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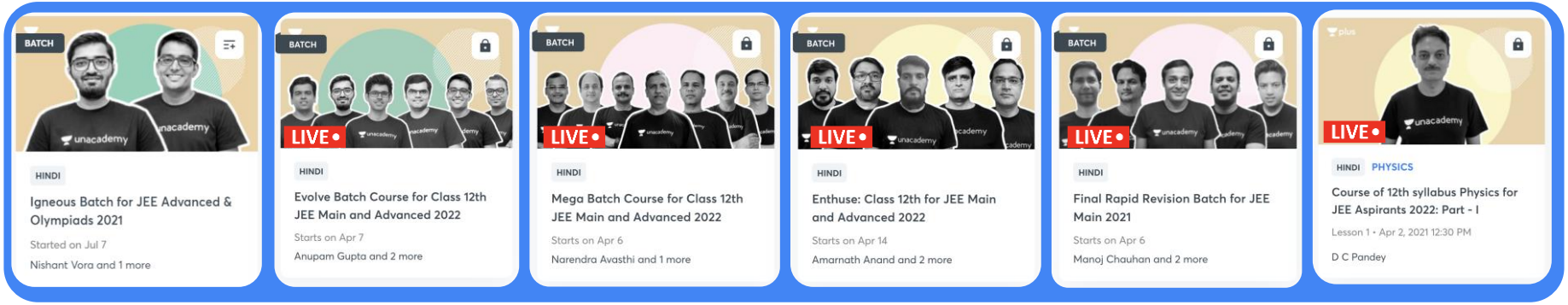

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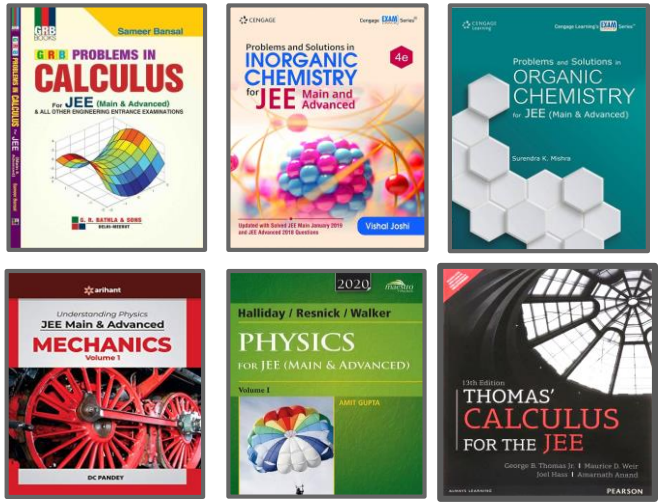

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Nishant Vora
Mathematics Maestro

Ajit Lulla
Physics Maestro

Abhilash Sharma
Physics Maestro

Sakshi Vora
Chemistry Maestro

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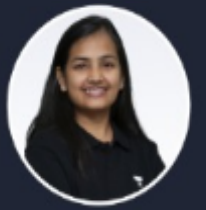

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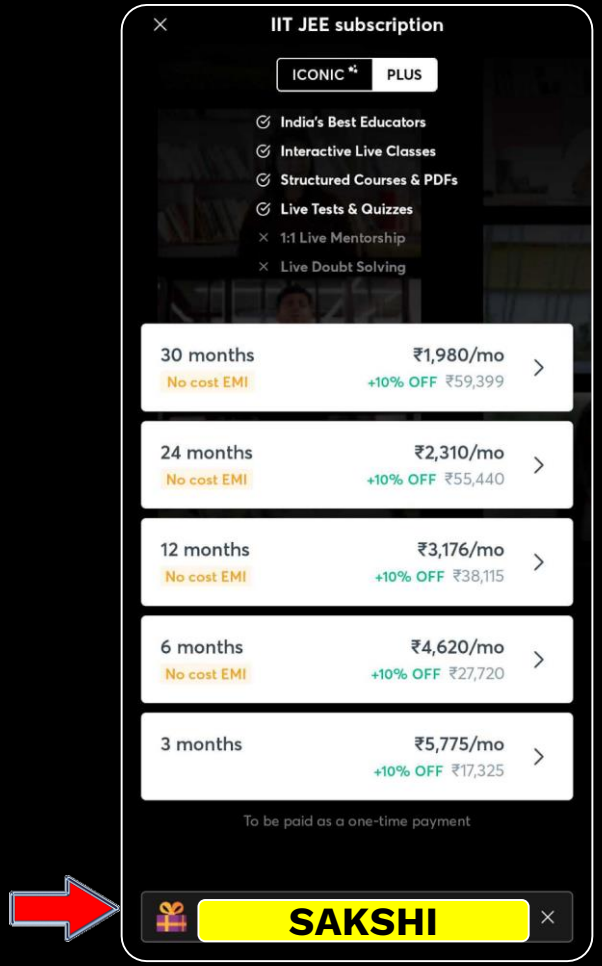
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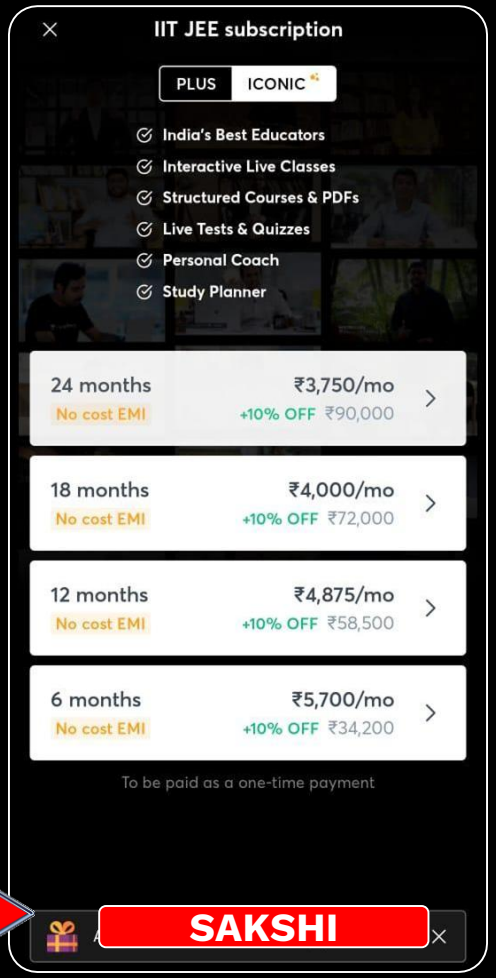
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WHERE
WHAT
WHEN
WHY
HOW
WHO

Q

Among the following species

N_2 , N_2^+, N_2^-, N_2^{2-}, O_2, O_2^+, O_2^-, O_2^{2-}

1

the number of species showing diamagnetism is

2

$N_2 \rightarrow 14 \rightarrow d$

$N_2^+ \rightarrow 13 \rightarrow p$

$N_2^- \rightarrow 15 \rightarrow p$

$N_2^{2-} \rightarrow 16 \rightarrow p$

$O_2 \rightarrow 16 \rightarrow p$

$O_2^+ \rightarrow 15 \rightarrow p$

$O_2^- \rightarrow 17 \rightarrow p$

$O_2^{2-} \rightarrow 18 \rightarrow d$

Q

2

Match **List I** with **List II** :

List-I (molecule)	List-II (hybridization; shape)
A. XeO_3	I. sp^3d ; linear
B. XeF_2	II. sp^3; pyramidal
C. $XeOF_4$	III. sp^3d^3; distorted octahedral
D. XeF_6	IV. sp^3d^2 ;square pyramidal

Choose the correct answer from the options given below:

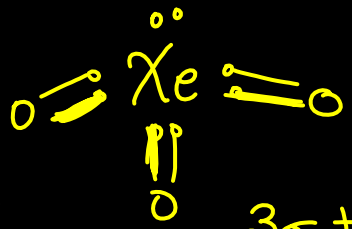
A. A-II, B-I, C-IV, D-III

B. A-II, B-IV, C-III, D-I

C. A-IV, B-II, C-III, D-I

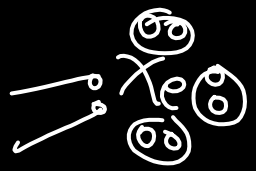
D. A-IV, B-II, C-I, D-III

jee main PYQ.



3σ + 1lp = 4

XeF_2



σ = 2

lp = 3

sp^3d

The total number of acidic oxides from the following list is : NO, N_2O , B_2O_3, N_2O_5, CO, SO_3 , P_4O_{10}

2

A. 3

B. 4

C. 5

D. 6

CO → neutral
NO → neutral
N_2O → "

इस नौ मरो
| | |
N_2O NO CO

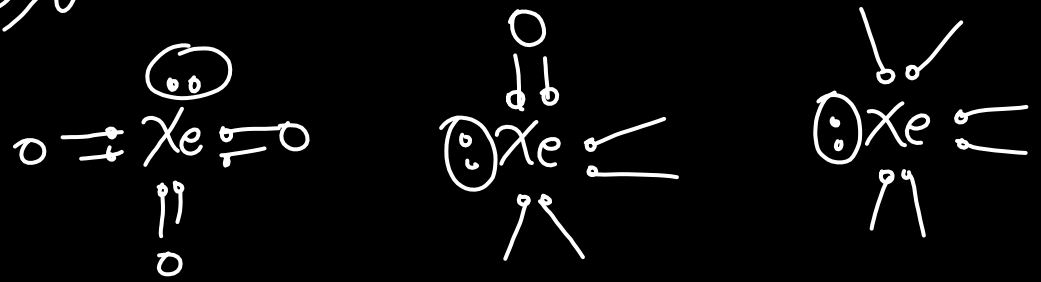
B_2O_3 → acidic
N_2O_5 → acidic
SO_3 → acidic
P_4O_{10} → acidic

Q

The sum of number of lone pairs of electrons present on the central atoms of XeO_3, $XeOF_4$ and XeF_6 is_

A

Jee main PYQ



Q

5

Match **List - I** with **List - II**.

List - I (Compound)	**List – II (Shape)**
(A) BrF_5	(I) bent
(B) $[CrF_6]^{3-}$	(II) square pyramidal
(C) O_3	(III) trigonal bipyramidal
(D) PCl_5	(IV) octahedral

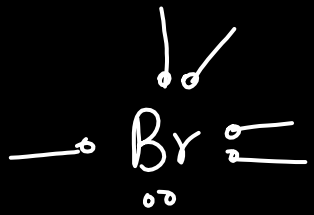
Choose the **correct** answer from the options given below :

A. (A) – (I), (B) - (II), (C) - (III), (D) - (IV)

B. (A) - (IV), (B) - (III), (C) - (II), (D) - (I)

C. (A) - (II), (B) - (IV), (C) - (I), (D) - (III)

D (A) - (III), (B) - (IV), (C) - (II), (D) - (I)

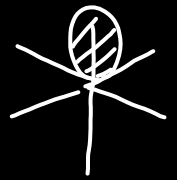


$\sigma = 5$

$lp = 1$

6

sp^3d^2



Q 6

Arrange the following in increasing order of their covalent character.

JEE 2022

(A) CaF_2

(B) $Cacl_2$

(C) $CaBr_2$

(D) CaI_2

Choose the correct from the options given below.

A. B < A < C < D

B. A < B < C < D

C. A < B < D < C

D. A < C < B < D

Q 7

Given below are two statements.

Statement I : O_2 , Cu^{2+} Fe^{3+} are weakly attracted by magnetic field and are magnetized in the same direction as magnetic field.

Statement II : NaCl and H_2O are weakly magnetized in opposite direction to magnetic field. In the light of the above statements, choose the most appropriate answer form the options given below:

A. Both statement I and statement II are correct

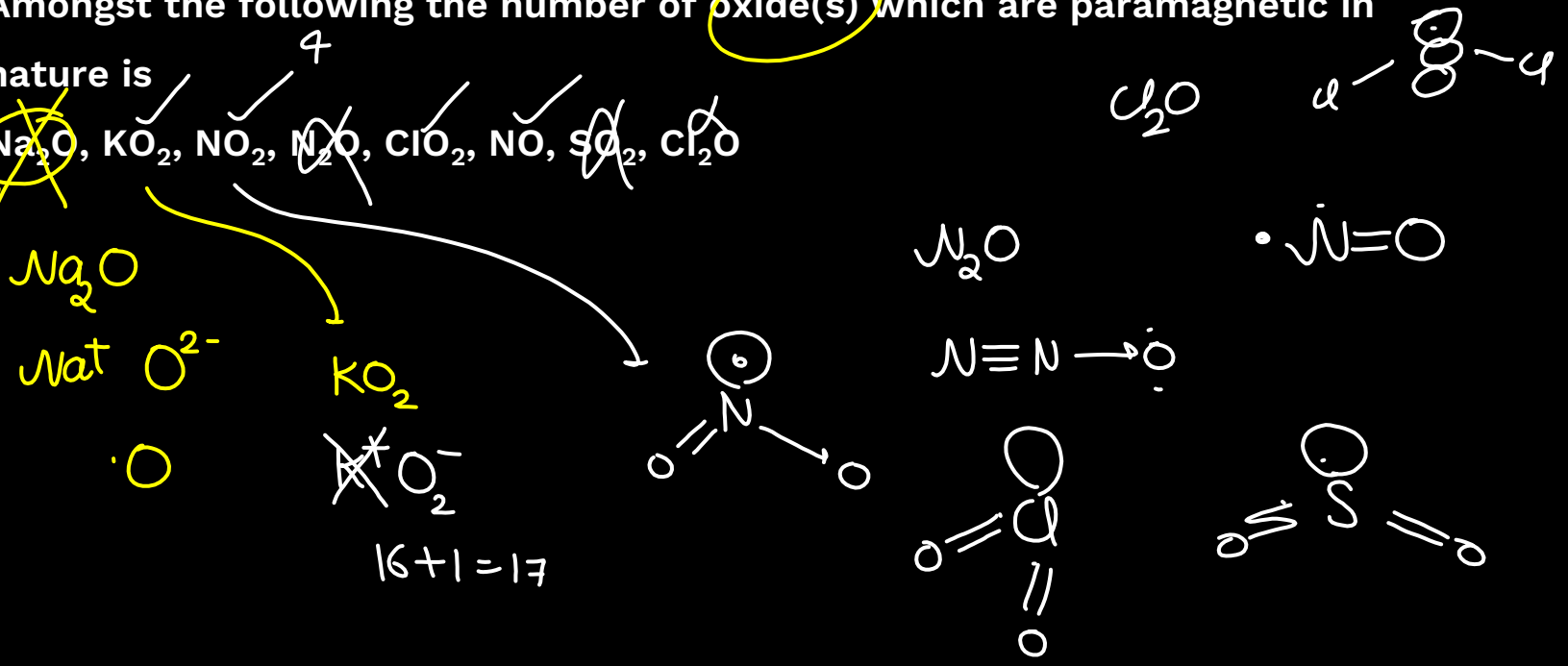
B. Both statement I and Statement II are incorrect

C. Statement I is correct but Statement II is incorrect

D. Statement I is incorrect but statement II is correct.

Amongst the following the number of oxide(s) which are paramagnetic in nature is

Na_2O, KO_2, NO_2, N_2O, ClO_2, NO, SO_2, Cl_2O



Q

9

According to MO theory, number of species/ions from the following having identical having bond order is _.

CN^-, NO^+, O_2, O_2^+, O_2^{2+}

O_2^{2+} $16-2=14$ → 3

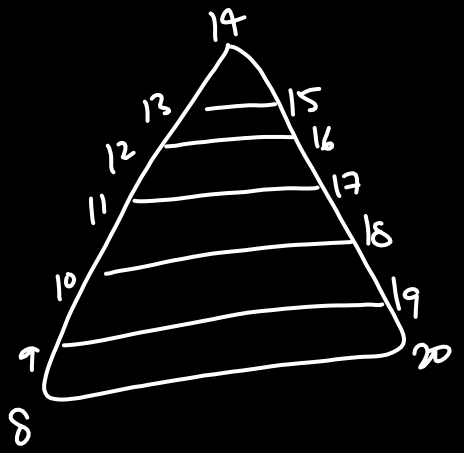
$6+7+1=14$ → 3

$7+8-1=14$ → 3

2

$16-1=15$ → 2

(2)



Q

10

Match List-I with List-II

List-I	List-II
(A) $\Psi_{MO} = \Psi_A - \Psi_B$	(I) Dipole moment
(B) $\mu = Q \times r$	(II) Bonding molecular orbital
(C) $\frac{N_b - N_a}{2}$	(III) Anti-bonding molecualr orbital
(D) $\Psi_{MO} = \Psi_A + \Psi_B$	(IV) Bond order

jee main PYQ.

A. (A)-(II), (B)-(I), (C)-(IV), (D)-(III)

B. (A)-(III), (B)-(IV), (C)-(I), (D)-(II)

C. (A)-(III), (B)-(I), (C)-(IV), (D)-(II)

D (A)-(III), (B)-(IV), (C)-(II), (D)-(I)

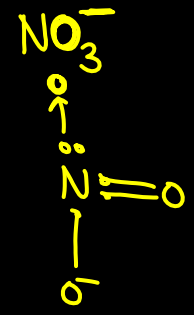
Q

The number of molecule(s) or ion(s) from the following having non-planar structure is_.

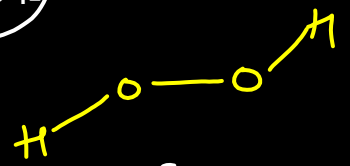
NO_3^-, H_2O_2, BF_3, PCl_3, XeF_4, SF_4, XeO_3, PH_4^+, SO_3, $[Al(OH)_4]^-$

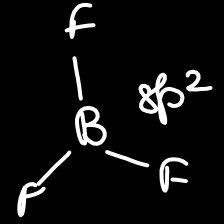
H_2O_2, PCl_3,

6

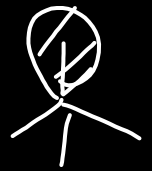


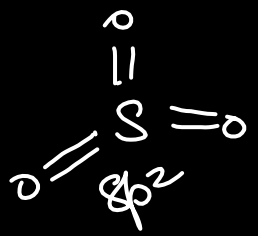
$\sigma = 3$
$lp = 0$
3
sp^2
Planar

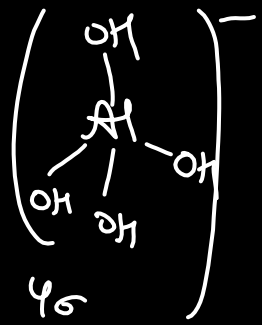


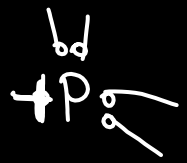


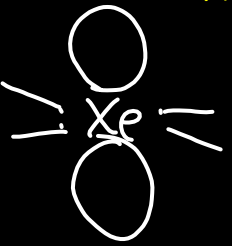
3σ
1lp
4

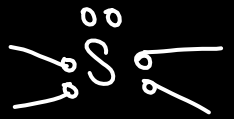


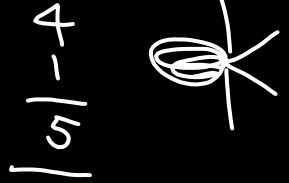












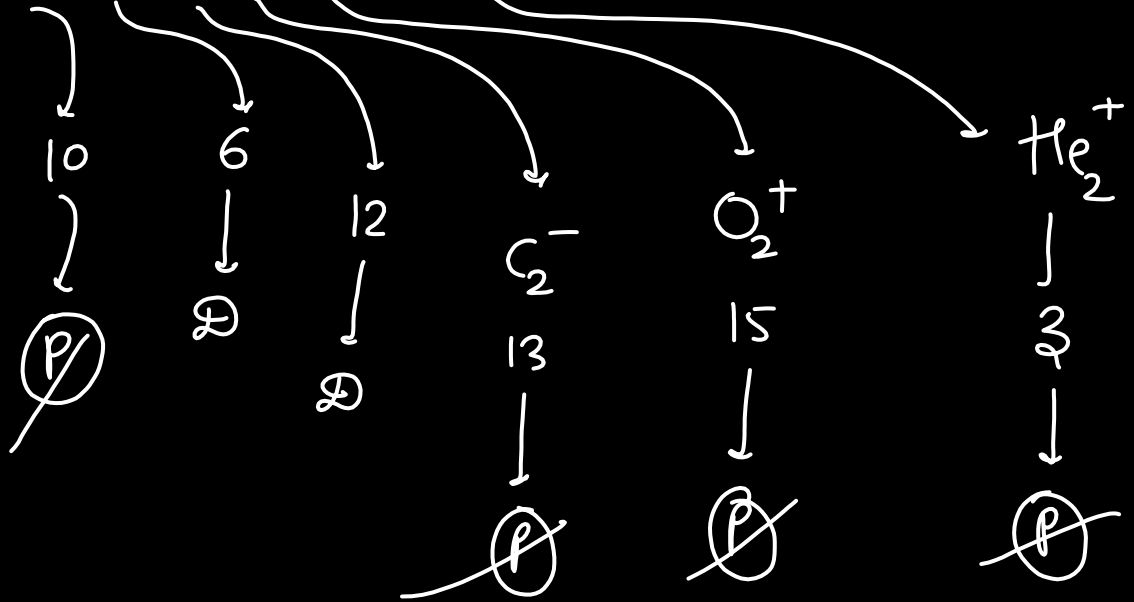
4

Q

The number of paramagnetic species among the following is_.

B_2, Li_2, C_2, C^-_2, O^+_2 and He^+_2.

12



Q

13

Given below are two statements : One is labelled as Assertion A and the other is labelled as Reason R

Assertion A : zero orbital overlap is an out of phase overlap.

Reason : It results due to different orientation / direction of approach of orbitals.

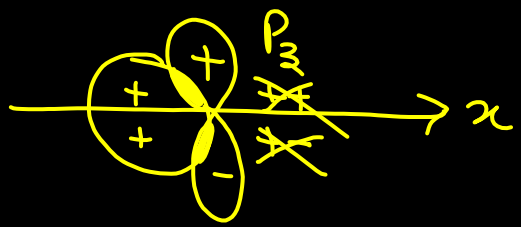
In the light of the above statements. Choose the correct answer from the options given below.

A. Both A and R are true and R is the correct explanation of A

B. Both A and R are true but R is NOT the correct explanation of A

C. A is the true but R is false

D. A is false but R is true



Q

14

Number of lone pairs of electrons in the central atom of SCl_2, O_3, ClF_3 and SF_6, respectively, are :

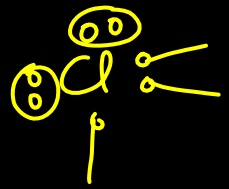
Jee main PYQ

A. 0, 1, 2 and 2

B. 2, 1, 2 and 0

C. 1, 2, 2 and 0

D. 2, 1, 2 and 0

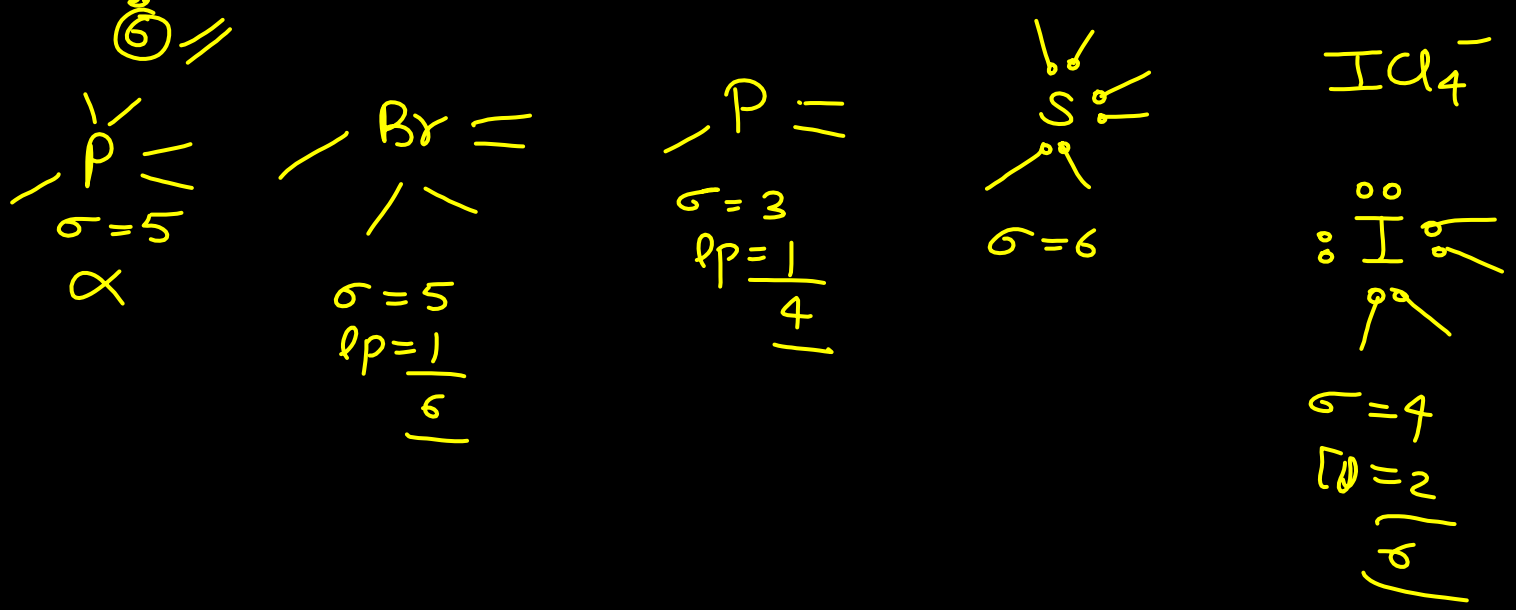


Consider , PF_5, BrF_5, PCl_3, SF_6, $[ICl_4]^-$, ClF_3 and IF_5.

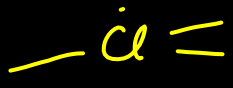
Amongst the above molecule(s)/ion(s), the number of molecule(s)/ion(s) having sp^3d^2 hybridisation is_.

15

4



ClF_3



$\sigma = 3$

$lp = 2$

5

9

IF_5

$\sigma = 5$

$lp = 1$

6

Q

16

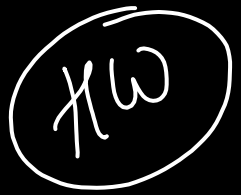
The correct order of bond orders of C_2^{2-}, N_2^{2-} and O_2^{2-} is, respectively.

A. $C_2^{2-} < N_2^{2-} < O_2^{2-}$

B. $O_2^{2-} < N_2^{2-} < C_2^{2-}$

C. $C_2^{2-} < O_2^{2-} < N_2^{2-}$

D. $N_2^{2-} < C_2^{2-} < O_2^{2-}$



Q

17

Bonding in which of the following diatomic molecule(s) become(s) stronger, on the basis of MO Theory, by removal of an electron ?

A. NO — 2.5 — 14 → 3

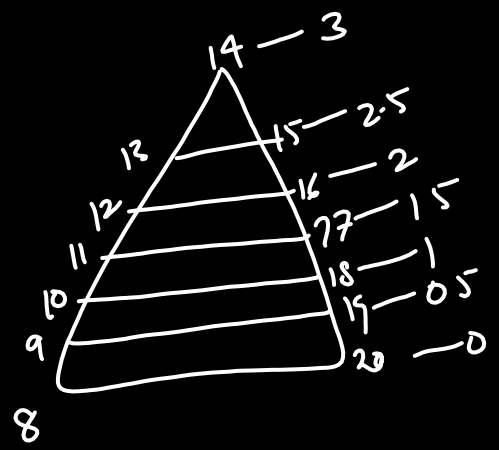
B. N_2 — 3 — 13 → 2.5

C. O_2 — BO = 2 — 15 → 2.5

D. C_2 — 2 — 11 → 1.5

E. B_2 — 1 — 9 → 0.5

B St ∝ BO

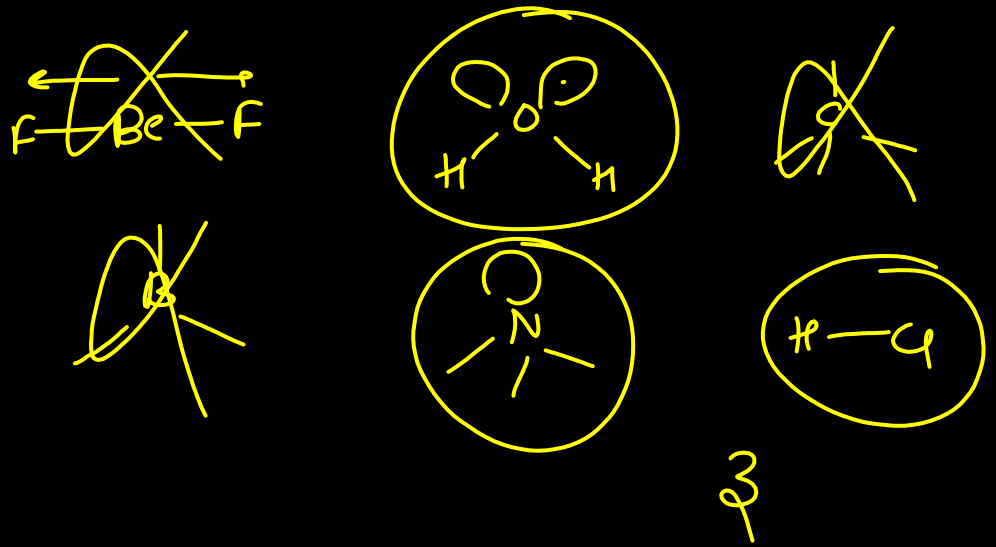


Q

Amongst BeF_2 , BF_3 , H_2O, NH_3 , CCl_4 and HCl, the number of molecules with non-zero net dipole moment is –

JEE PYQ.

18



3

Q

19

Consider the ions/molecule O^{+}_{2}, O_2, O_2^{-}, O^{2-}_{2}

For increasing bond order the correct option is

A. $O^{2-}_{2} < O^{-}_{2} < O_2 < O_2^{+}$

B. $O^{-}_{2} < O^{2-}_{2} < O_2 < O^{+}_{2}$

C. $O^{-}_{2} < O^{2-}_{2} < O^{+}_{2} < O_2$

D. $O^{-}_{2} < O^{+}_{2} < O^{2-}_{2} < O_2$

Q

The oxide which contains an odd electron at the nitrogen atom is

20

A. N_2O

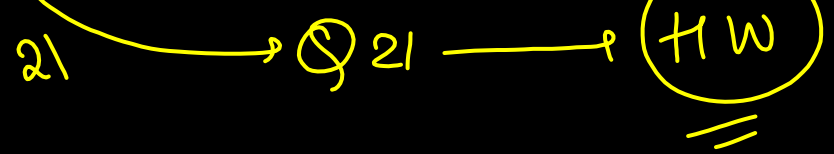
B. NO_2

C. N_2O_3

D. N_2O_5

jee main 2022

Amongst SF_4, XeF_4, CF_4 and H_2O, the number of species with two lone pairs of electrons_.



22

Based upon VSEPR theory, match the shape (geometry) of the molecules in List-I with the molecules in List-II and select the most appropriate option

List-I (Shape)	**List-II (Molecules)**
(A) T-shaped	(I) XeF_4
(B) Trigonal planar	(II) SF_4
(C) Square planar	(III) ClF_3
(D) See-saw	(IV) BF_3

A. (A) – I, (B) – (II), (C) – (III), (D) – (IV)

B. (A) – (III), (B) – (IV), (C) – (I), (D) – (II)

C. (A) – (III), (B) – (IV), (C) – (II), (D) – (I)

D. (A) – (IV), (B) – (III), (C) – (I), (D) – (II)

Q

23

Identity the incorrect statement for PCl_5 from the following.

A. In this molecule, orbitals of phosphorus are assumed to undergo $sp^3 d$ hybridization

B. The geometry of PCl_5 is trigonal bipyramidal.

C. PCl_5 has two axial bonds stronger than three equatorial bonds.

D. The three equatorial bonds of PCl_5 lie in a plane.

HW

Q

The correct order of increasing intermolecular hydrogen bond strength is

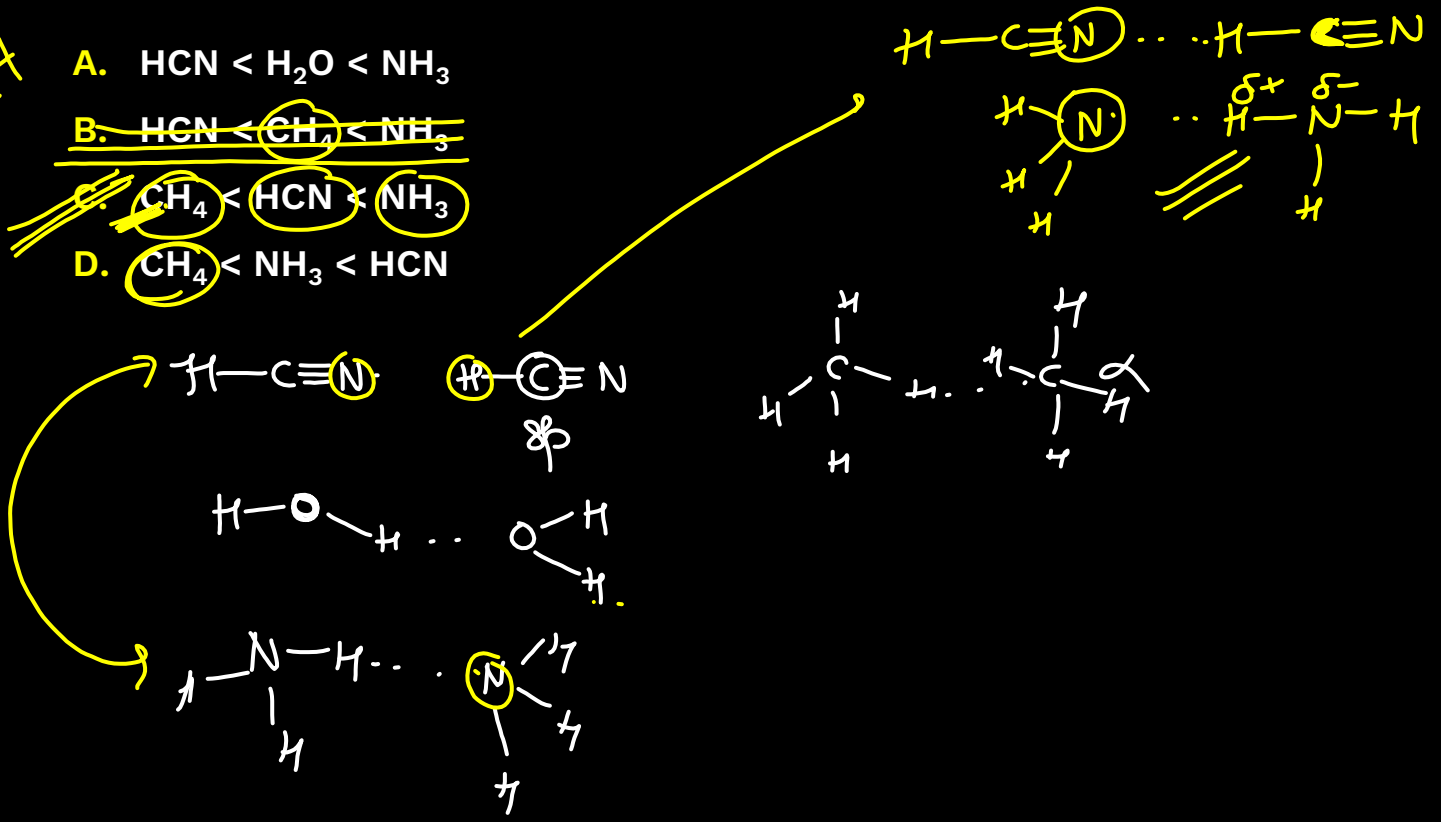
29

A. $HCN < H_2O < NH_3$

B. ~~$HCN < CH_4 < NH_3$~~

C. $CH_4 < HCN < NH_3$

D. $CH_4 < NH_3 < HCN$



Q

The hybridization of P exhibited in PF_5 is sp^xd^y. The value of y is_.

25

jee main 2022

1

sp^3d

In the structure of SF_4, the lone pair of electrons on S is in. 26

(A) equatorial position and there are two lone pair-bond pair repulsions at 90°

(B) equatorial position and there are three lone pair-bond pair repulsions at 90°

(C) axial position and there are three lone pair – bond pair repulsion at 90°.

(D) axial position and there are two lone pair – bond pair repulsion at 90°.

Arrange the following in the decreasing order of their covalent character :

(A) LiCl

(B) NaCl

(C) KCl

(D) CsCl

Question: Choose the **most appropriate** answer from the options given below :

(A) (A)> (C) > (B)> (D)

(B) (B) > (A) > (C) > (D)

(C) (A) > (B) > (C) > (D)

(D) (A) > (B) > (D) > (C)

28

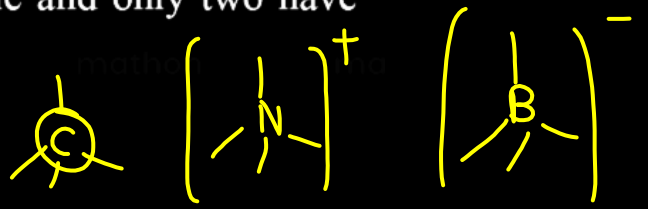
Consider the species CH_4, NH_4^+ and BH_4^-. Choose the correct option with respect to the there species:

(A) They are isoelectronic and only two have tetrahedral structures

(B) They are isoelectronic and all have tetrahedral structures

(C) Only two are isoelectronic and all have tetrahedral structures

(D) Only two are isoelectronic and only two have tetrahedral structures



6+4
10

7+4−1
10

5+4+1
10

Number of lone pair (s) of electrons on central atom and the shape of BrF_3 molecule respectively, are :

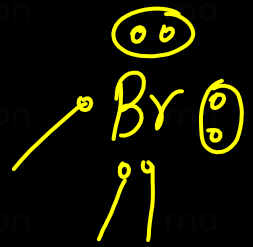
29

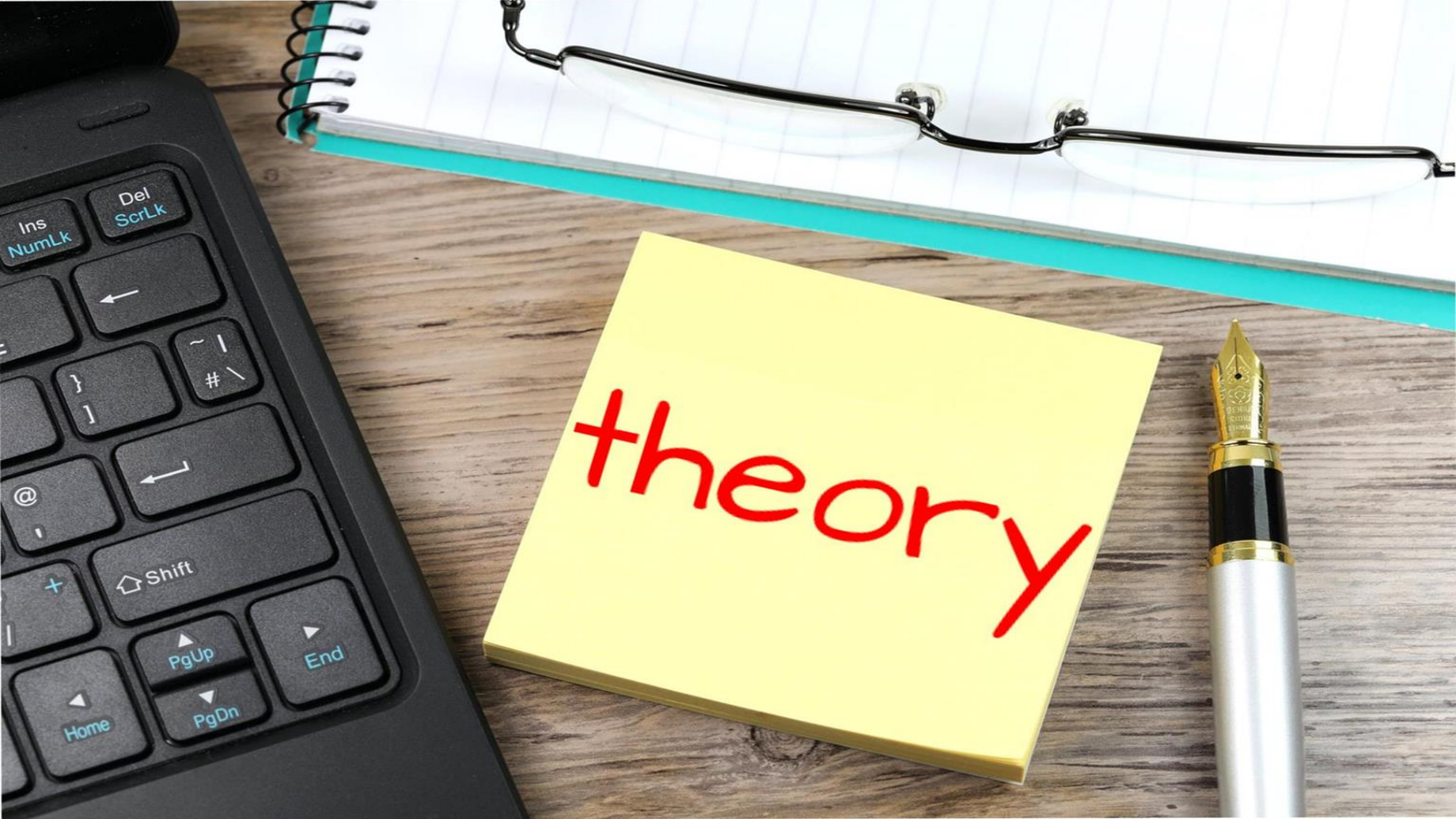
(A) 0, triangular planar.

(B) 1, pyramidal.

(C) 2, bent T-shape.

(D) 1, bent T-shape




theory

1

2

3

4

5

6

7

8

9.

10.

11

12

13

14

15

16

17

18

19

Section 1

Bond

A — A

Na^+ Cl^-

A_2 A_2

A — A required

A — A released

why?

F — F share → covalent

$Na \rightarrow 1s^2 2s^2 2p^6 3s^1$

$Na \rightarrow e^- + Na^+$

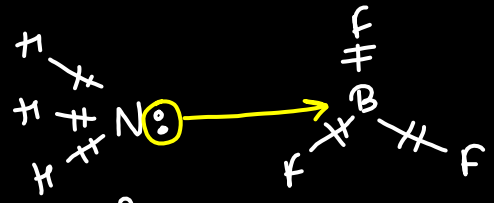
octet complete

$Cl + e^- \rightarrow Cl^-$

att

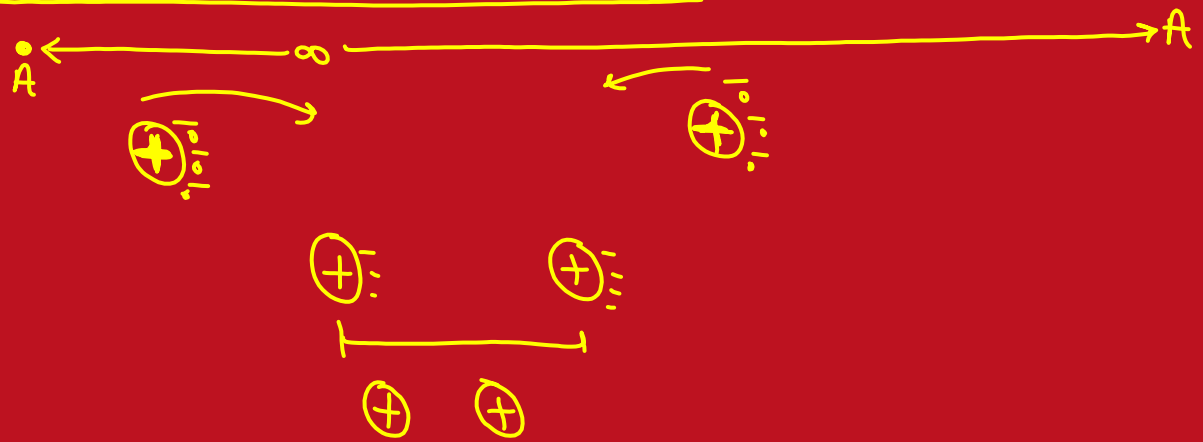
ionic Bond

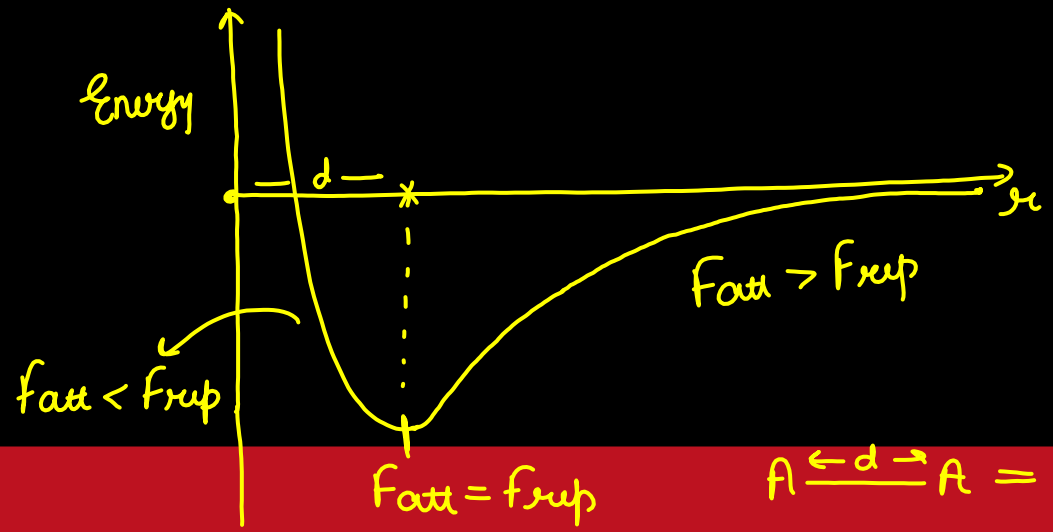
* Coordinate bond / dative bond



A : → B

* Reason for Bond formation





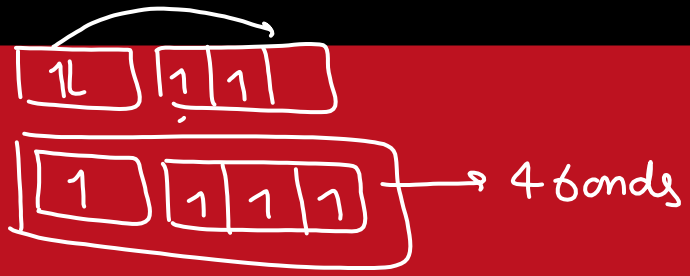
$A \xleftarrow{d} A$ = Bond length

Covalent Bond

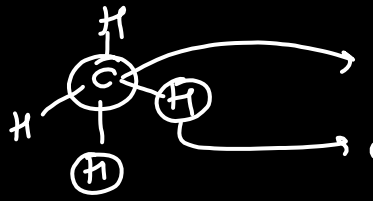
* sharing of (e⁻'s) → 2e⁻

* कितने covalent bond will be formed = no of unpaired e⁻
  how many
  - gnd state
  - excited state

* C → ~~1s²~~ 2s² 2p²



Structure of molecules

1 

2 central ⟶ less in eneg. bigger in size ⟶ covalency ↑ (no of bonds formed)

3 H, F, O^- ⟶ can be only side atom

4 $O = 1s^2 2s^2 2p^4$

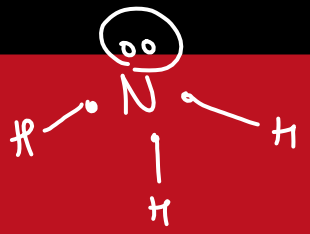
$\bar{O} = 1s^2 2s^2 2p^5$

5 NH_3, H_2O, SO_4^{2-}, $\overset{+}{N}H_4$, PCl_5, SF_4, NO_2^-, etc...

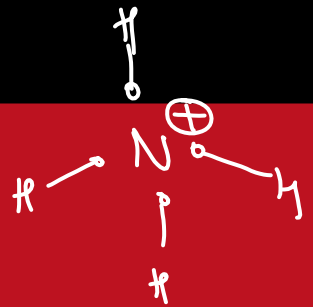
molecule has ⊖, & ⊙ ⟶ O

+ve or −ve ⟶ central atom

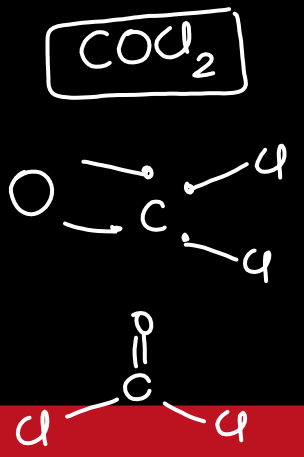
$\ddot{N}H_3$

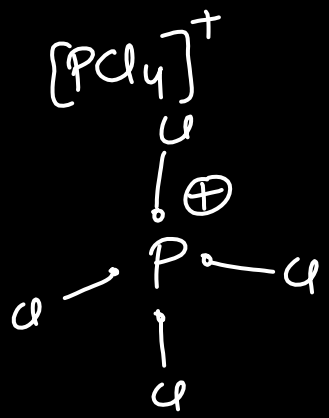


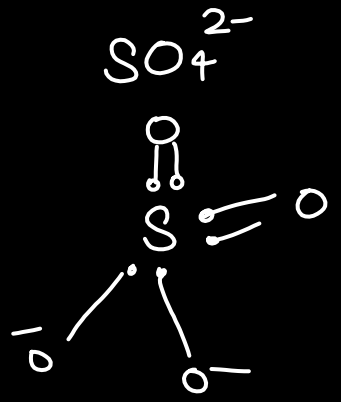
NH_4^+



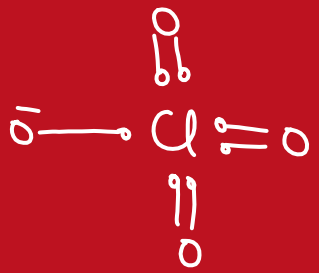
NO_2^-


$COCl_2$


$[PCl_4]^+$

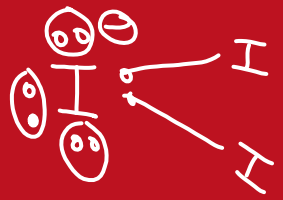

SO_4^{2-}

$[ClO_4^-]$



I_3^-

II_2^-



Lewis Octet Rule

every atom → outermost shell → (8e⁻)

(H) → 2e⁻

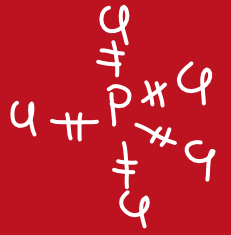
* $BeCl_2$ Cl ← (Be) → Cl

4e⁻ < 8e⁻

BF_3 → 6e⁻

} hypovalent compound

* PCl_5



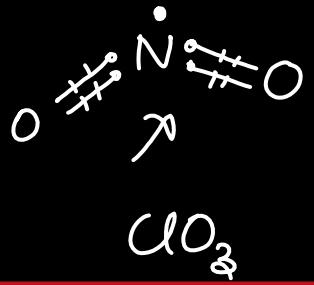
10e⁻ > 8e⁻

} hypervalent compounds

SF_6

(12e⁻)

* NO_2

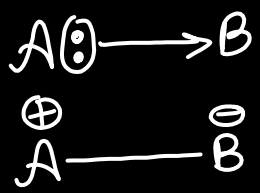


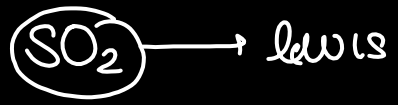
ClO_2

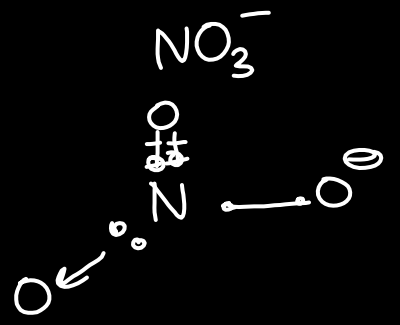
* Xe → inert gas — octet complete

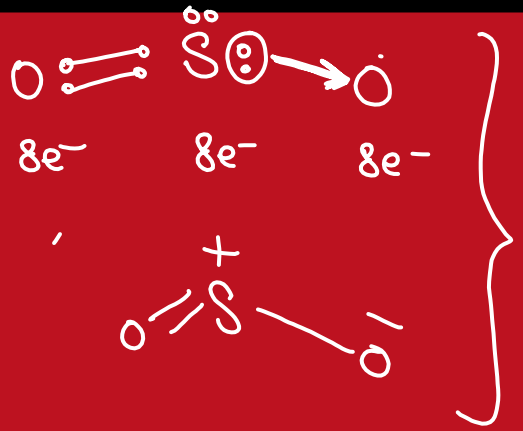
XeO_3 $XeOF_4$ XeF_6 → ?

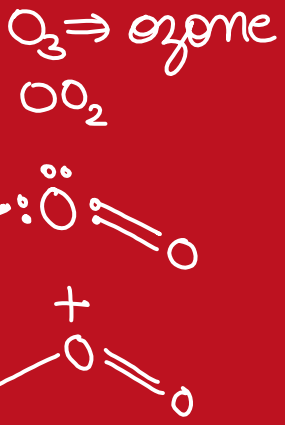
Coordinate Bond











Q. N_2O → इस नो मरो

N_2O NO CO

laughing gas

$N \equiv N \rightarrow O$

$N \equiv \overset{+}{N} - \overset{-}{O}$

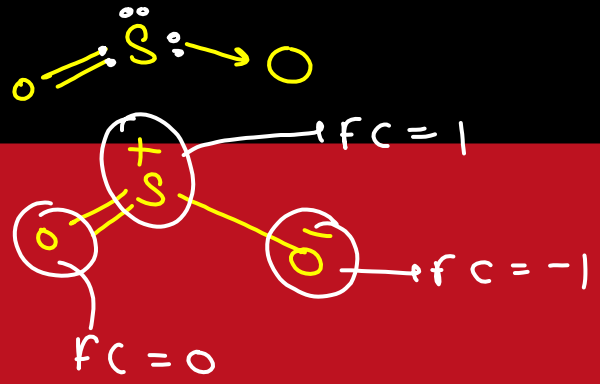
Formal Charge

SO_2

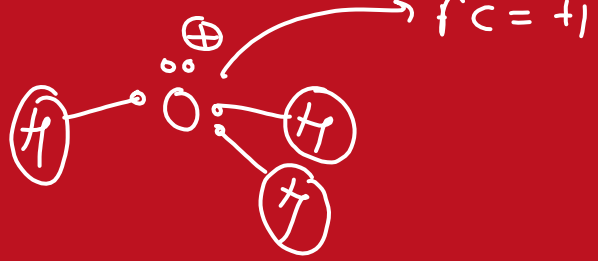
Lewis dot st

S → $3s^2 3p^4$

6e⁻



Q. H_3O^+ · hydronium ion

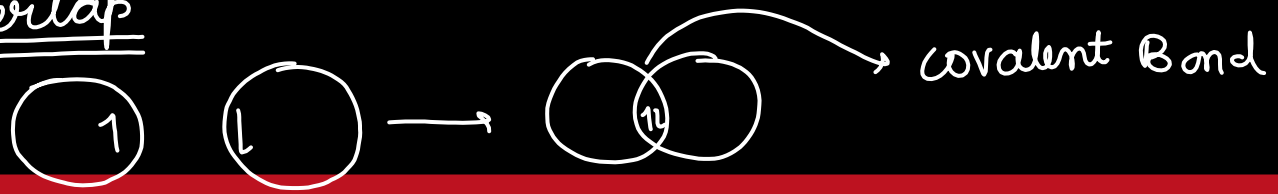


Section 2 — Valence Bond Theory (VBT)

1 Bond ⟶ valence e⁻s

O ⟶ $1s^2 2s^2 2p^4$

* **Overlap**



* Directional in nature

* internuclear axis

N_2 ⟶

N ⟶ ~~$1s^2$~~ $2s^2 2p^3$

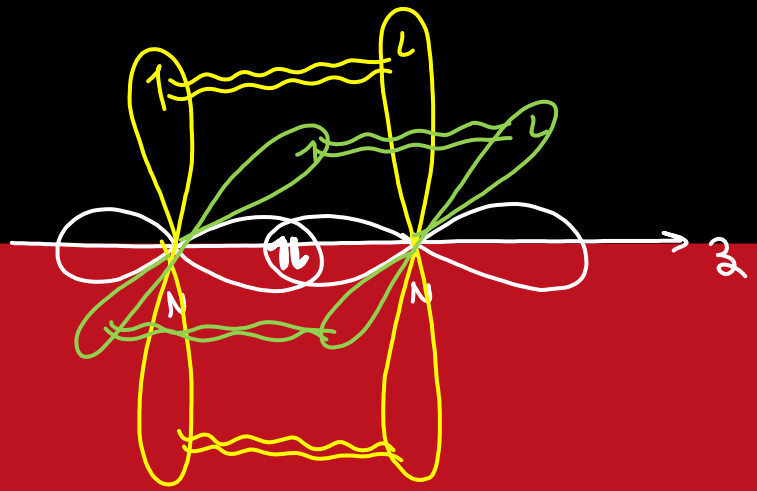
N ⟶ [↿⇂] [↿] [↿] [↿]

$2p_x$ $2p_y$ $2p_z$

N ⟶ [↿⇂] [↿] [↿] [↿]

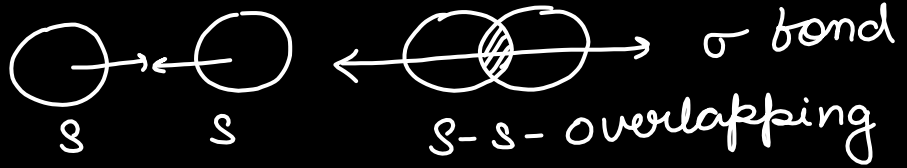
$2p_x$ $2p_y$ $2p_z$

O_2 ⟶ h.w



Overlapping के Types

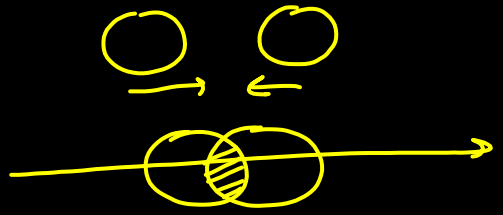
Coaxial. Head to Head overlap : along the internuclear axis



Colateral / Sideways ⊥ to the internuclear axis

adv

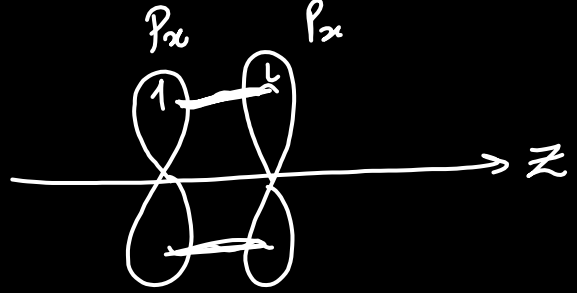
① S–S overlap



S–S overlap
σ bond

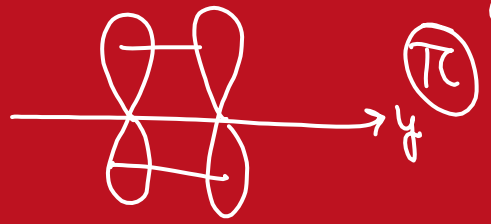
② P–P- overlapping
σ bond

③



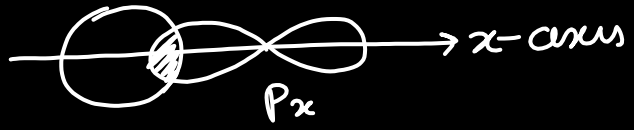
P–P overlap
π bond

④ P_z, P_z overlap
along y-axis →
Bond type= ?



adv

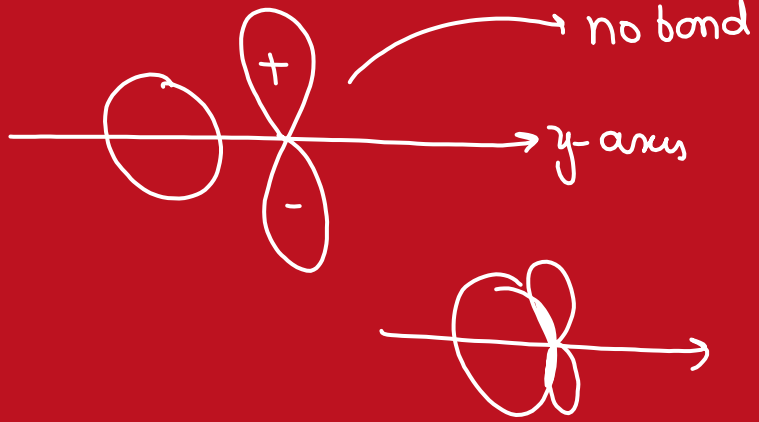
(5)



σ- bond

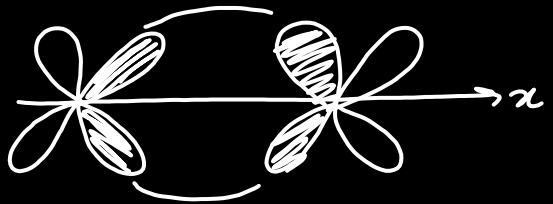
s-p overlap

(6)



ado.

(7). dxy – dxy along x-axis

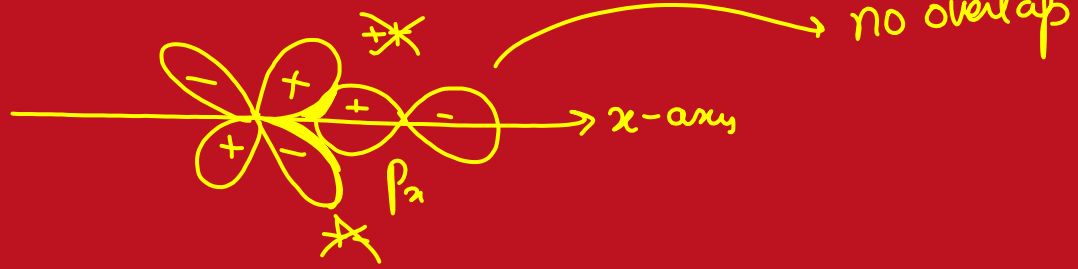


π- bond

dxy – dxy → along z axis

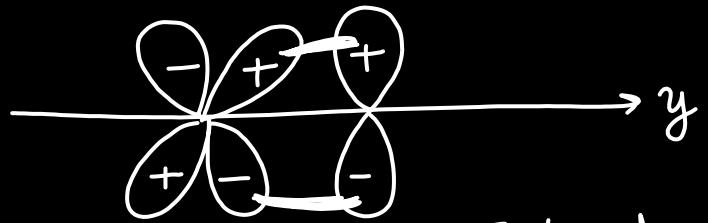
δ-bond

(8). dxy & p_x overlap along x axis



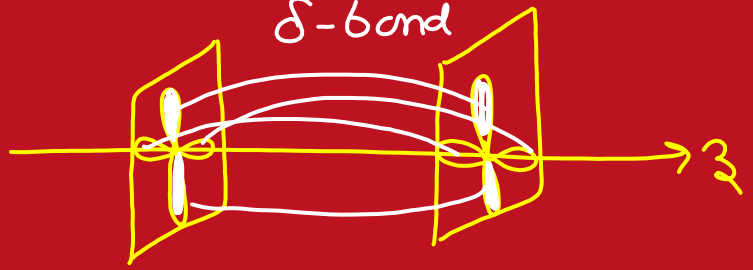
no overlap

d_{xy}, p_x overlap along y-axis



p_x π-bond

Q. $d_{x^2-y^2}$ - $d_{x^2-y^2}$ along z axis



* Bond strength.

① coaxial overlap >>>> colateral overlap

② 1s–1s > 2s–2s > 3s–3s

③ 2s–2s < 2s–2p < 2p–2p [along the axis]

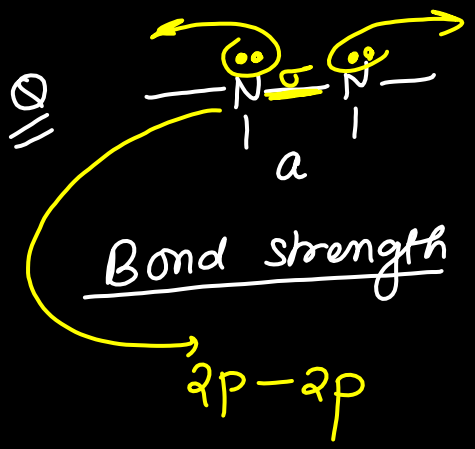
Q The strongest Bond among the following.

