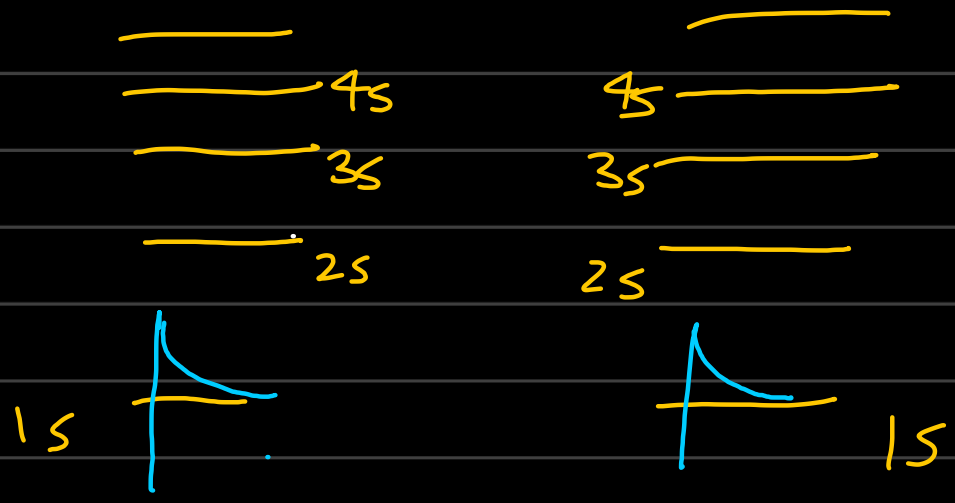
☆ Stern-Gerlach experiment:

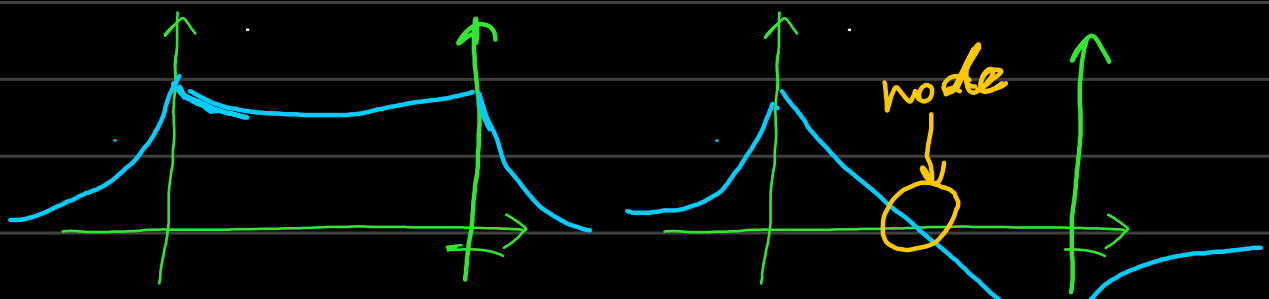
→ discreteness of magnet.



→ In Solids:







