Doubt Clearing Session

Course on General Organic Chemistry for Class XI

SURENDRA K MISHRA • Lesson 4 • Aug 10, 2021

Viva :-

(1) AlO_2 (-I)

(2) $-CH_2-CH_2-CH_3$ (+I)

(3) $-CH=CH-CH_3$ (-I)

(4) $-C\equiv C-CH_3$ (-I)

(5) $-CH_3$ (-I)

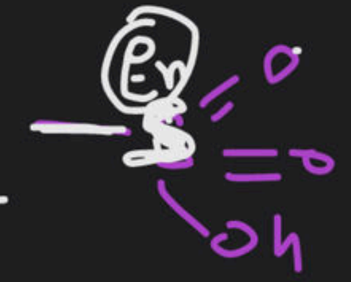
(6) $-ND_2$

(7) $-O-\overset{O}{\overset{\|}{C}}-CH_3$ (-I)

(8) $-NH-\overset{O}{\overset{\|}{C}}-CH_3$ (-I)

(9) $-O-N=O$ (-I)

(10) $-O-Al(=O)_2$ (-I)

(11)  (-I)

(12) $-\overset{O}{\overset{\|}{S}}-OH$ (-I)

(13) $-N(Me)_2$ (-I)

(14) $-N=O$ (-I)

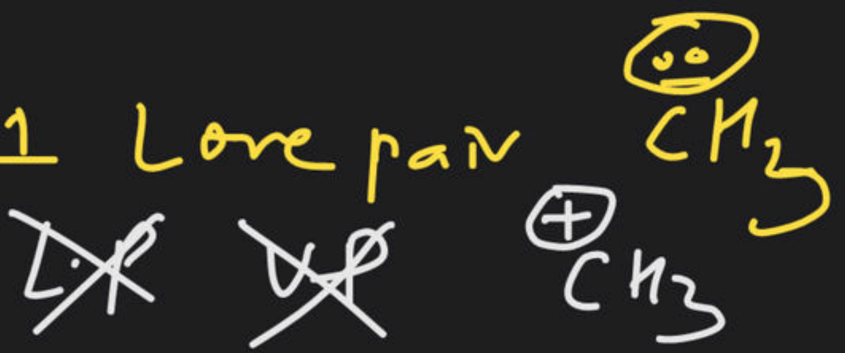
(15) $-\ddot{N}H^{\ominus}$ (+I)

(#) Heterolytic fission $\Longrightarrow$ Polar

(#) Homolytic fission $\Longrightarrow$ Non polar

(#) $A-B$ (heterolytic fission) $\Rightarrow$ $E_B^- > E_A^-$

(#) Intermidiate 1 Lone pair

(#) ——— 

HW (Discussion)