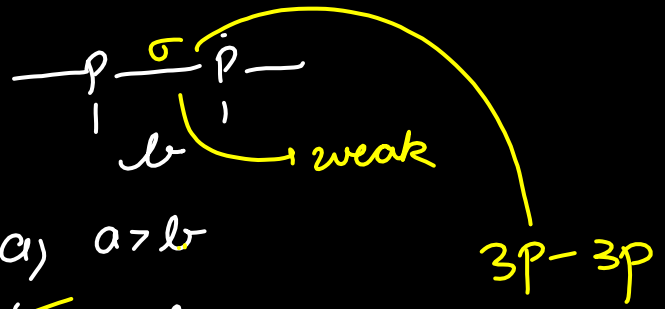
a) 1s–2p

c) 1s–3p

b) 1s–4p

d) 1s–5p





Bond strength

a) $a > b$

~~b) $a < b$~~

c) $a = b$

d) can't be compared

Q Yuman PYQ 2019

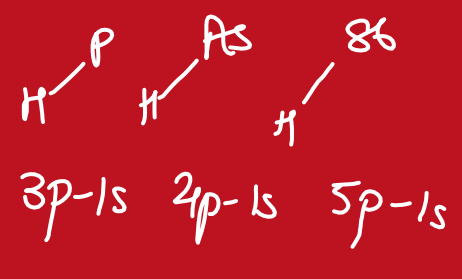
Bond strength of the following

~~a) $NH_3 > PH_3 > AsH_3 > SbH_3$~~

b) $NH_3 < PH_3 < AsH_3 < SbH_3$

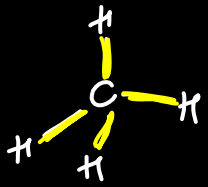
c) $NH_3 = PH_3 = AsH_3 = SbH_3$

d) $PH_3 > NH_3 > AsH_3 > SbH_3$



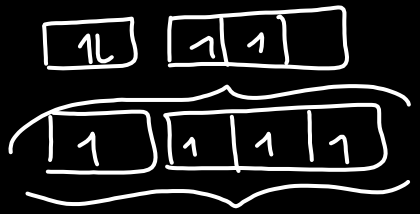
hybridization

CH_4



$C \longrightarrow 1s^2 2s^2 2p^2$

C^*



redistribution of energy

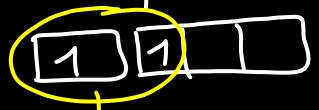
sp^3 hybrid orbitals

BA = 109°28' or 109.5°

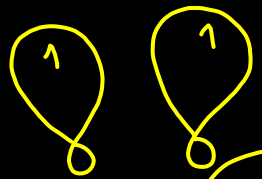
Tetrahedral

① $BeCl_2$ $Cl-Be-Cl$

$Be \longrightarrow 1s^2 2s^2 2p^0$

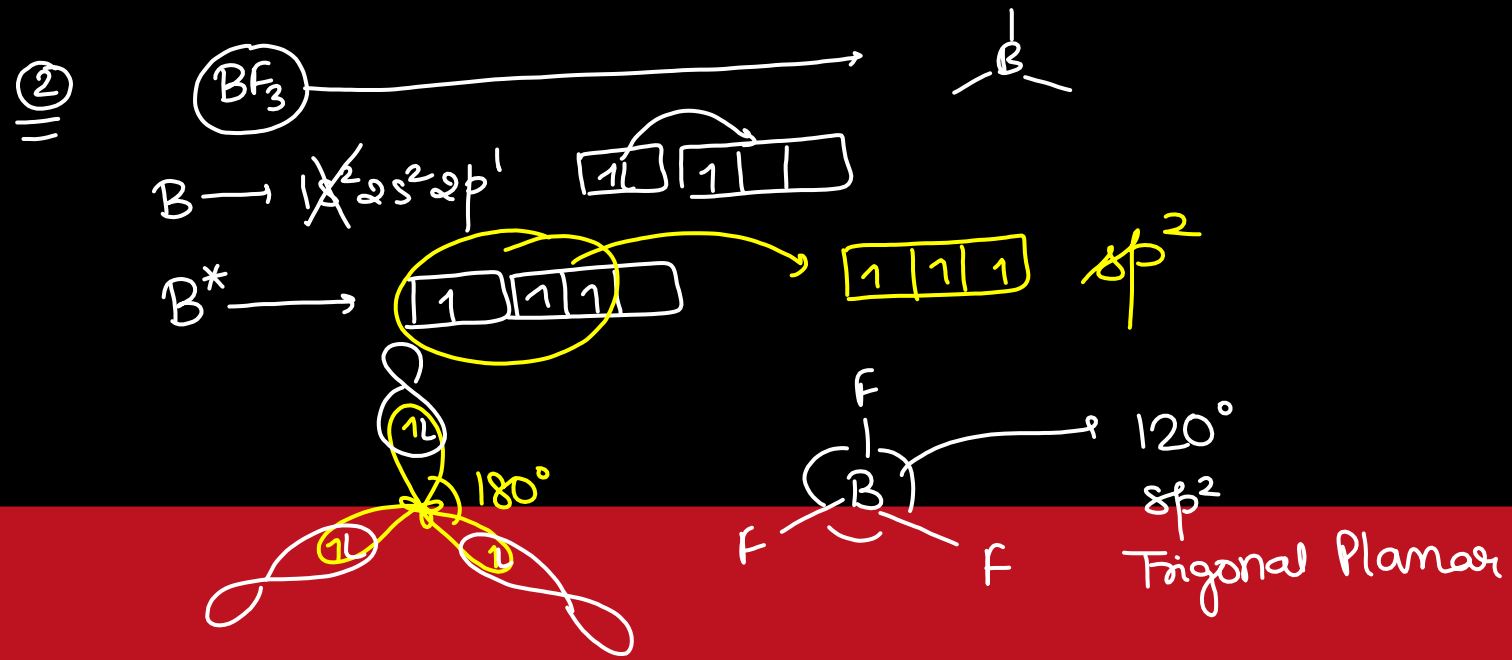
$Be^* \longrightarrow$ 

atomic orbitals



Hybrid orbitals → e^- cloud

linear, sp


2
BF_3
B
$B \rightarrow 1s^2 2s^2 2p^1$
$B^* \rightarrow$
sp^2
180°
F
F
F
120°
sp^2
Trigonal Planar

Participation of d-orbital in hybridization

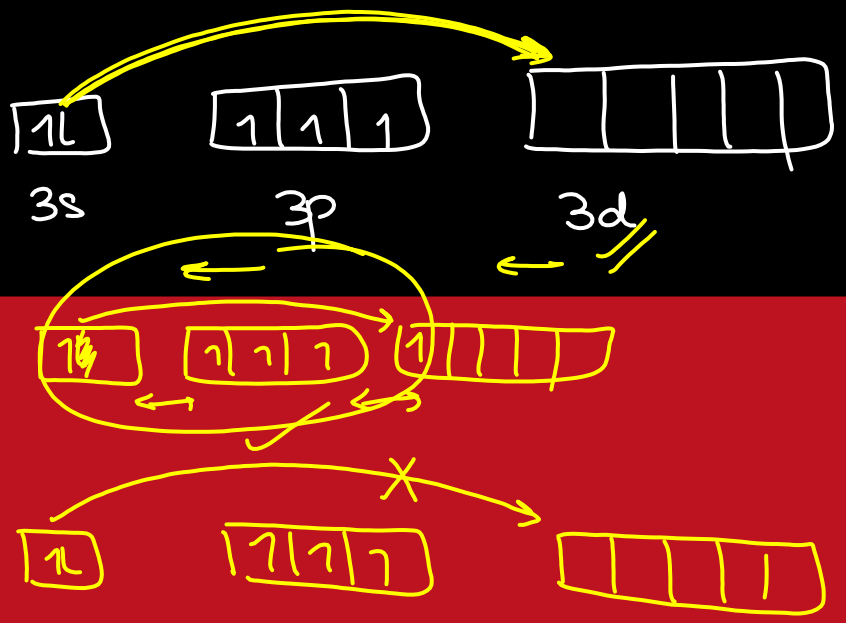
Q. PCl_5 ✓

PH_5 ×

δ^+ δ^-

PCl_5

$P \longrightarrow 3s^2 3p^3$



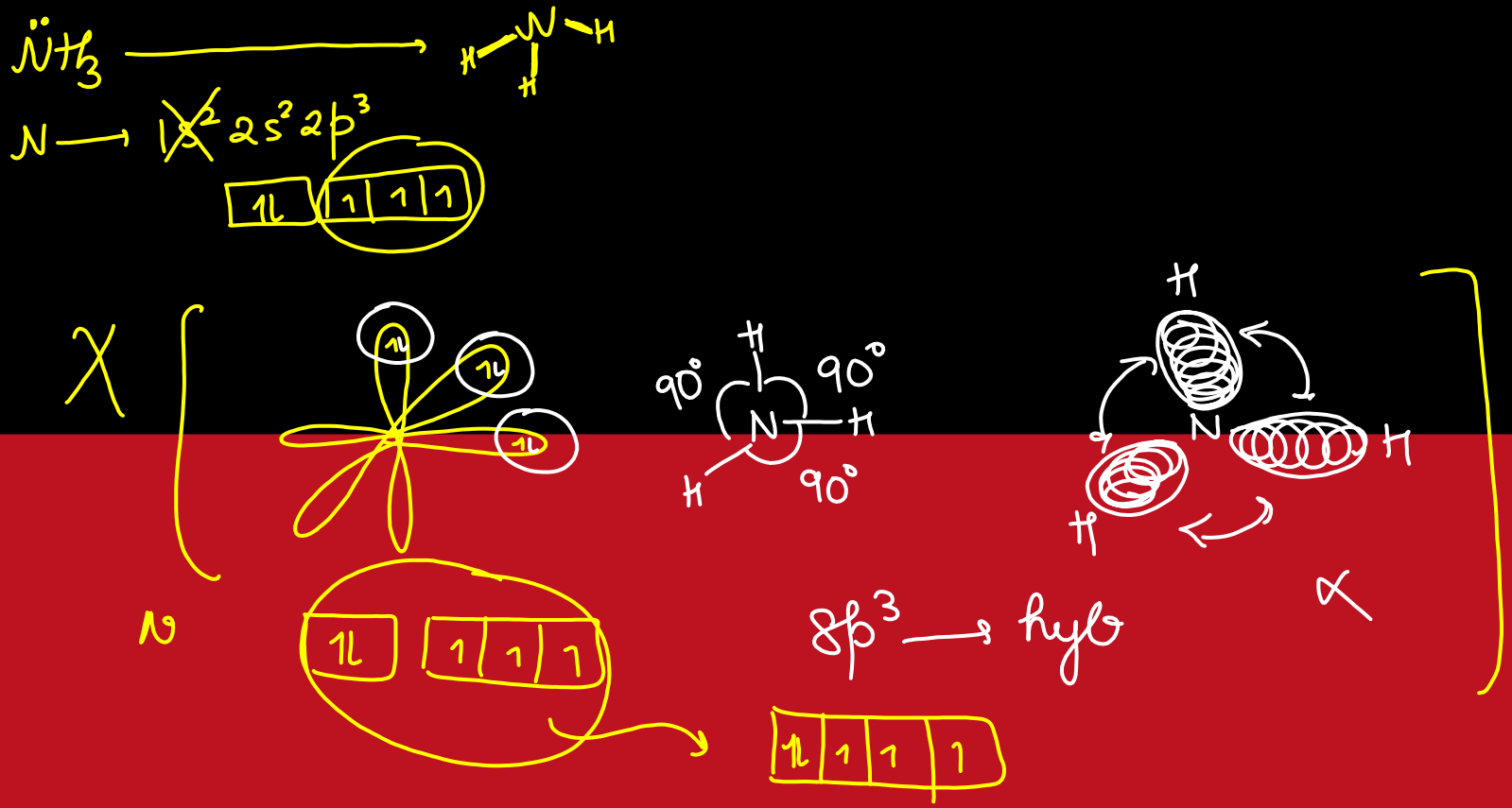
p^* ⟶

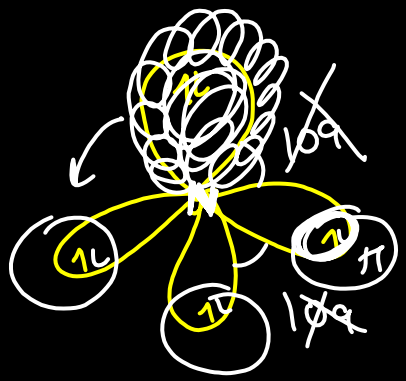
δ^+

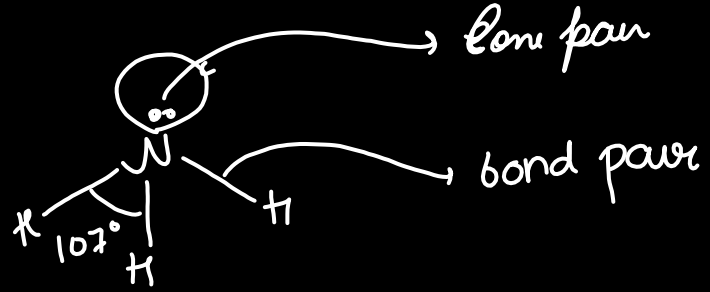
PCl_5

δ^-

PH_5


NH3
N → 1s² 2s² 2p³
90°
90°
90°
N
sp³ → hyb





* Electronic geometry → all e⁻ pair 3D → BP + l.p

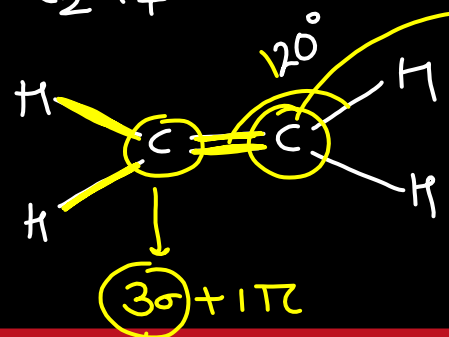
Tetrahedral

Shape bp ✓ lp ✗

Triangular Pyramidal

* ethene

C_2H_4



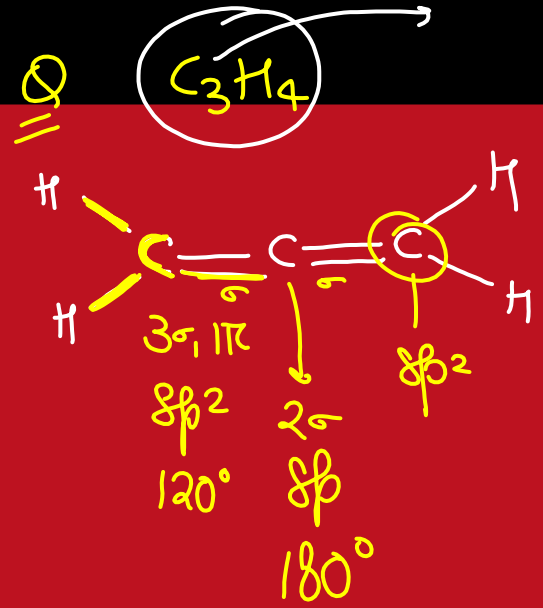
3σ, 1π → sp^2 → planar

* ethyne

H—C≡C—H

2σ + 2π

sp 180° linear



hyb → $\sigma + \pi p$

$\sigma + \pi p$ → 2 → sp

→ 3 → sp^2

→ 4 → sp^3

→ 5 → sp^3d

→ 6 → sp^3d^2

→ 7 → sp^3d^3

sp → $s + p_x$ or p_y or p_z

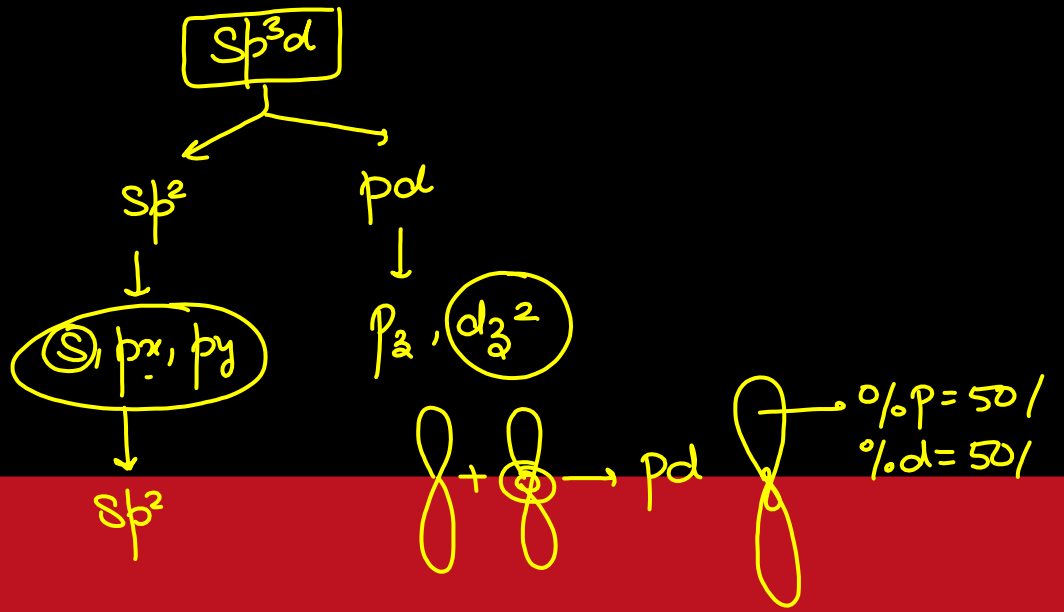
sp^2 → $s + p_x + p_y$

sp^3 → $s + p_x + p_y + p_z$

sp^3d → jee PYQ

sp^2 → s, p_x, p_y

pd → p_z, d_{z^2}



xy Plane

$\%s = \frac{1}{3} \times 100 = 33.33\%\ s$

$\%p = \frac{2}{3} \times 100 = 67\%\ p$

Axial bonds

S-less bond

long, weak

/p = 50

/d = 50

/s = 0

equatorial bond

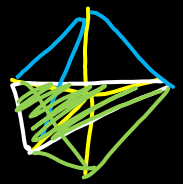
33/s

67/p

Shorts

Strong

sp^3d →



Trangular bipyramidal

sp^3d^2

$s + p_x + p_y + p_z + d_{x^2-y^2} + d_{z^2}$

Square bipyramidal

$\%s = \frac{1}{6} \times 100$

$\%p = \frac{3}{6} \times 100$

$\%d = \frac{2}{6} \times 100$

8

Octahedral

90°, 180°

faces

VSEPR Theory

Valence shell electron pair repulsion theory

① lp − lp > lp − bp > bp − bp

② multiple bond − multiple bond > multi − single > single − single

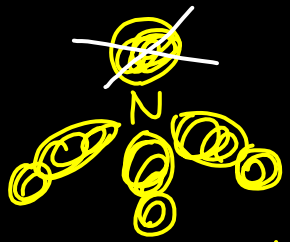
CH_4

tetrahedral — electronic geo

CH_4

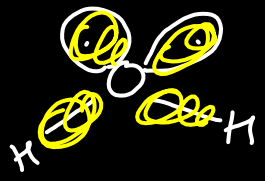
Shape

tetrahedral



e⁻ geo – tetrahedral

Shape – Pyramidal



e⁻ geo – tetrahedral

Shape → bent/V

VSEPR

$\sigma = 2$

$lp = 0$

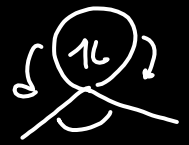
linear, sp

$\sigma = 3$

$lp = 0$

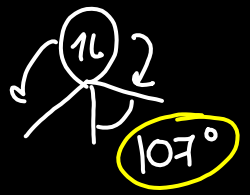
Trigonal planar, sp^2

$\sigma = 2$
$lp = 1$
3
sp^2



Bent / V

$\sigma = 3$
$lp = 1$
4
sp^3

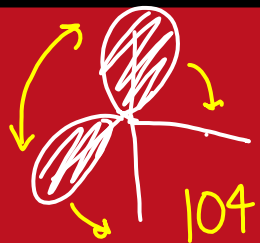


Pyramidal

$\sigma = 4$
$lp = 0$
4
sp^3

tetrahedral

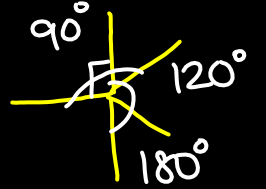
$\sigma = 2$
$lp = 2$
4
sp^3



bent / V

104.5°

$\sigma = 5$
$lp = 0$
5
sp^3d



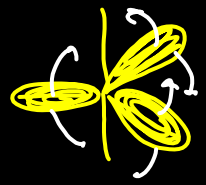
Trigonal bipyramidal
TBP

☆

lp ♡ to go to the orbital with more % s character

lp ♡ nucleus

$\sigma = 2$
$lp = 3$
5 → sp^3d



Linear
180°

$\sigma = 4$
$lp = 1$
5
sp^3d

See-saw

$\sigma = 3$
$lp = 2$
5 sp^3d

Bent
T-shaped
< 180°

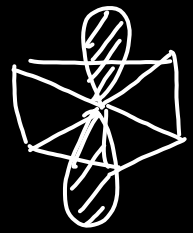
$\sigma = 6$
$lp = 0$
6
sp^3d^2

Sq bipyramidal

$\sigma = 4$
$lp = 2$
6
sp^3d^2

Square planar

$\sigma = 5$
$lp = 2$
7
sp^3d^3



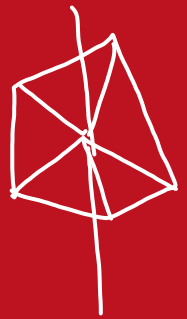
Pentagonal planar

$\sigma = 5$
$lp = 1$
6
sp^3d^2

Square Pyramidal

$\sigma = 7$
$lp = 0$
$7 \longrightarrow sp^3d^3$

Pentagonal bi-pyramidal



☆ jee adv

$\boxed{sp^3d^3}$

$\sigma = 6$

$lp = \underline{1}$

$\underline{7}$

$\boxed{\text{नटखट case}}$

$\sigma = 6$
$lp = 1$
active lp

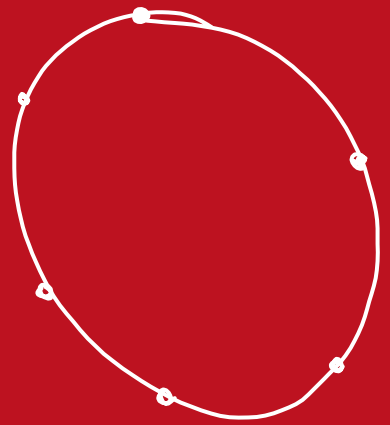
$\sigma = 6$
$lp = 1$
inactive lp.

Natkhat Case- 1

$\boxed{XeF_6 \text{ and } IF_6^-}$

participate ← hyb

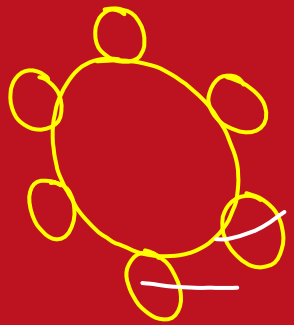
$\left.\begin{array}{l}\sigma = 6 \\ lp = 1\end{array}\right\}$ 7 → sp^3d^3 →



Natkhat - Case 2. → inactive l.p

ClF_6^-

6σ }
1 lp }



lp doesnt participate in hyb

lp → pure s-orbital

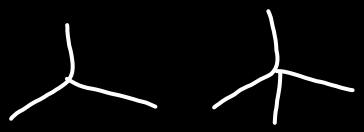
p^3d^3

→ lp pure s-

Perfect octahedral

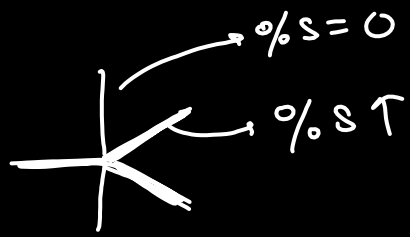
✱ Bent's Rule

sp^2, sp^3



lp

sp^3d



lp ⟶ equatorial pos

adv

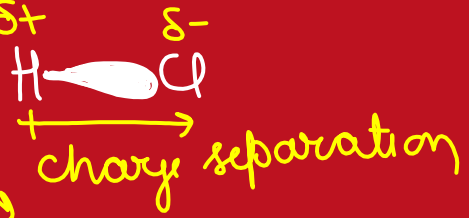
sp^3d

↳ more e neg atom

↳ wants to go to that orbital which has less I.S

Polar ⟷ Non-Polar Molecules

Dipole moment

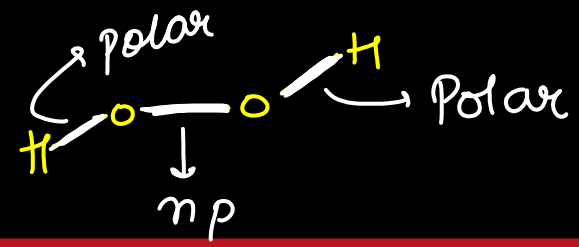


$\mu = q \times d$

Dipole

H—H $\mu = 0$ non-polar bond

H—Cl $\mu \neq 0$ Polar bond

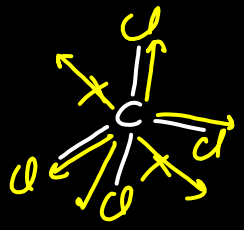


linear, 180°, $\mu = 0$

bonds are polar

molecule is non-polar

CCl_4 → Polar / non-polar



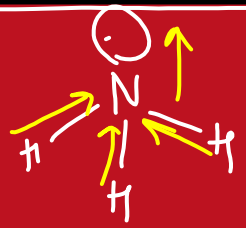
$\mu = 0$

A NH_3 B NF_3

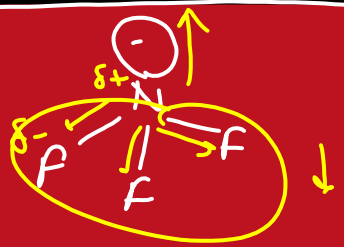
a) A is more polar than B
b) A is less
c) A is =
d) Not comparable.

① e⁻ cloud – symmetrical
non-polar

②



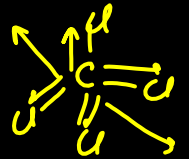
$\mu = \uparrow$



Repeat jii Que

Q. CH_3Cl CH_2Cl_2 $CHCl_3$ ~~CCl_4~~

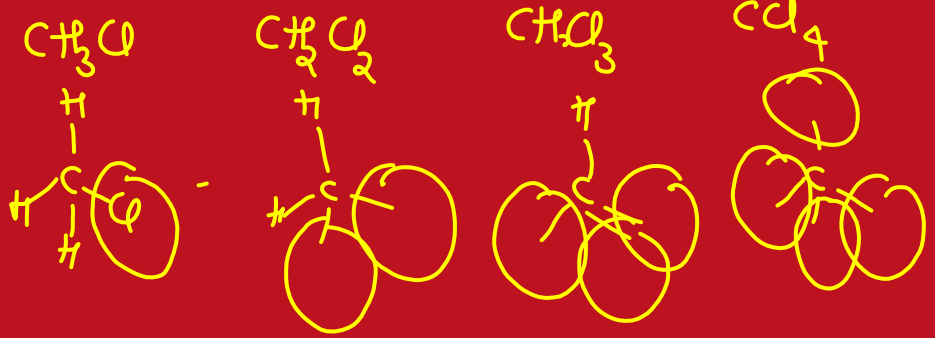
- 2018
- 2019
- 2020
- 2021
- 2022



$\mu = 0$

$$\mu = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2\cos\theta}$$

Side atom ka size ↑
repulsion ↑
θ ↑
$\cos\theta$ ↓
μ ↓



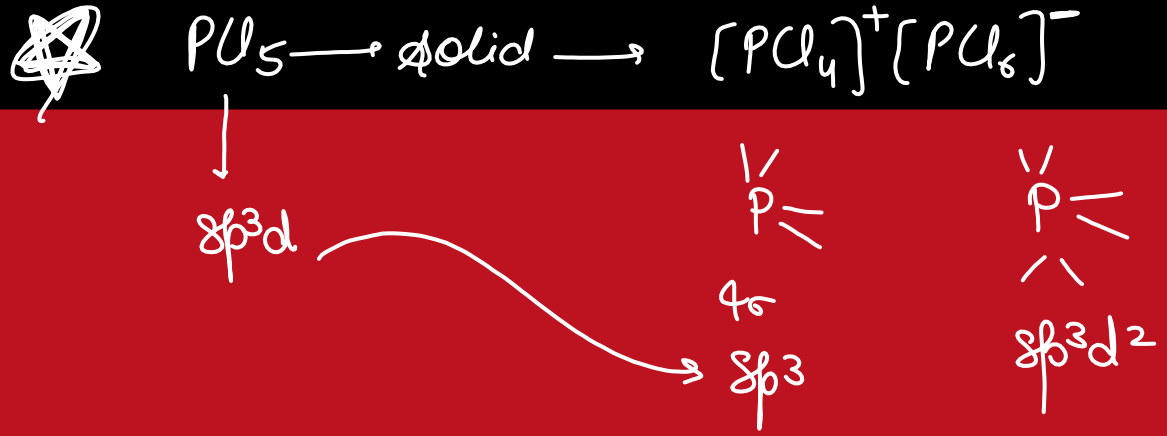
Hyb in s/l/g state

PF_5 ⟶ gaseous ⟶ sp^3d

PF_5 ⟶ solid ⟶ sp^3d

PCl_5 ⟶ Gaseous ⟶ sp^3d

PCl_5 ⟶ solid ⟶ $[PCl_4]^+[PCl_6]^-$



sp^3d PBr_5 solid ⟶ ~~$PBr_4^+ PBr_6^-$~~

PBr_5 ↓

$[PBr_4]^+Br^-$

sp^3

N_2O_3 (s) NO^+ NO_2^-

N_2O_4 (s) NO^+ NO_3^-

N_2O_5 (s) NO_2^+ NO_3^-

→ group 15 table

Drago's rule / compounds → 92° – 94°

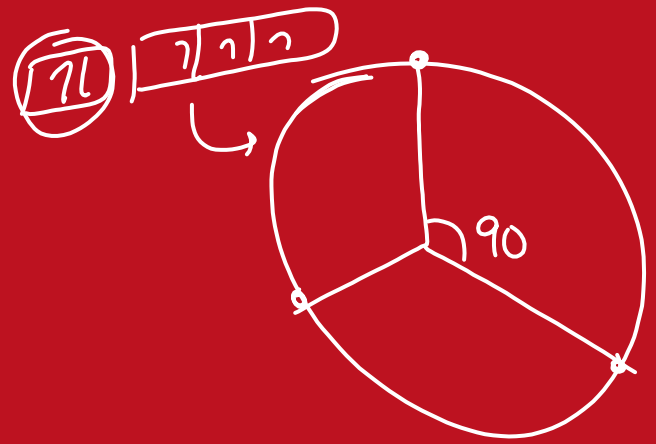
no hybridization.

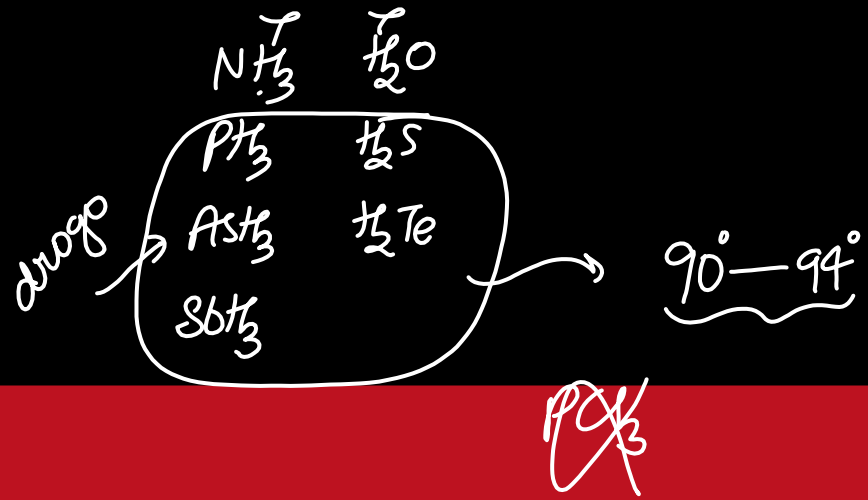
NH_3 → sp^3 → 107°

$\ddot{P}H_3$ → sp^3 → ≃

≃ 90°

NH_3




NH_3 H_2O
PH_3 H_2S
AsH_3 H_2Te
SbH_3
drop
90°—94°
PCl_3

Molecular Orbital Theory

① VBT → fail

↳ Oxygen (g)

O = O

all e^-s are paired dimag

→ O_2 ⇒ para

② 1 bond
2 bond
3 bond

? { 2 5 bond
1 5 bond }

ex NO ?

③ VBT – bond → colour ?

MOT

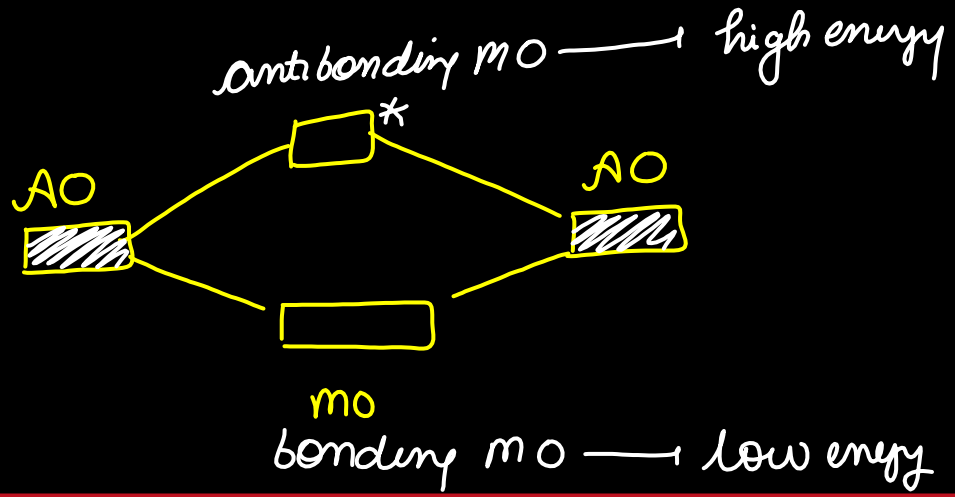
① atom → e^- → atomic orbitals
molecule → e^- → molecular orbital

② atom + atom → molecule
AO AO MO

③ no. of AO = no of MO formed

④ Hund's rule, Aufbau, Pauli's → rules → e^- in M.O

(5)



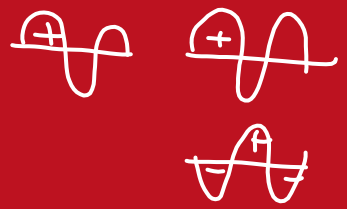
* jiu adv.

LCAO

Linear combination of Atomic Orbitals

atom A — atom B

wave function $\psi_A \longleftrightarrow \psi_B$



$\psi_A + \psi_B$

$\psi_A^2 + \psi_B^2 + 2\psi_A\psi_B$

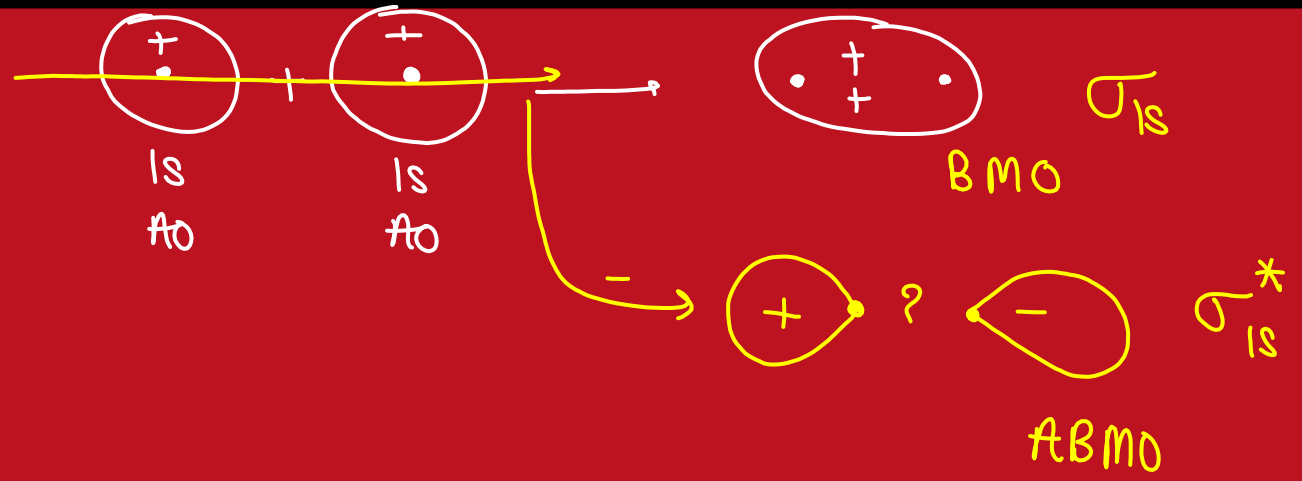
bonding MO

$\psi_A - \psi_B$

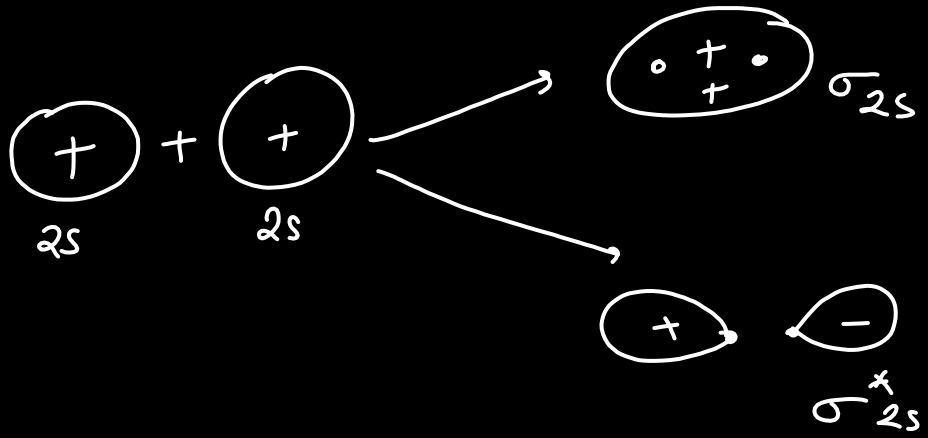
$\psi_A^2 + \psi_B^2 - 2\psi_A\psi_B$

Antibonding MO

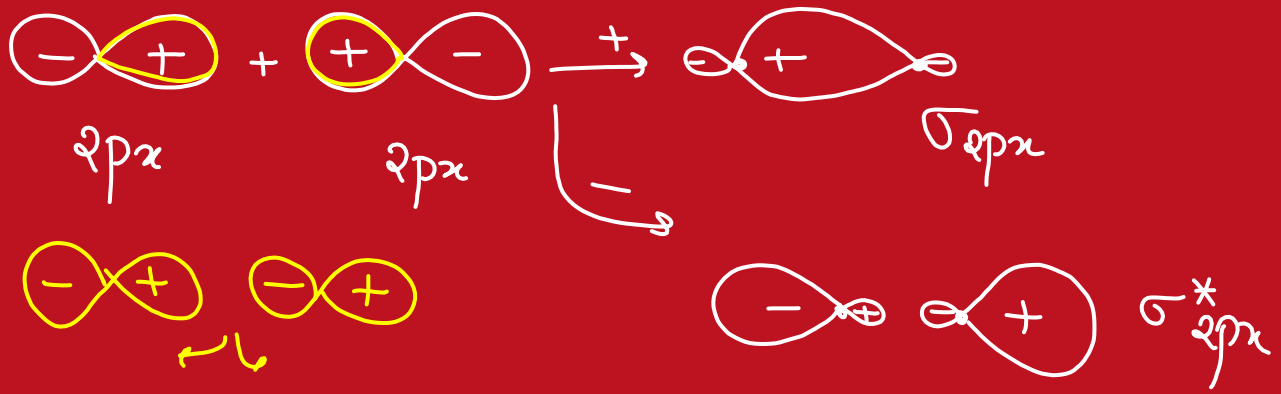
Case 1.