Bonding Orbital

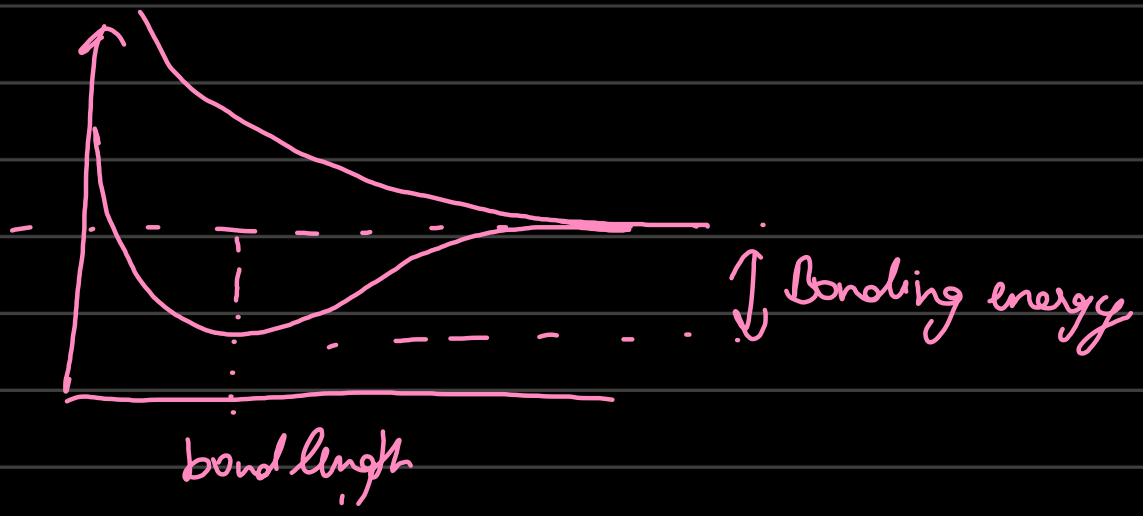
Anti-Bonding Orbital

Linear Combination of Atomic Orbitals: (LCAO)

$$\psi = \psi_{1s}(A) + \psi_{1s}(B)$$

$$\psi = \psi_{1s}(A) - \psi_{1s}(B)$$

$E_{bonding} < E_{anti-bonding}$



H_2 $\qquad$ He_2

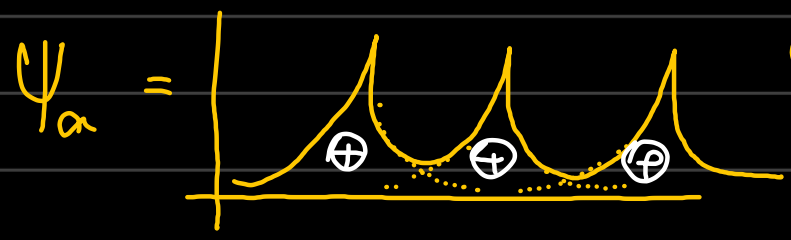
$E_{bond} + E_{anti} > E_{seperate}$

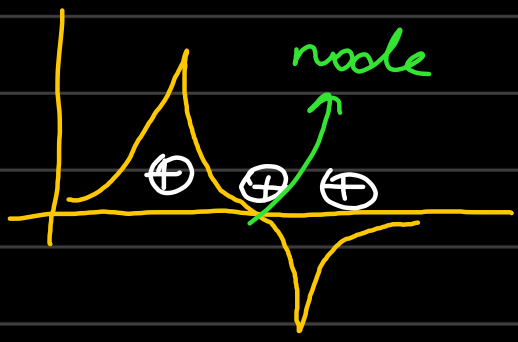
→ 3 hydrogen atoms:

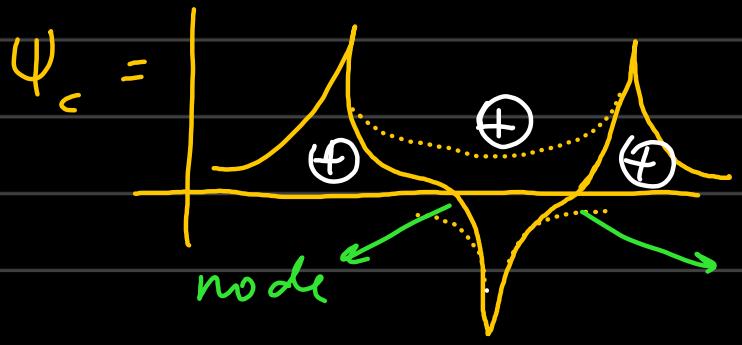
$\psi_a = \psi_{1s}(A) + \psi_{1s}(B) + \psi_{1s}(C)$

$\psi_b = \psi_{1s}(A) - \psi_{1s}(C)$

$\psi_c = \psi_{1s}(A) - \psi_{1s}(B) + \psi_{1s}(C)$







$E_c > E_b > E_a$

N atoms of Lithium: