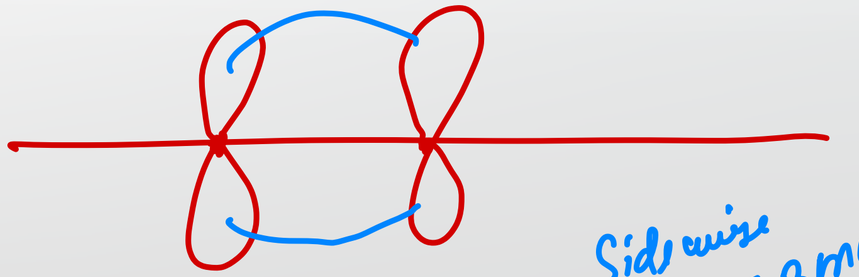
① internuclear axis

$p_x - p_x$

head on.

x axis

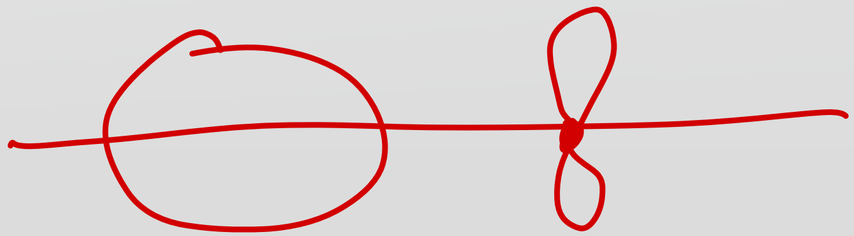
σ Bond form



x axis

$p_y - p_y$

Sidewise π Bond.



x axis

p_y

zero overlapping

(Q) which of the following overlapping is not possible if x is inter nuclear axis. Also write the type of bond from whether sigma or pi.

(a) PX+PX σ

(b) PX+PY not possible

(c) PY+PY π

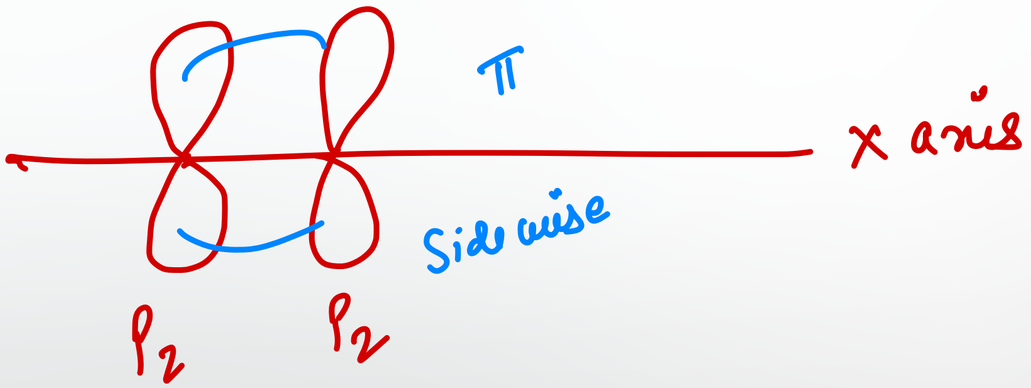
(d) PZ+PZ π

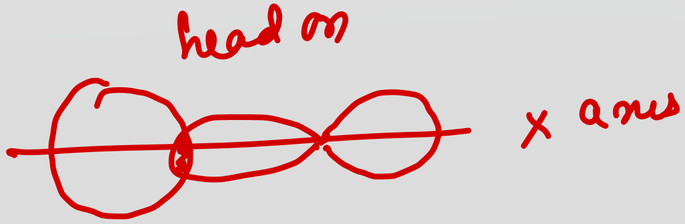
(e) PX+PZ not possible

(f) PY+PZ not possible

(g) S+PX σ

(h) S+PY not possible





Chemical Bonding

H.W

(Q) which of the following overlapping is not possible . Also write the type of bond from whether sigma or pi.

internuclear axis Z.

(a) PX+PX — π Bond.

(b) PX+PY — not possible

(c) PY+PY — π Bond.

(d) PZ+PZ — σ Bond.

(e) PX+PZ — not possible

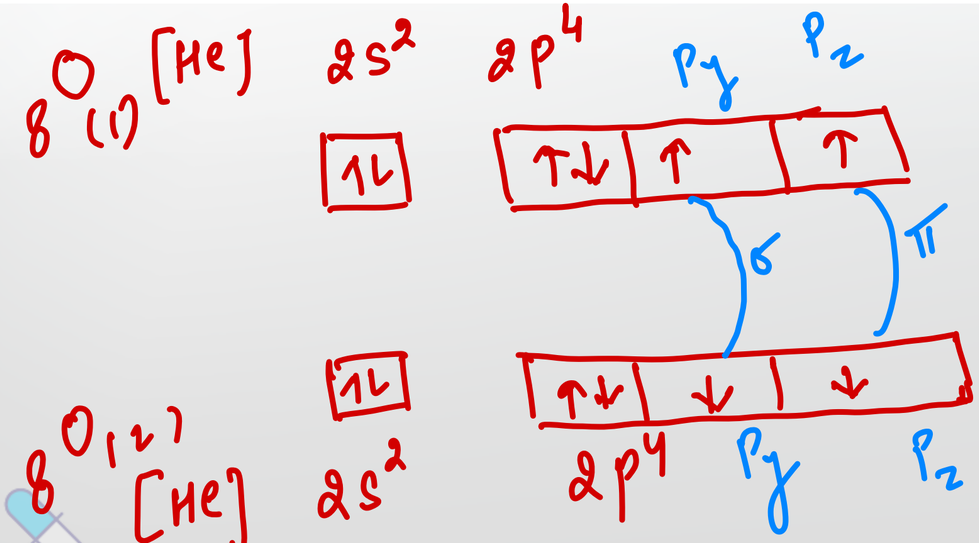
(f) PY+PZ — not possible

(g) S+PX — not possible

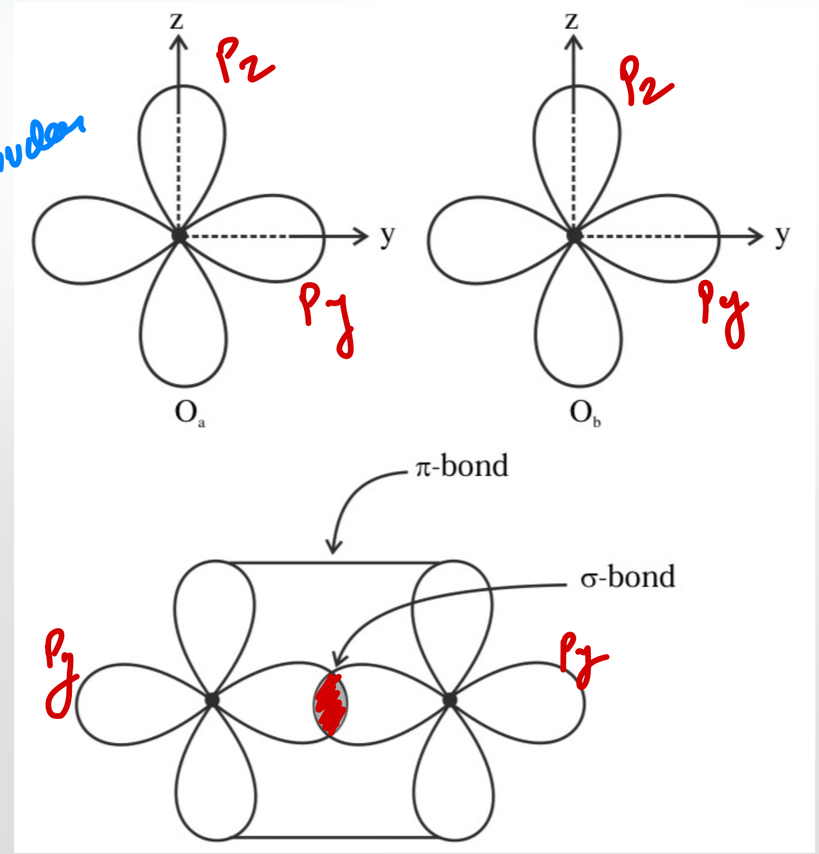
(h) S+PY — not possible.

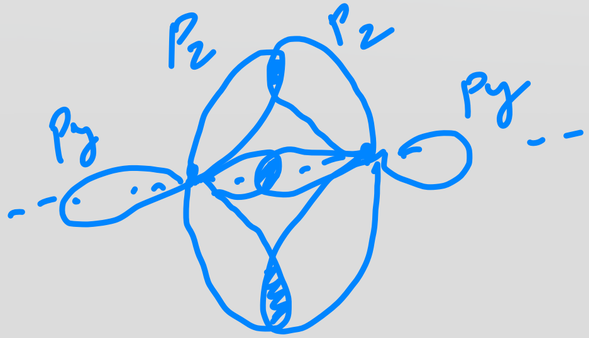
Explain bonding in (a) O2 (b) N2

Oxygen molecule: The electronic configuration of oxygen atom is $(1s)^2\ (2s)^2\ (2p_x)^2 (2p_y)^1\ (2p_z)^1$. There are two 2p atomic orbital, each containing one electron. Thus it can form two bonds — σ and π bonds.



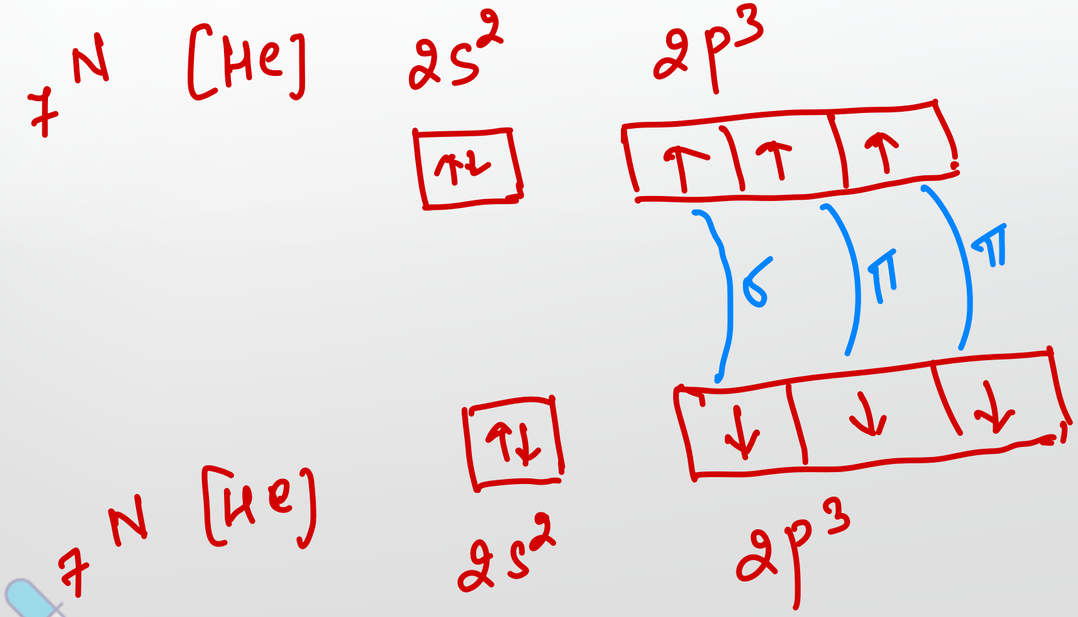
:Ö = Ö:



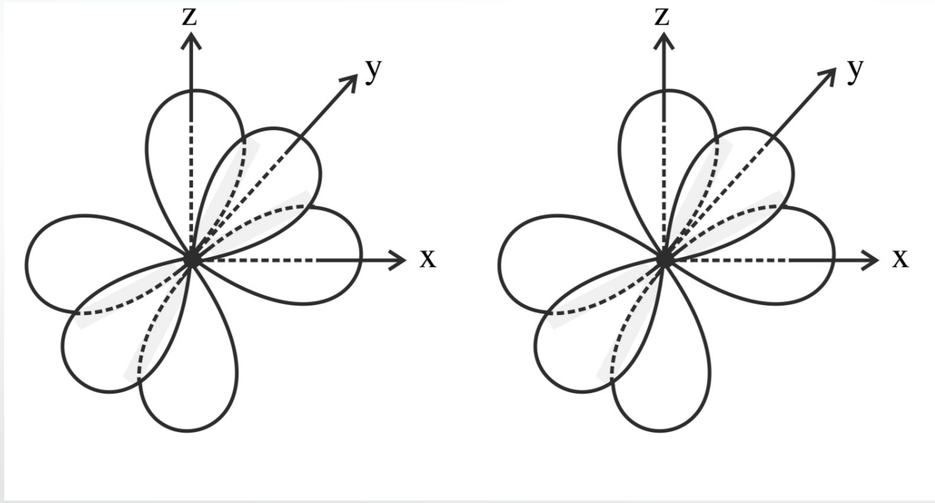


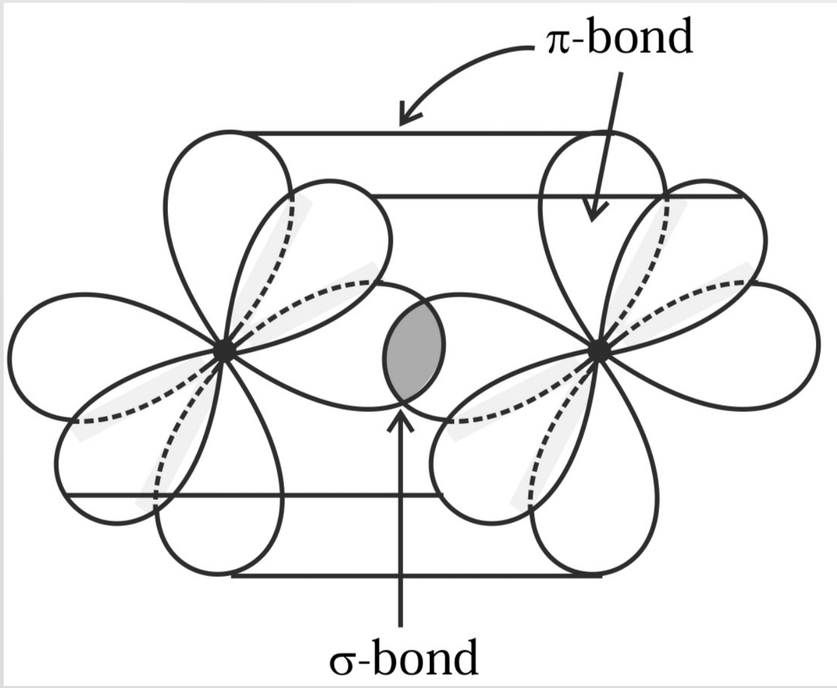
internuclear axis

Nitrogen molecule: The electronic configuration of nitrogen atom is $(1s)^2(2s)^2(2p_x)^1(2p_y)^1(2p_z)^1$. There are three 2p orbitals, each containing one electron. Thus it can form three bonds—one σ and two π-bonds.

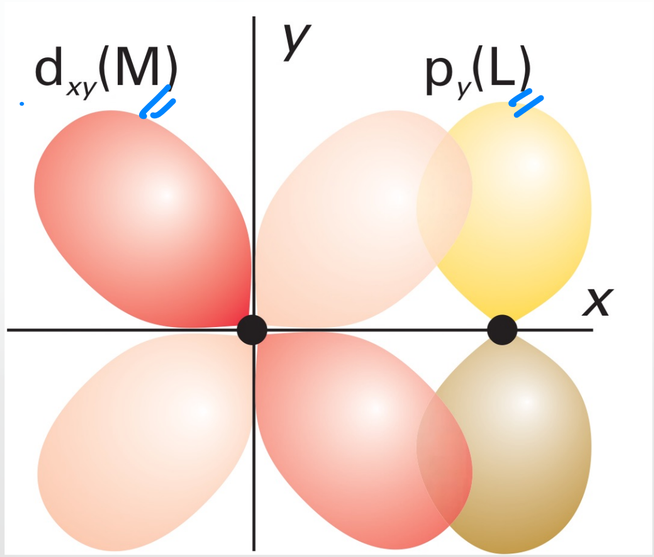


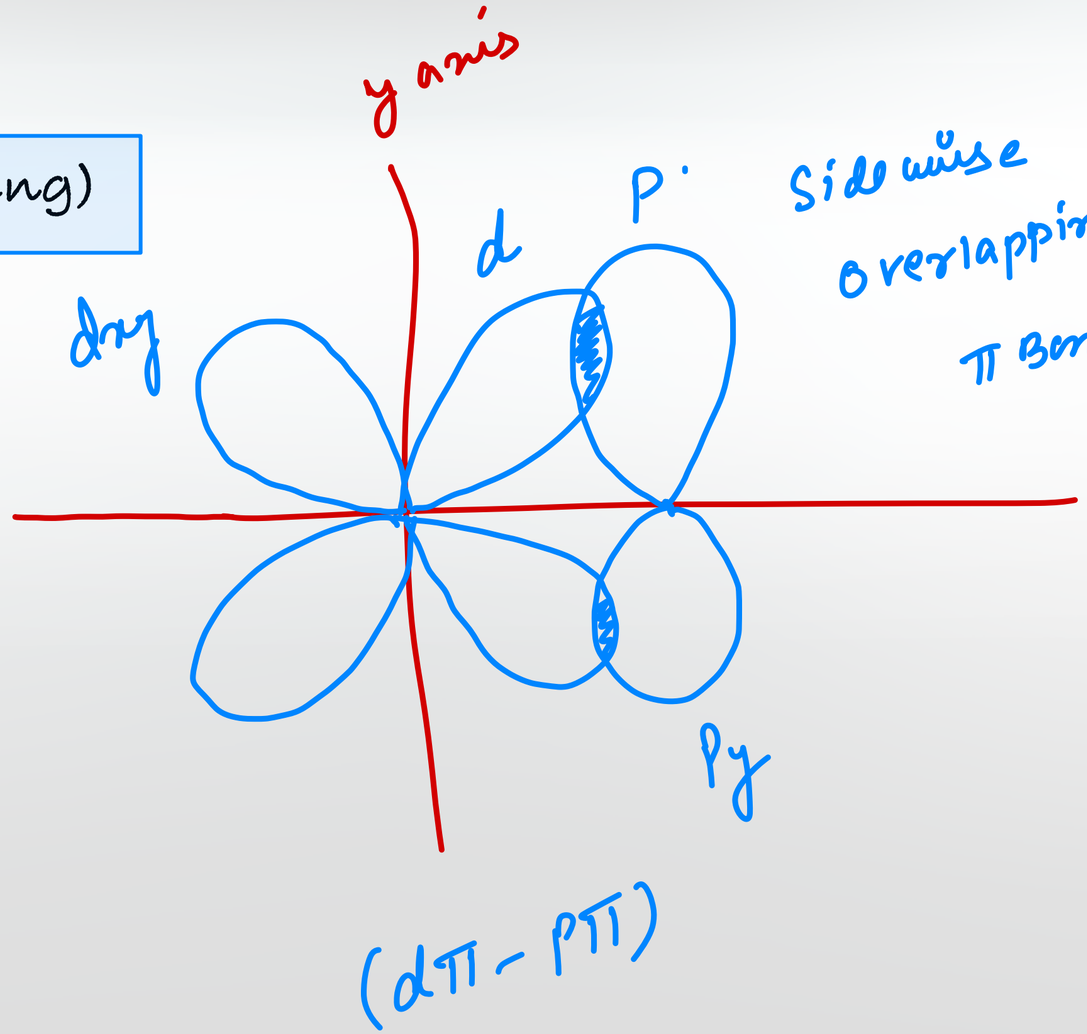
$$\overset{\cdot\cdot}{N} \equiv \overset{\cdot\cdot}{N} \quad (1\sigma, 2\pi)$$

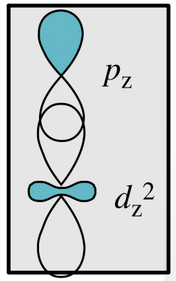
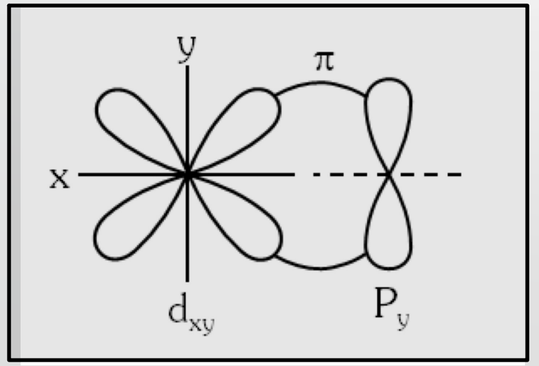


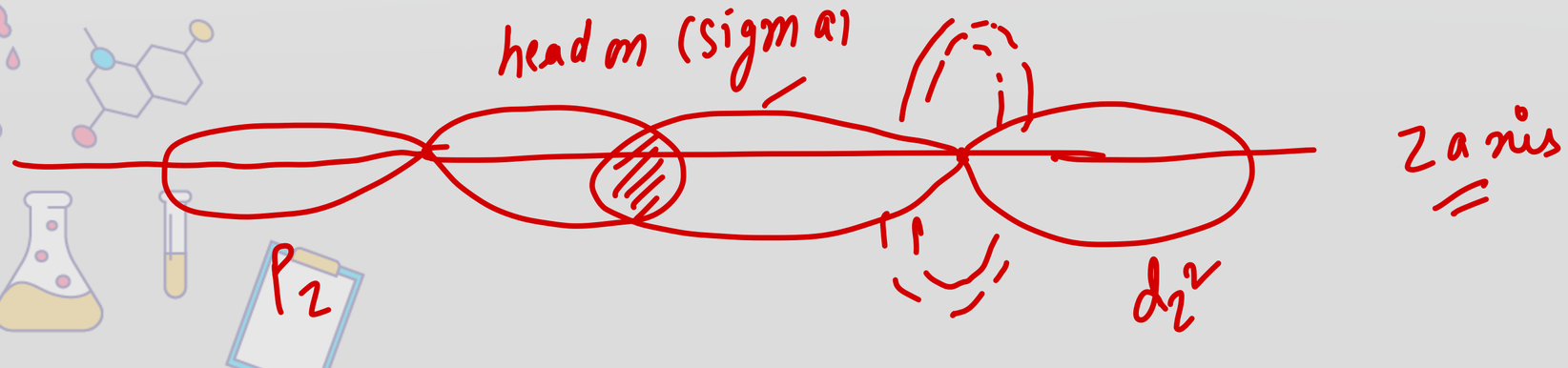


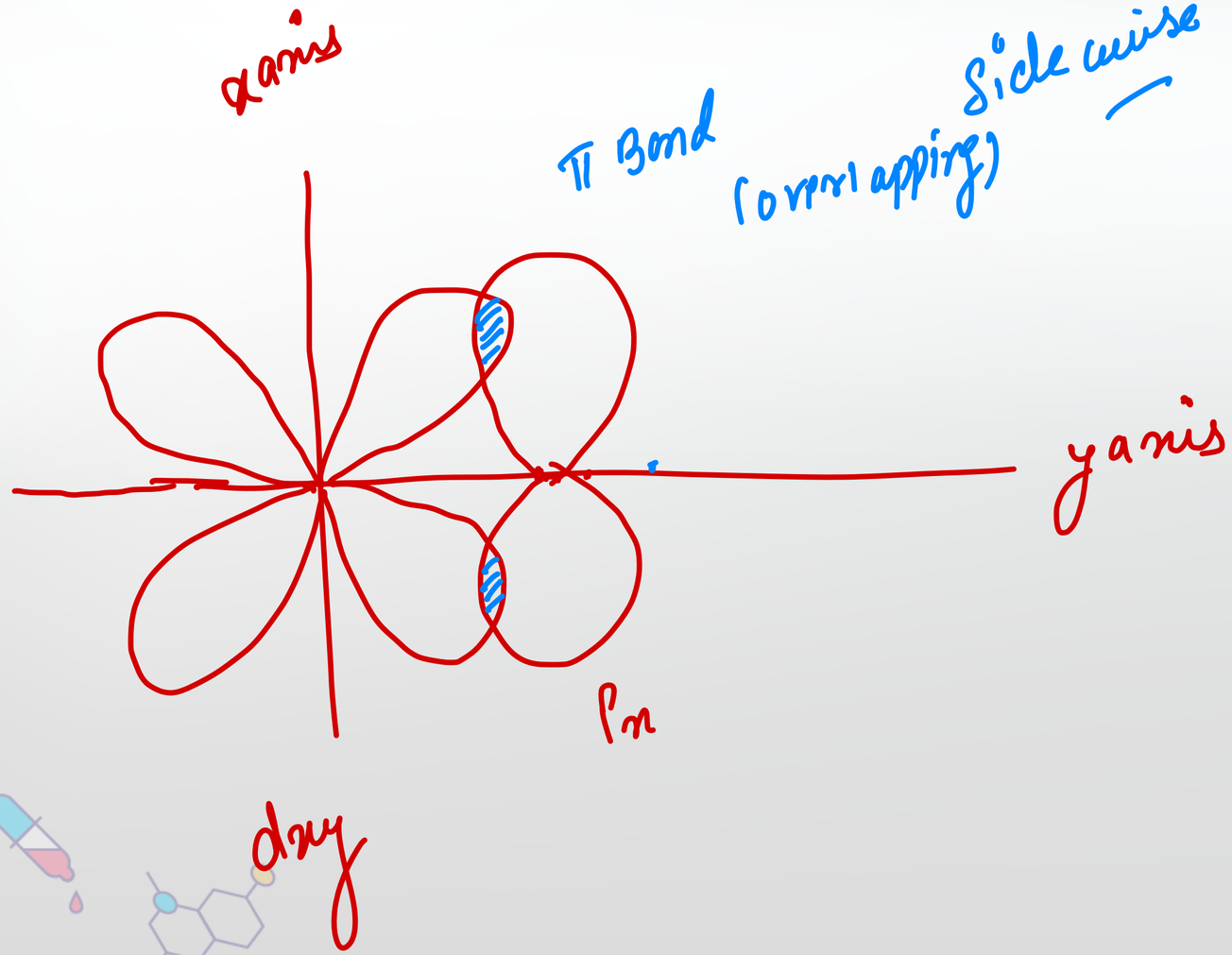
Side wise overlapping (dπ – pπ Overlapping)

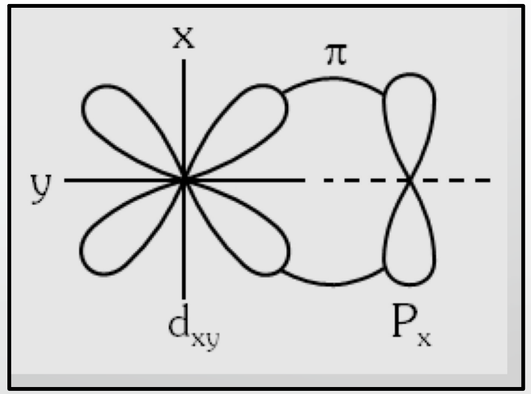




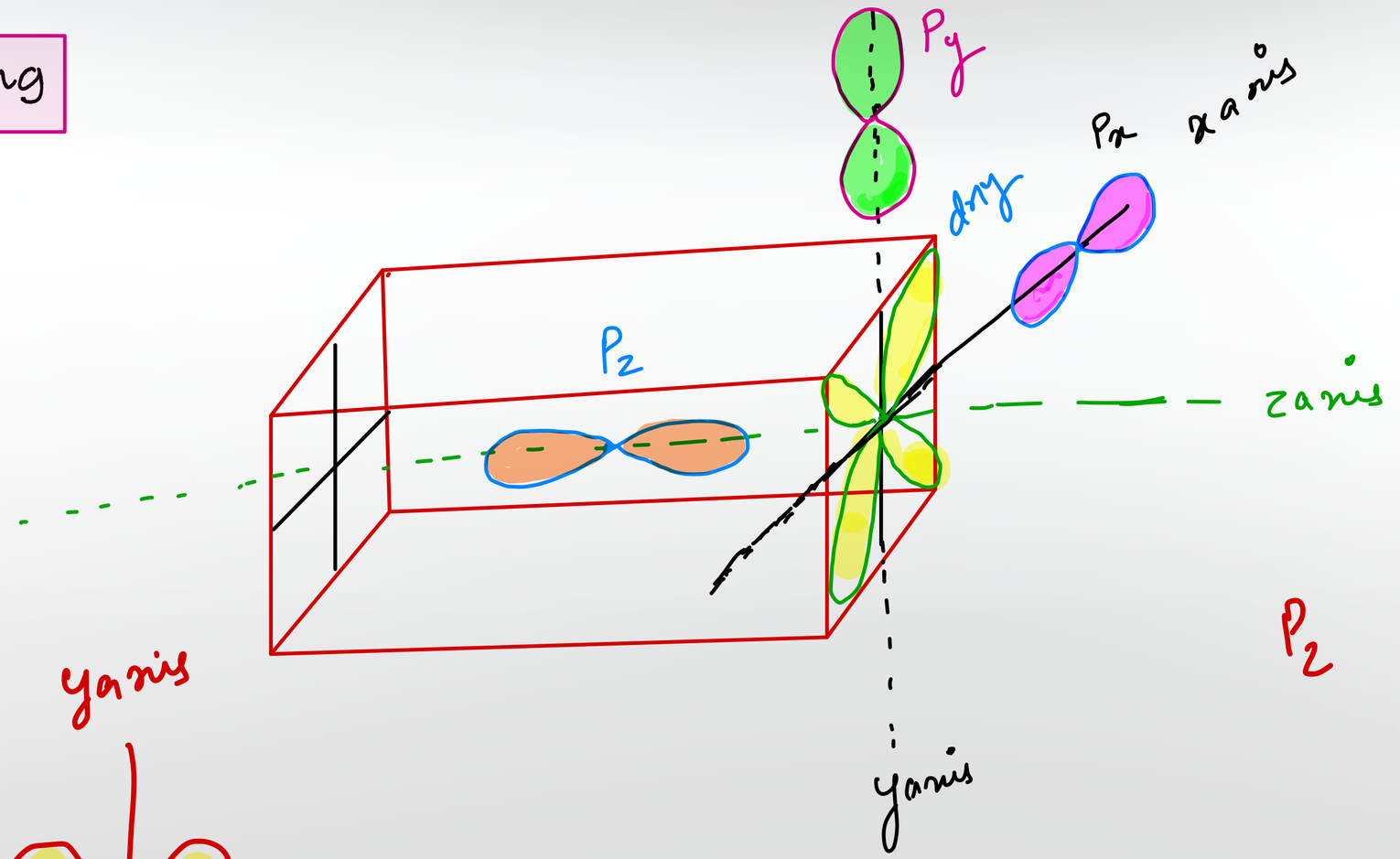
	Overlapping	Inter nuclear axis.	Type of bond.	Example
5.	Pz + dz2	Z axis.	Sigma	
6.	Px + dxy	Y axis	Pi	
	Py + dxy	X axis	Pi	



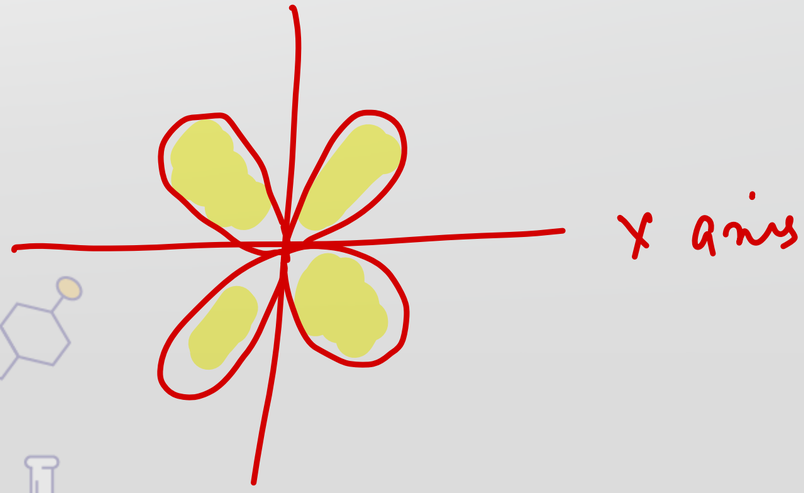

x axis
π Bond
(overlapping)
Side wise
y axis
p_x
d_{xy}

	Overlapping	Inter nuclear axis.	Type of bond.	Example
7.	Py + dyz	Z axis.	Pi	
	Pz + dyz.	Y axis.	Pi	
8.	Px + dxz	Z axis	Pi	
	Pz + dxz.	X axis	Pi	

Chemical Bonding

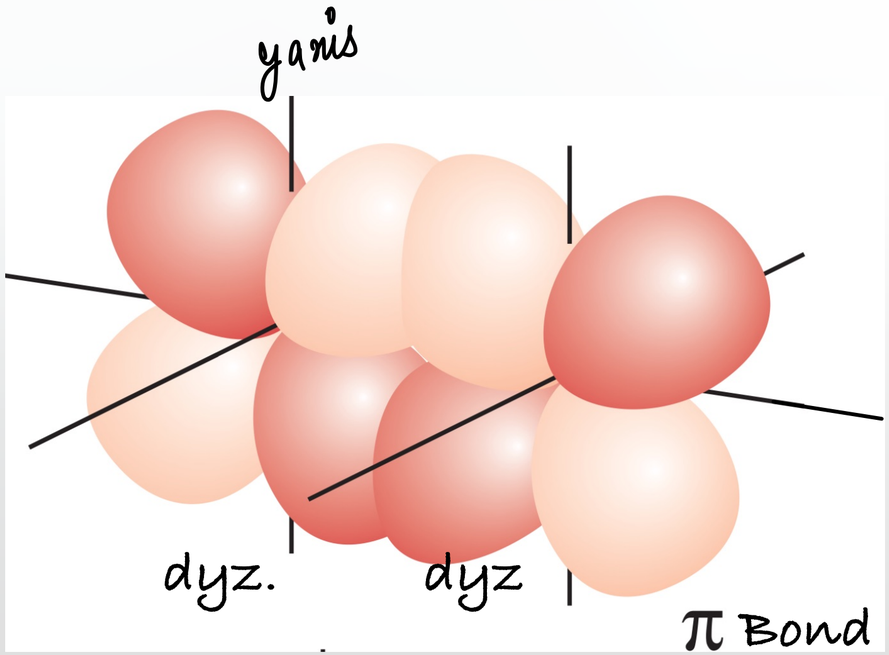


p_z d_{xy} z axis

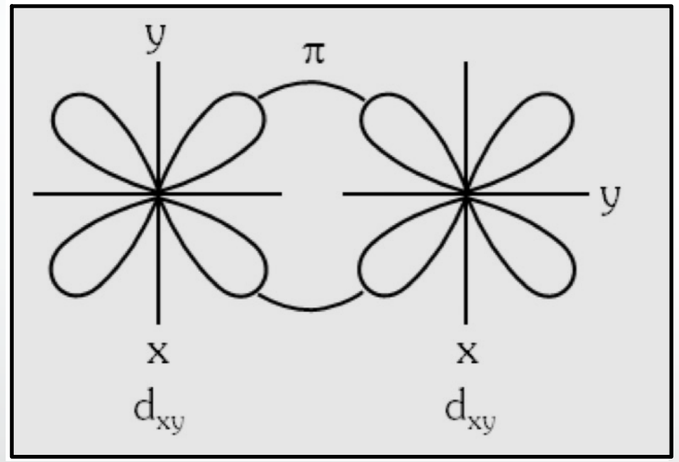


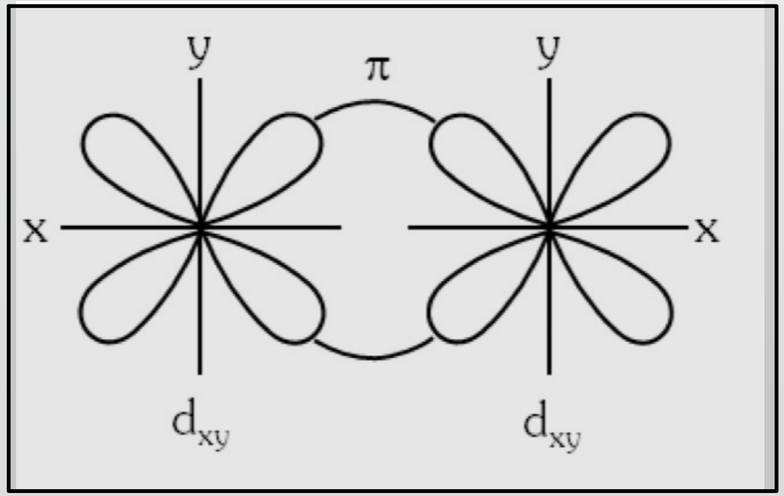
Side -wise $d\pi - d\pi$ overlapping

Inter nuclear axis



Combination of orbitals	Type of bond	INA
$d_{xy} + d_{xy}$	π	X/Y
$d_{yz} + d_{yz}$	π	Y/Z
$d_{xz} + d_{xz}$	π	X/Z



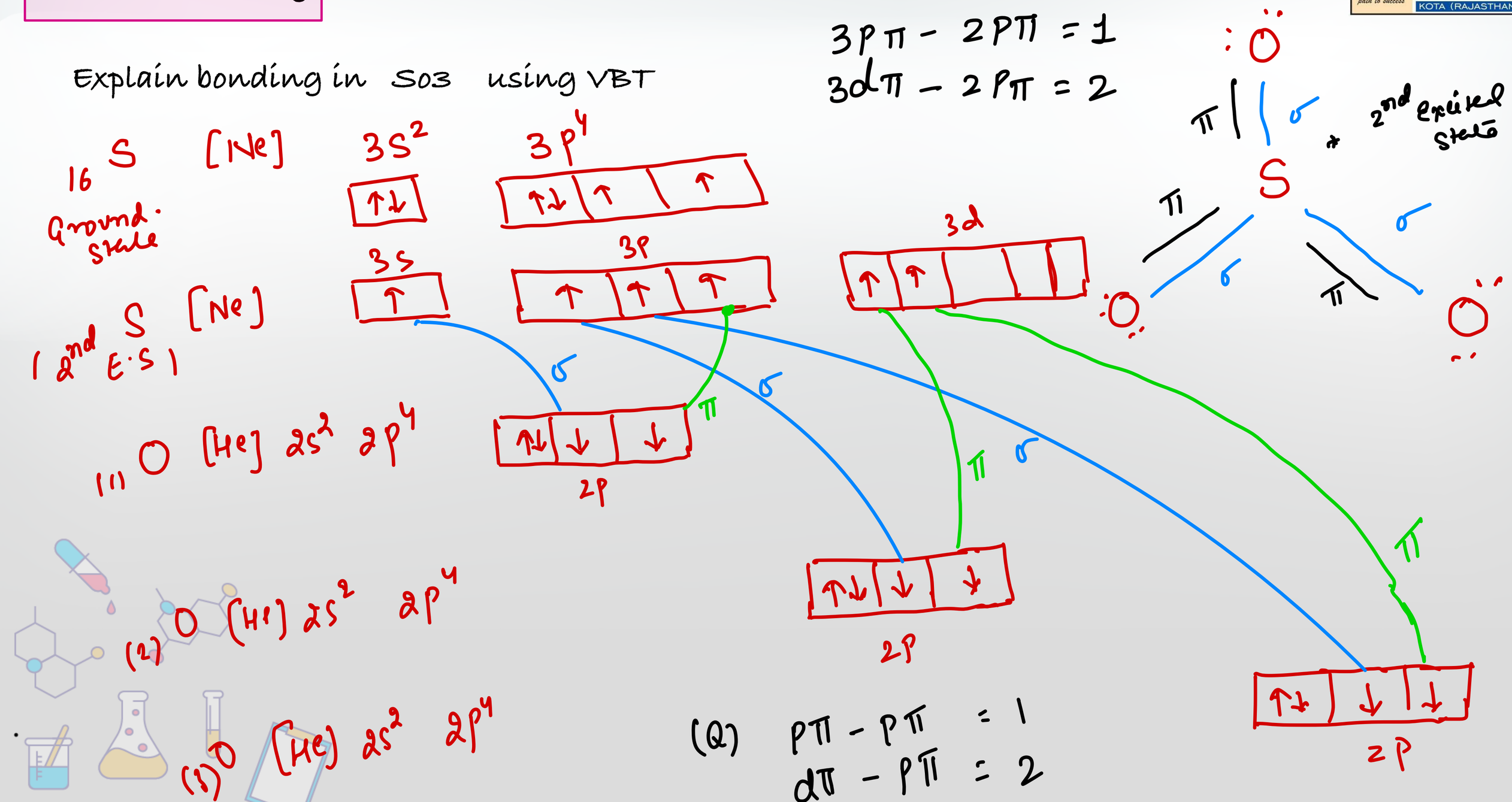


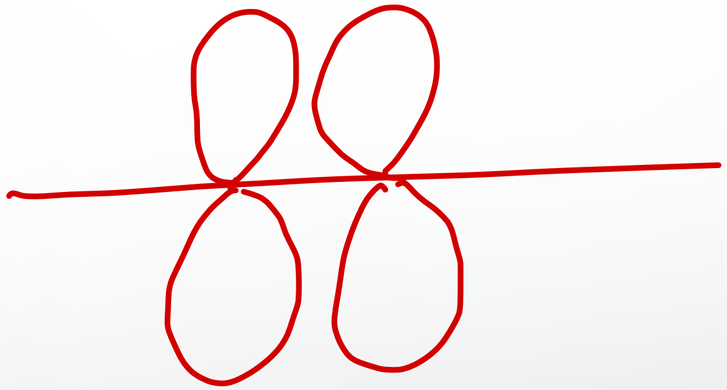
Chemical Bonding

Explain bonding in SO_3 using VBT

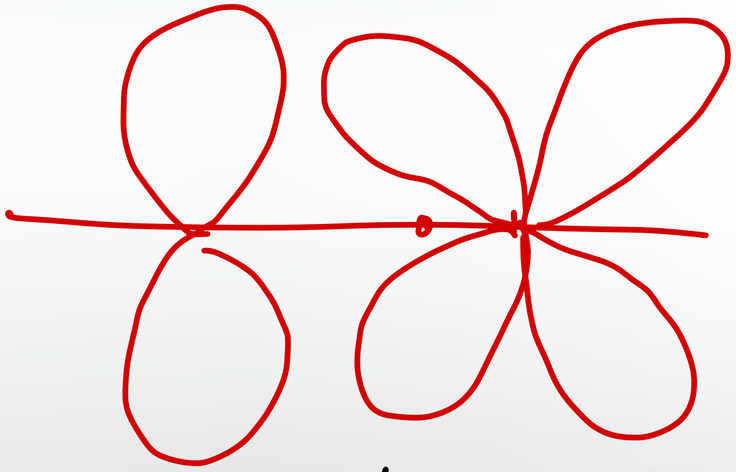
$3p\pi - 2p\pi = 1$

$3d\pi - 2p\pi = 2$



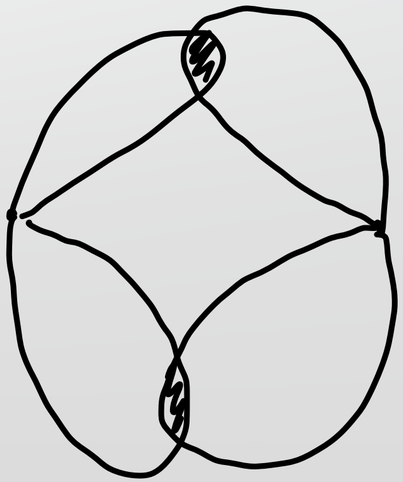


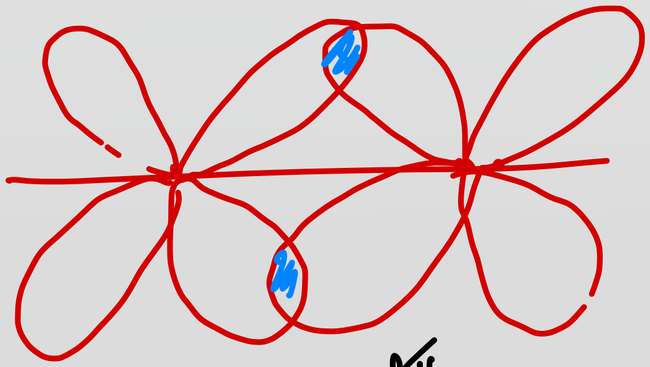
$p_\pi - p_\pi$



$p_\pi - d_\pi$

due to inclination of d orbital.





d_π d_π

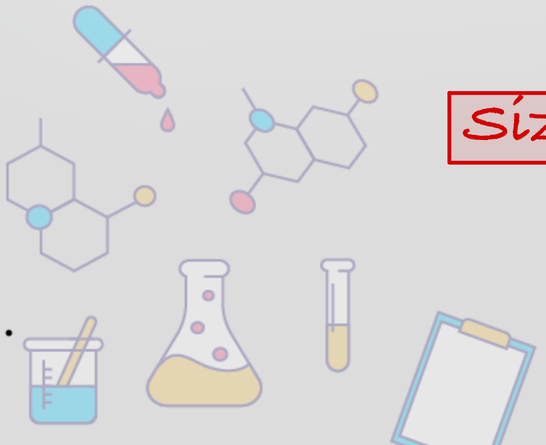
Strength of pi bond:

1. Bond strength $\propto \frac{1}{\text{Size}}$

Compare bond strength

(a) $2P_\pi - 2P_\pi$ > (b) $2P_\pi - 3d_\pi$ > C) $2P_\pi - 3P_\pi$ > (d) $3P_\pi - 3P_\pi$

Strongest. | Stable. | Very weak | too weak to be formed



Size increases strength of pi bond decreases

(Q) O2. ,N2 exist at room temperature but S2 ,P2 doesn't.?

Solution: $:\ddot{O}=\ddot{O}:$, $\ddot{N}\equiv\dot{N}$ (bond formed $2p\pi - 2p\pi$)

$2p\pi - 2p\pi$, $2p\pi - 2p\pi$

(n=3) $:\ddot{S}=\ddot{S}:$ ✗ , $\ddot{P}\equiv\ddot{P}$ ✗ (bond formed by $3p\pi - 3p\pi$)

$3p\pi - 3p\pi$, $3p\pi - 3p\pi$