+ I Series

(1) $-F > -Cl > -Br > -I$

(2) $-CF_3 > -CH_3 > -CBr_3 > -CI_3$

(3) $-CH_2-CH_3 > -CH_3 > -H$

(4) $-CH_2-CH_2-CH_3 > -CH_2-CH_2-H$

(5) $-T > -D > -H$

(6) $-CT_3 > -CD_3 > -CH_3$

(7) $-CD_3 > -CD_2H > -CDH_2 > -CH_3$

(8) $1 > 2 > 3$

$-I \cdots > H > D > T > CH_3 > -CH_2-CH_3$

Hybridisation

sp^3 hybridisation

Ex: methane CH_4 contains

(a) All C—H Bond of same length

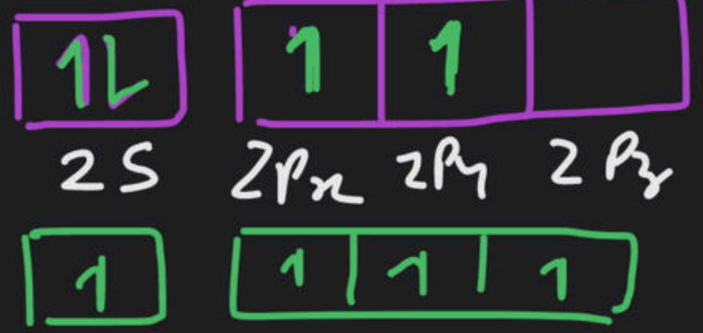
(b) All C—H Bond of same Bond Energy

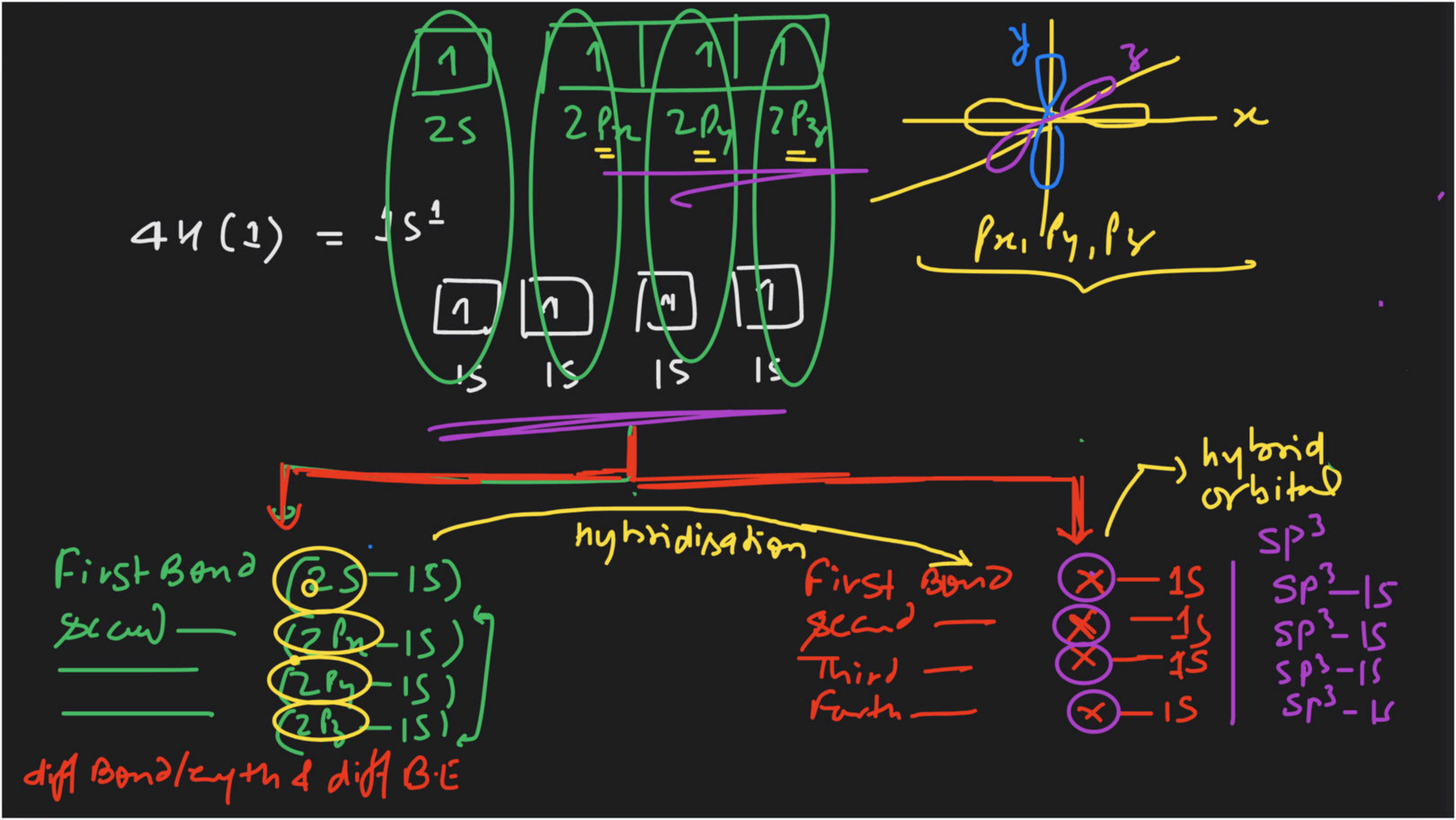
Explain above observation

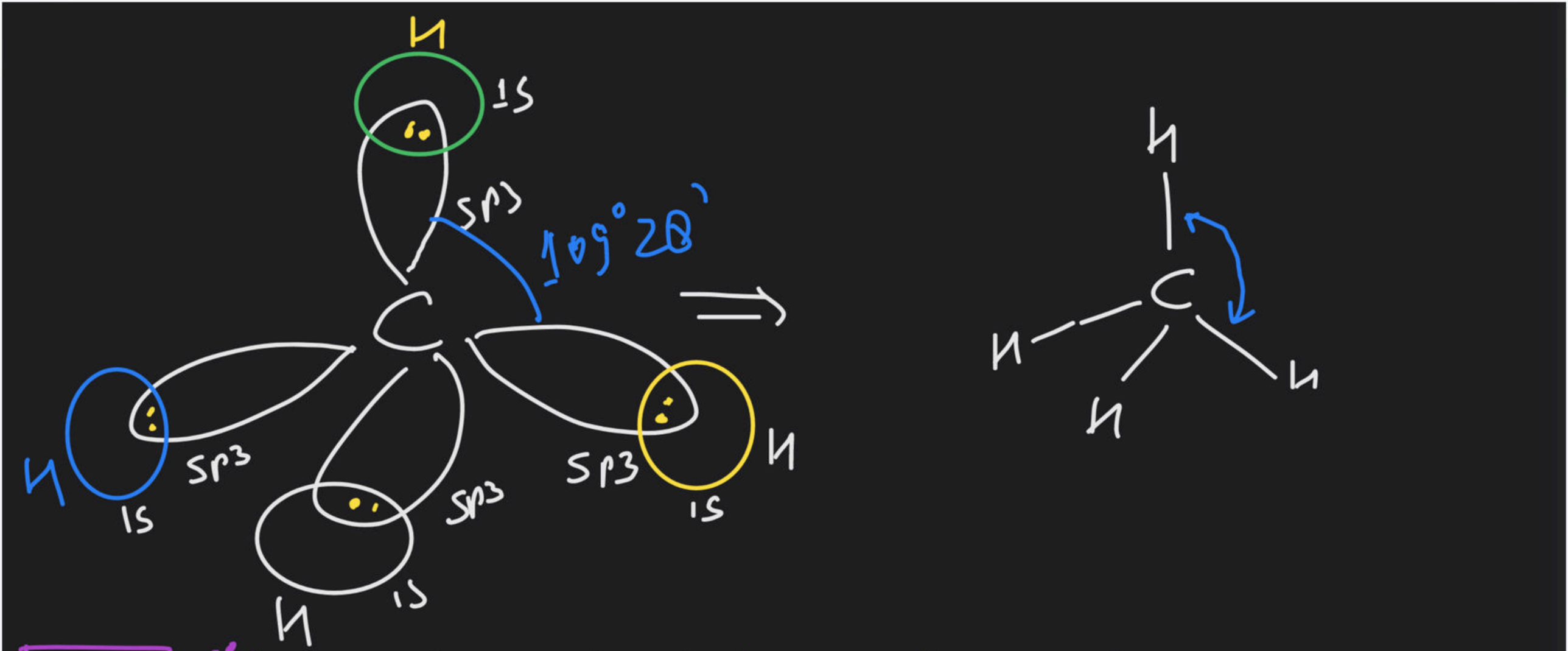
$CH_4 \Rightarrow$ $C(6) = 1s^2 | 2s^2\ 2p^2$

Ground state

Excited state



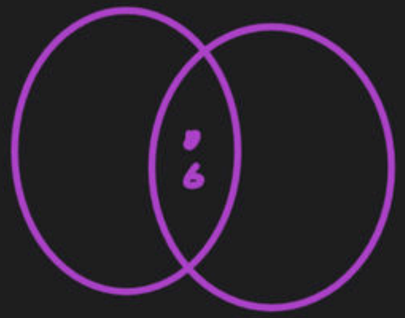

4H(1) = 1s¹
2s
2Px
2Py
2Pz
1s
y
z
x
Px, Py, Pz
hybridisation
hybrid orbital
First Bond
Second —
Third —
Fourth —
(2s — 1s)
(2Px — 1s)
(2Py — 1s)
(2Pz — 1s)
diff Bond/Length & diff B.E
sp³
sp³ — 1s
sp³ — 1s
sp³ — 1s
sp³ — 1s



Note (i) Hybrid orbitals (sp^3, sp^2, sp) are always involved in σ Bond formation

(ii) Unhybrid orbitals (P_y, P_z) are always involved in π Bond formation

(iii) head to head overlapping involved in σ Bond
(sideways overlapping)

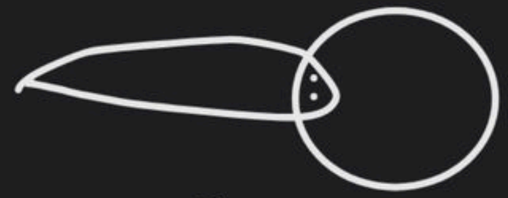


σ - Bond

$sp^3 - sp^3$

or $sp^2 - sp^2$
or $sp - sp$

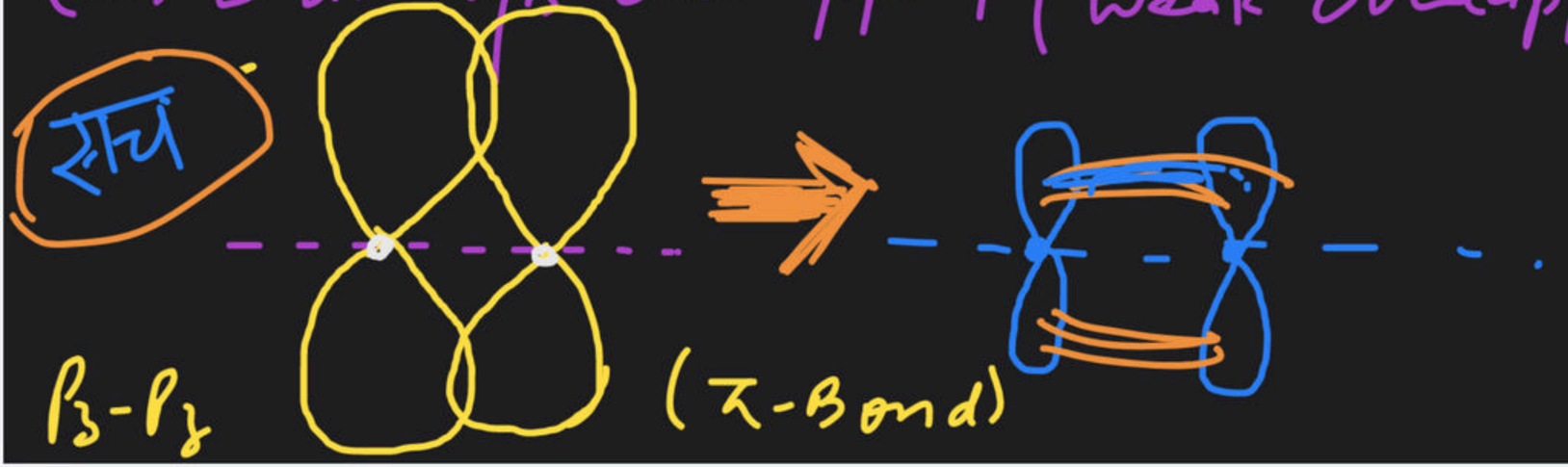
(σ - Bond)



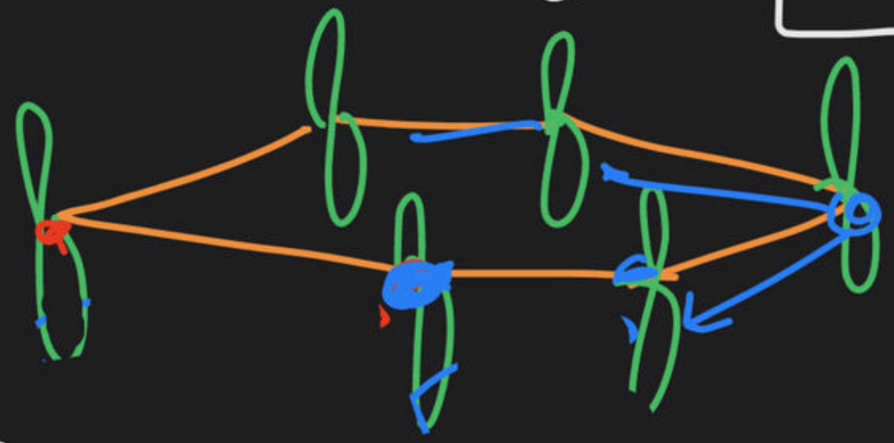
sp^3 — 1S
or sp^2 — 1S
or sp — 1S

(σ - Bond)

(iv) Sideways overlapping (weak overlapping) involved in π Bond



⇒ If atom contains sp^i hybridisation then Bond angle $\boxed{\cos\alpha = -\frac{1}{i}}$



sp^3 (S) p^3

sp^4 sp^5

Ex: For $sp^3 \Rightarrow i=3 \Rightarrow \cos\alpha = -\frac{1}{3} \Rightarrow \boxed{\alpha = 109^\circ 28'}$

For $sp^2 \Rightarrow i=2 \Rightarrow \cos\alpha = -\frac{1}{2} \Rightarrow \boxed{\alpha = 120^\circ}$

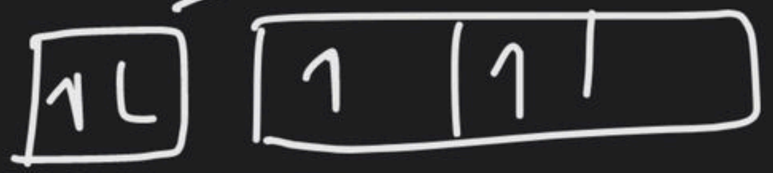
For $sp \Rightarrow i=1 \Rightarrow \cos\alpha = -1 \Rightarrow \boxed{\alpha = 180^\circ}$

For H_2N $\alpha = 107^\circ \Rightarrow \cos 107^\circ = -\frac{1}{i} \Rightarrow i =$

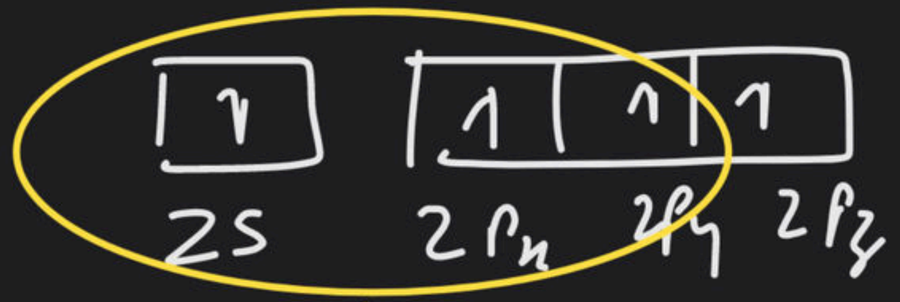
For H_2O $\alpha = 105^\circ \Rightarrow \cos 105^\circ = -\frac{1}{i} \Rightarrow i = 4 \Rightarrow sp^4$ $(S/p) = \frac{1}{4}$

(#) sp^2 Hybridisation :

$C(G) = 1s^2 | 2s^2 \; 2p^2$



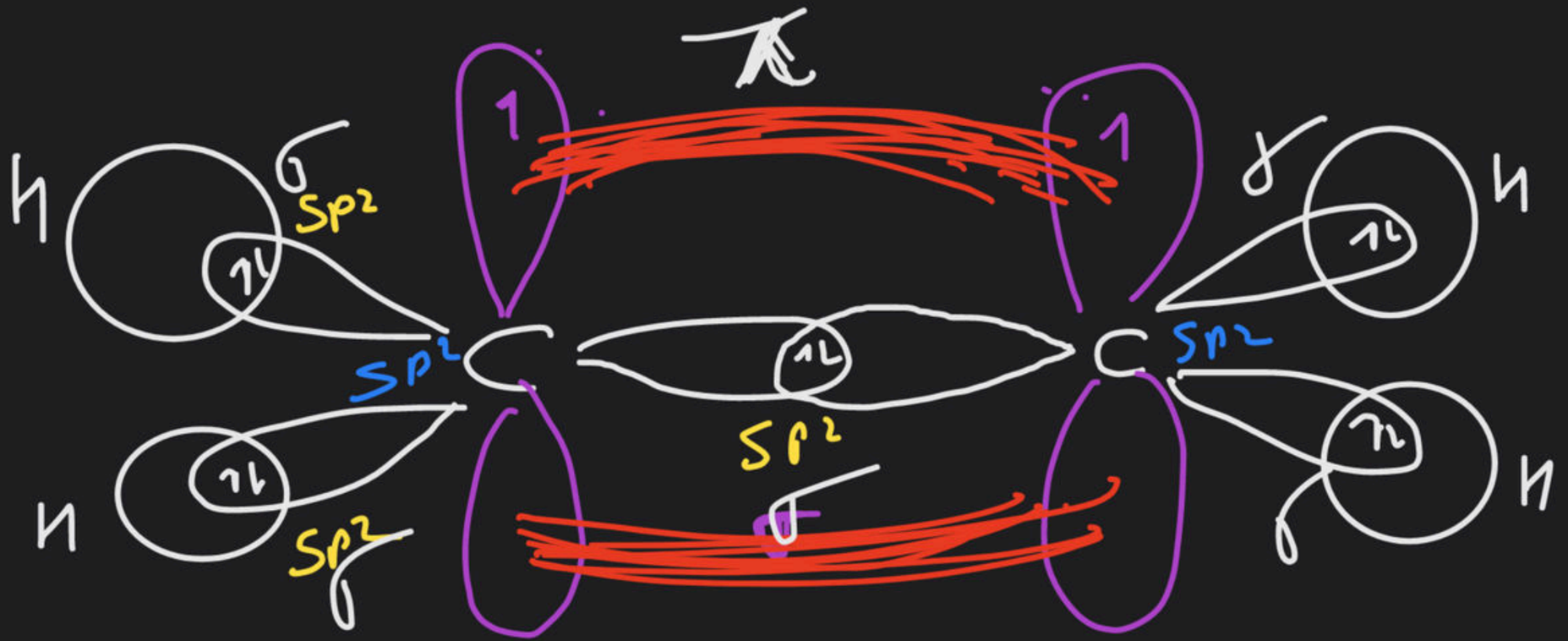
Excited state



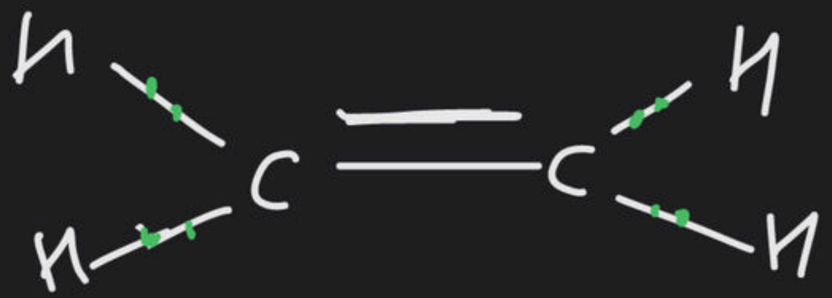
sp^2 sp^2 sp^2 p_z

$(\sigma \quad \sigma \quad \sigma \quad \pi)$

$BA = 120^\circ$



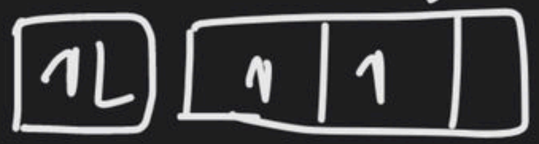
(5 σ
1 π)



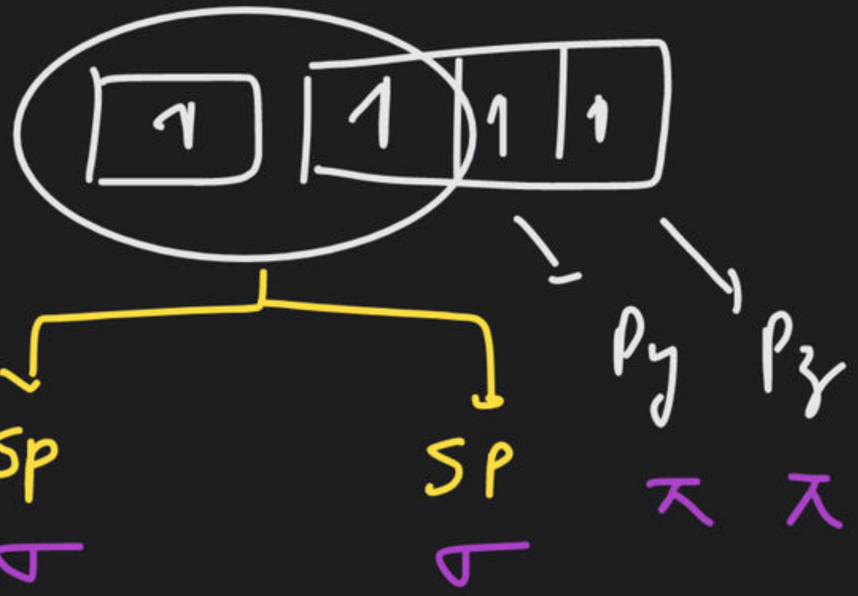
(Ethene)

Sp Hybridisation

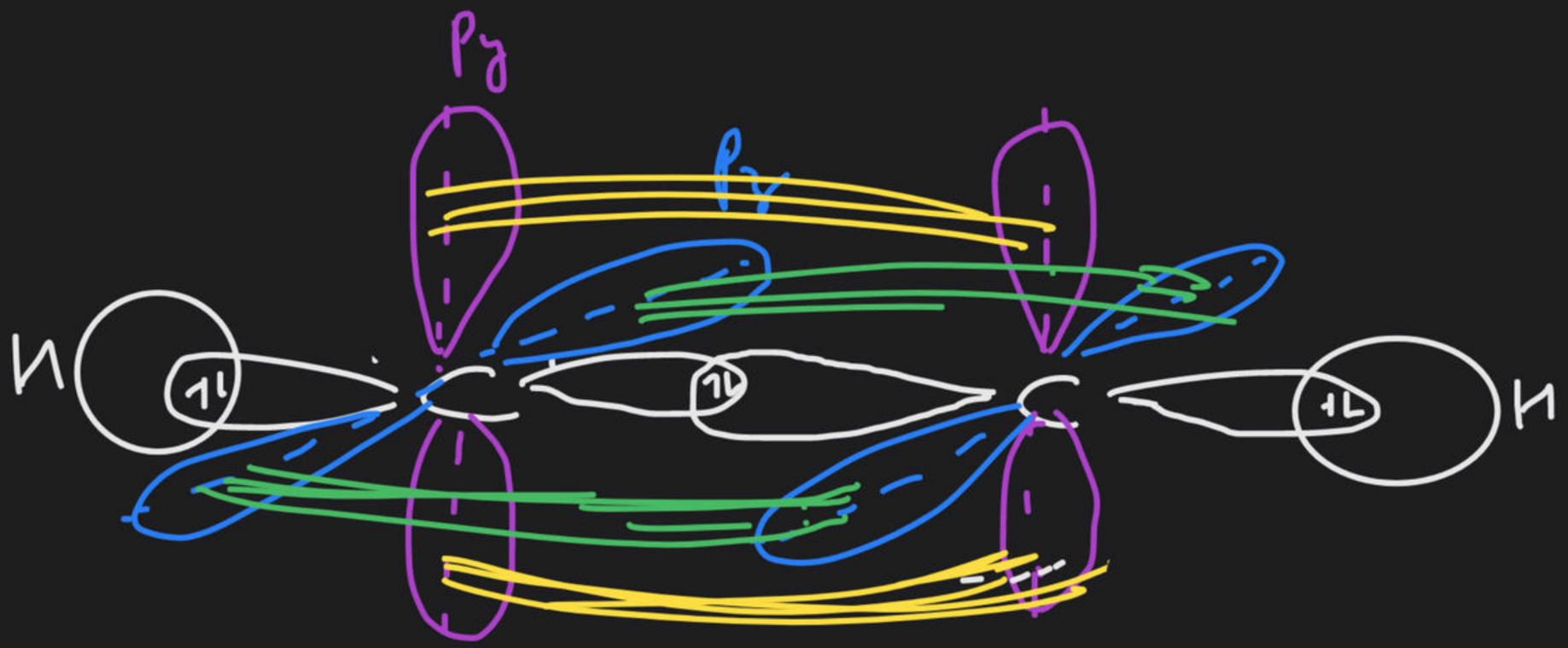
$C(6) = 1s^2 | 2s^2\ 2p^2$



Excited state

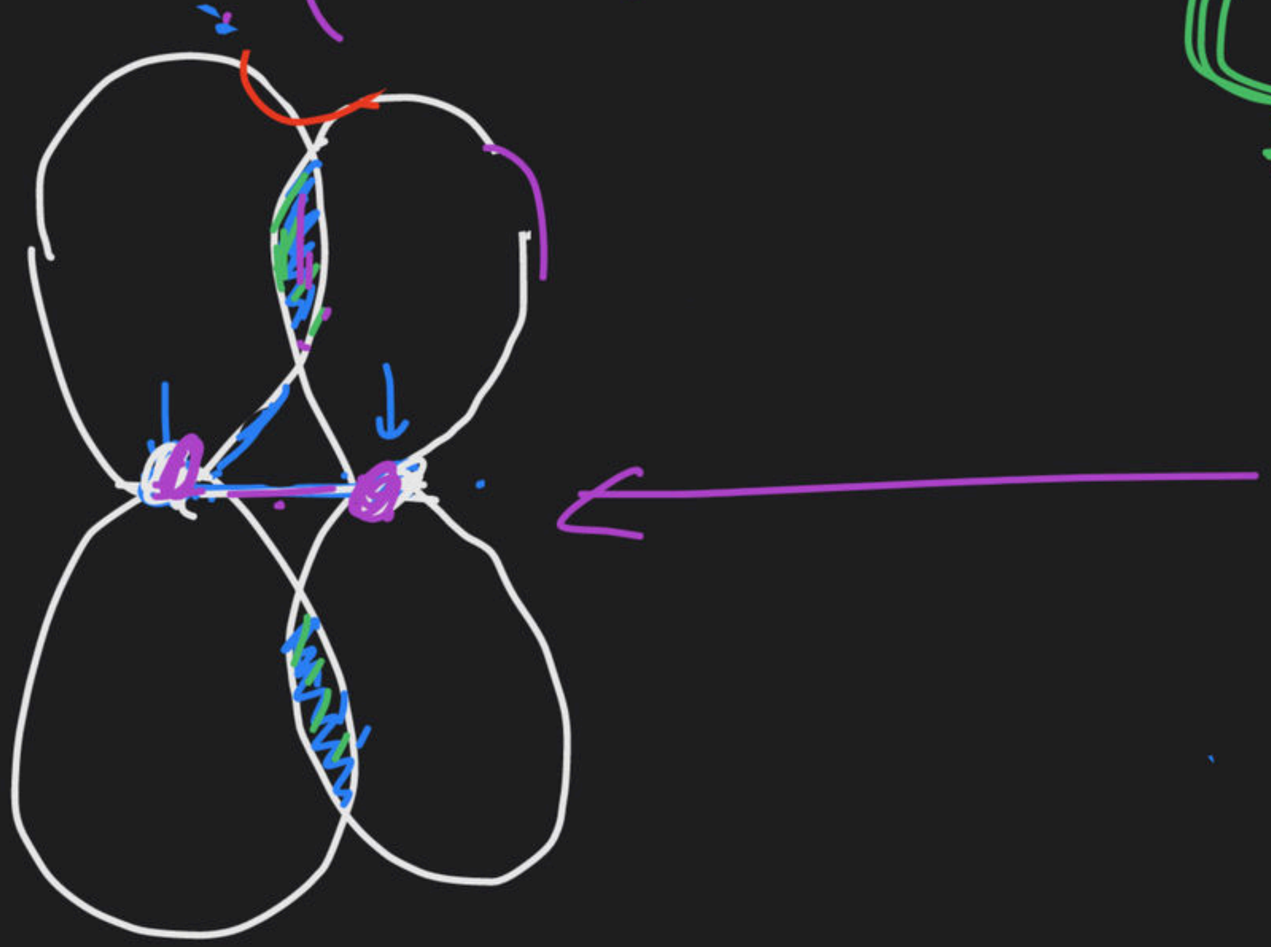


BA = 180°

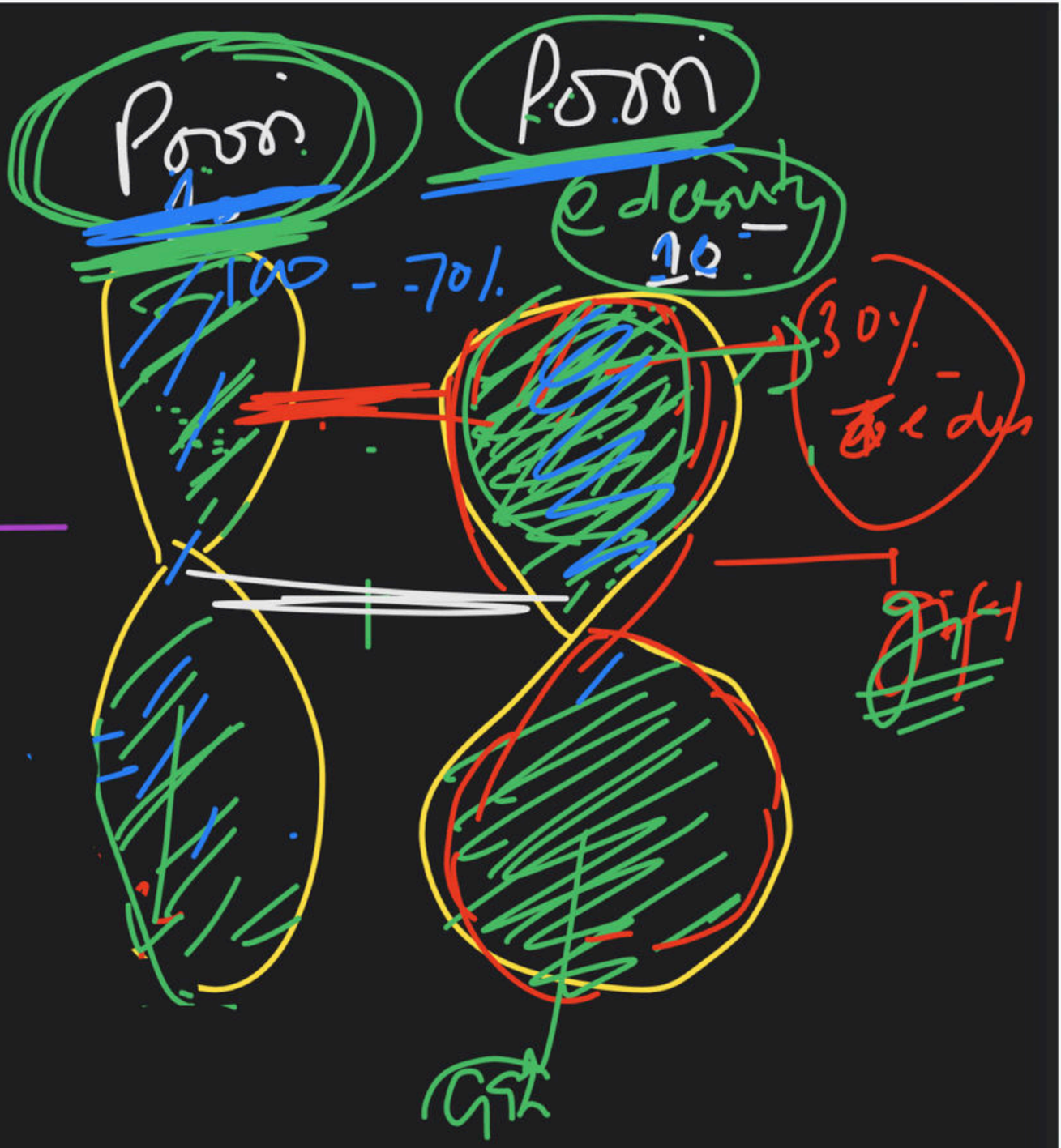


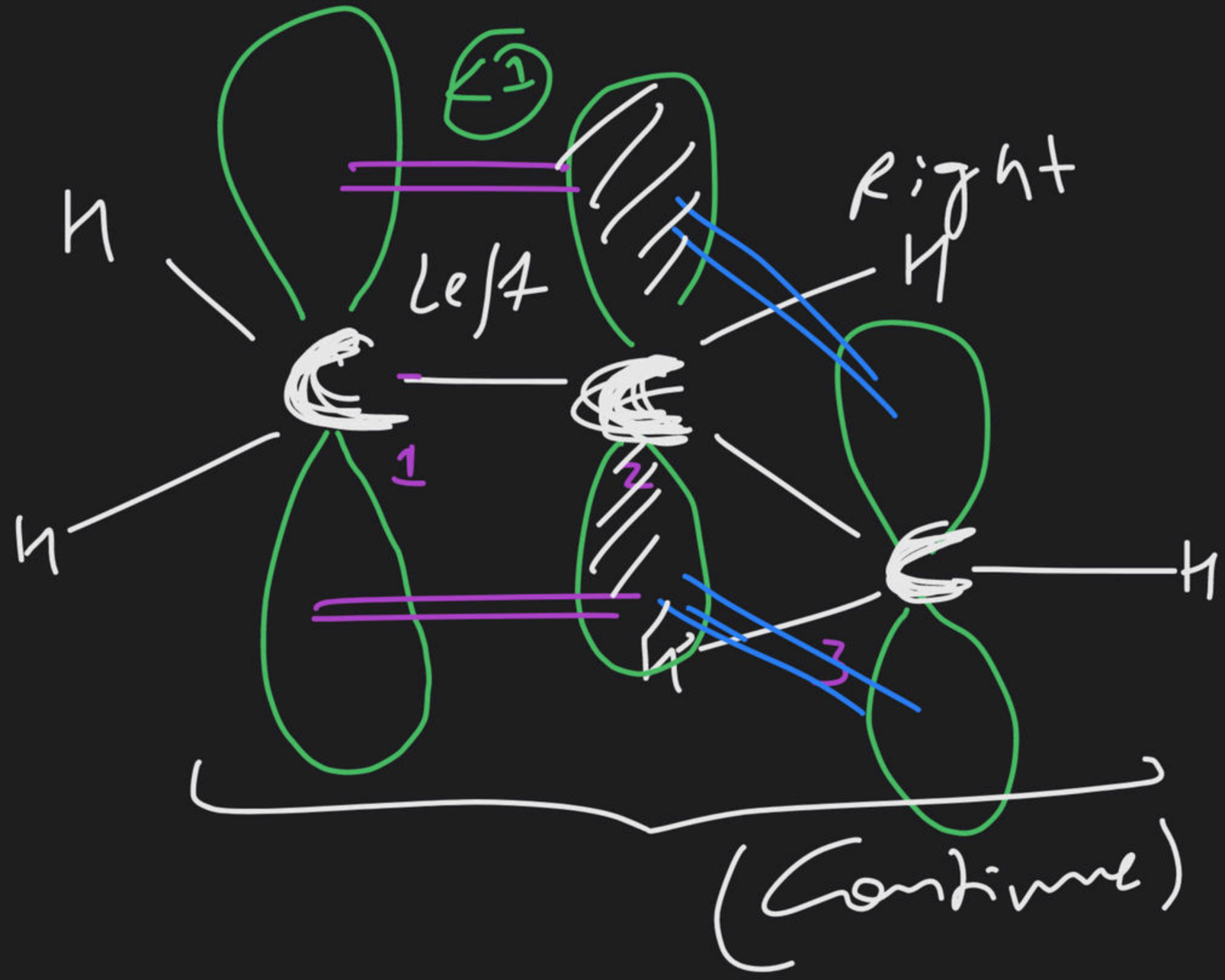
(3σ & 2π)

BO = (1 + 0.6x)



BO ⇒ fraction




1
H
Left
Right
H
1
2
H
3
(Continue)