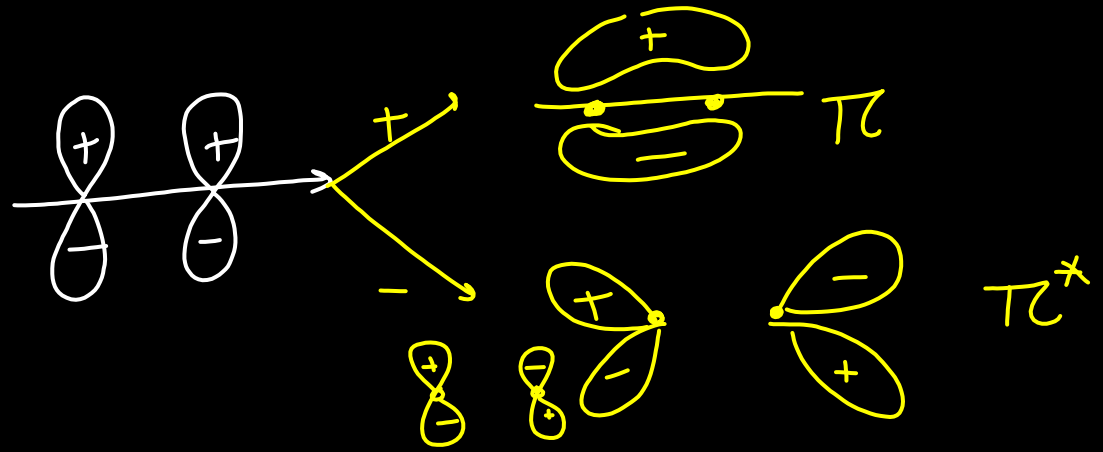
Case 2



Case 3



Case 4.



Gerage & Ungrade

cos wrt. phase

no cos. wrt phase

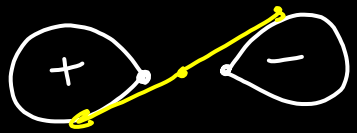
s → gerade

p → ungerade

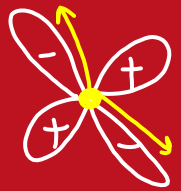
σ_{1s}

gerade

σ^*_{1s}



ungerade

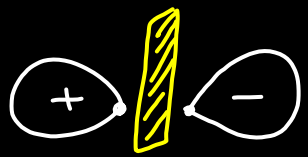


d → gerade

Nodal plane

σ_{1s}

nodal plane = 0

σ^*_{1s} 

nodal plane = 1

σ_{2p_z}

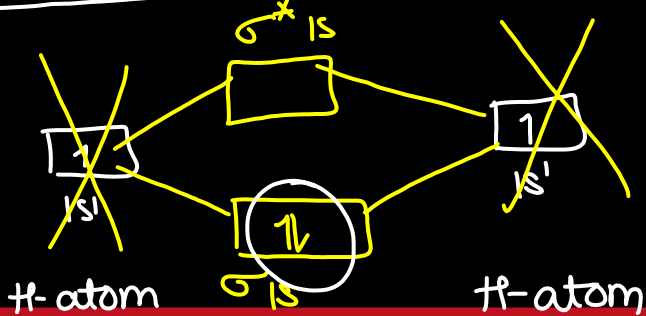
nodal plane = 2

$\sigma^*_{2p_z}$

nodal planes = 3

MOD

Molecular Orbital Diagram

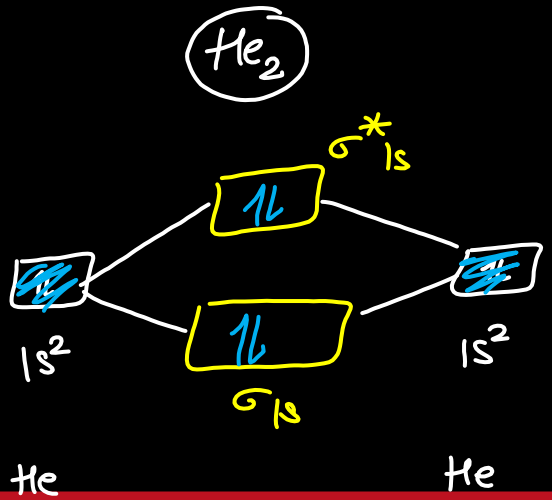


BO

Bond order = $\frac{1}{2}$ [no of e^- in BMO − no. of e^- in ABMO]

$= \frac{1}{2}[2-0] = 1$

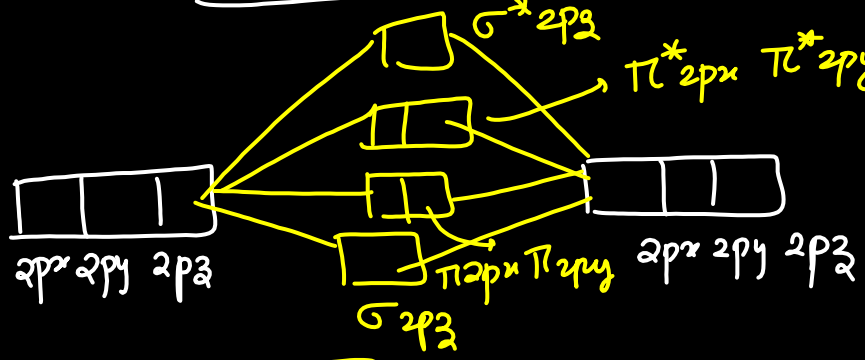
H—H

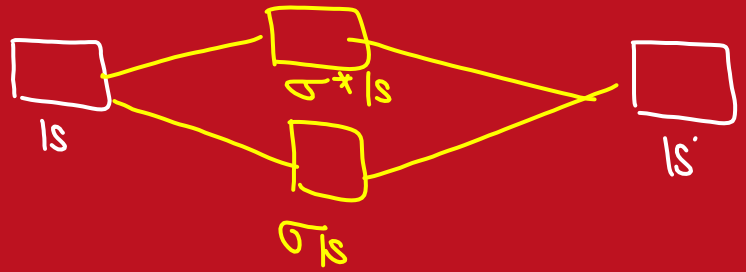


$\frac{1}{2}(2-2) = 0$

He_2 → doesn't exist

Z internuclear axis.

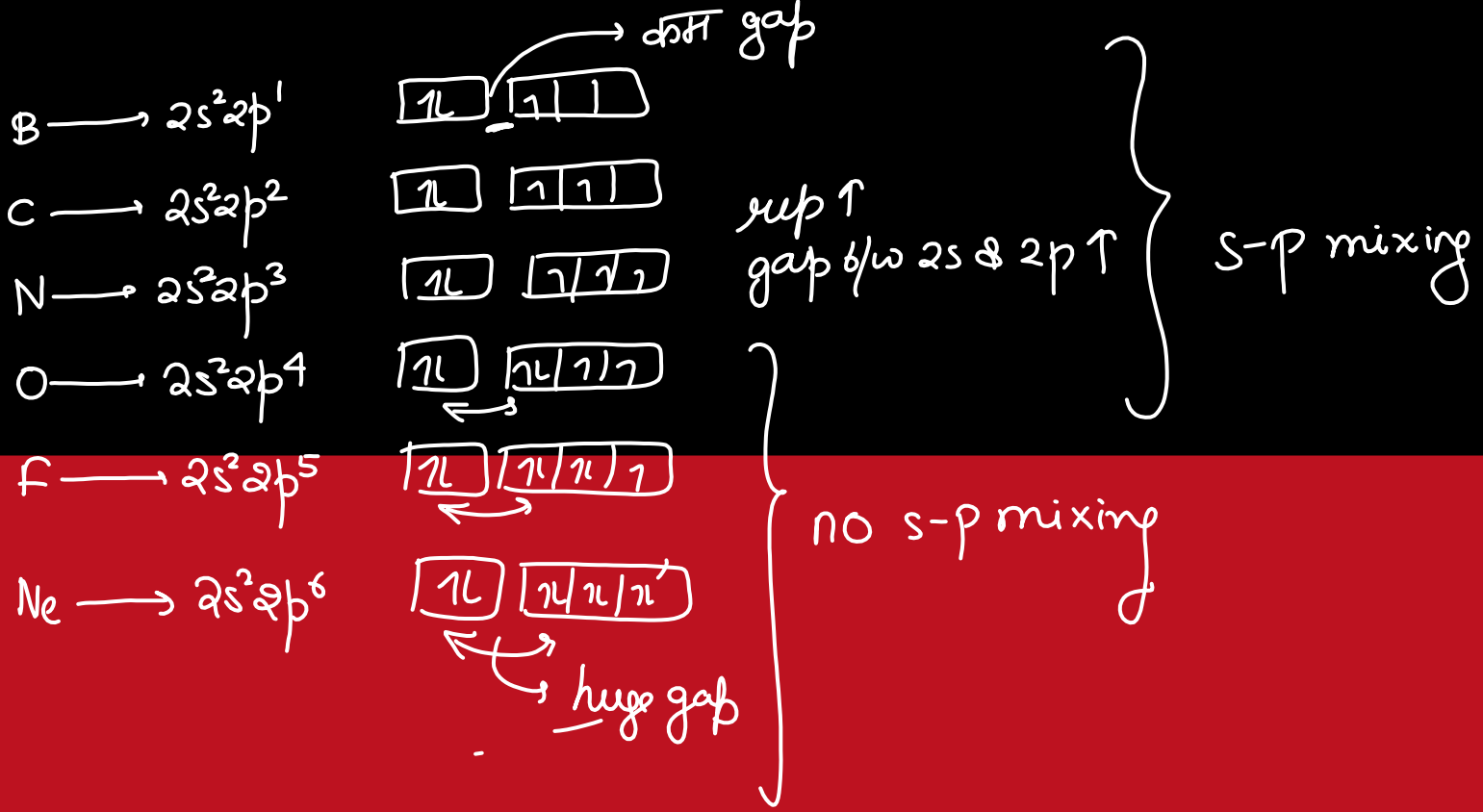


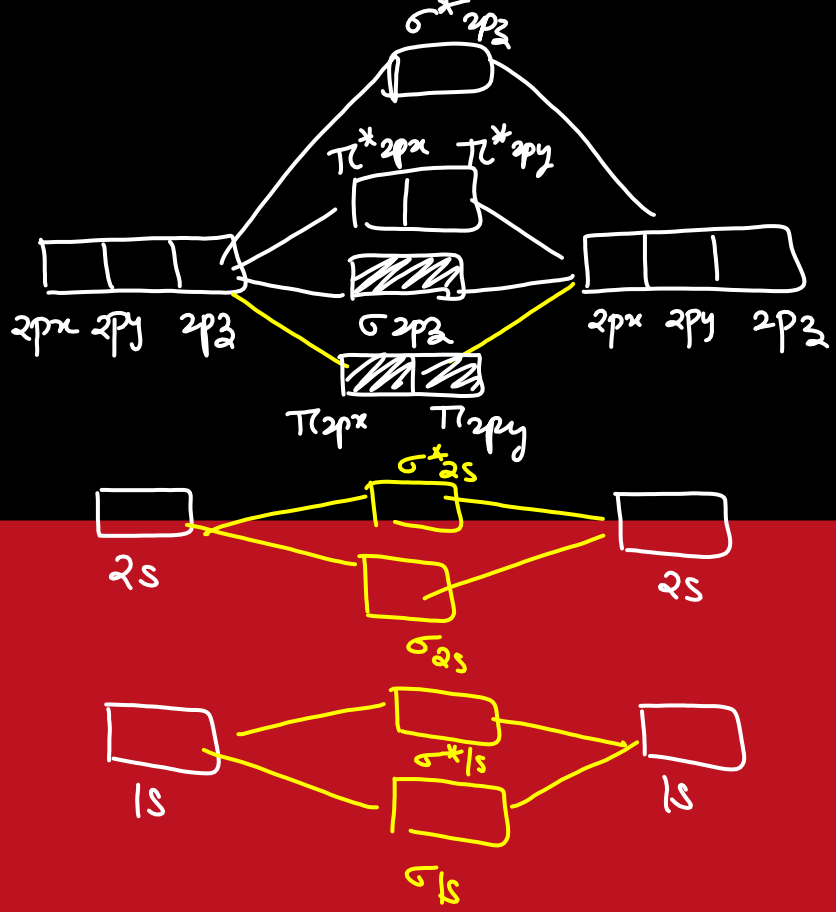


F_2 O_2 Ne_2

स्थितेदारों

O_2^+ O_2^- O_2^{2-} O_2^{+2}


B ⟶ 2s²2p¹
C ⟶ 2s²2p²
N ⟶ 2s²2p³
O ⟶ 2s²2p⁴
F ⟶ 2s²2p⁵
Ne ⟶ 2s²2p⁶
small gap
sup ↑
gap b/w 2s & 2p ↑
S-P mixing
no s-p mixing
huge gap

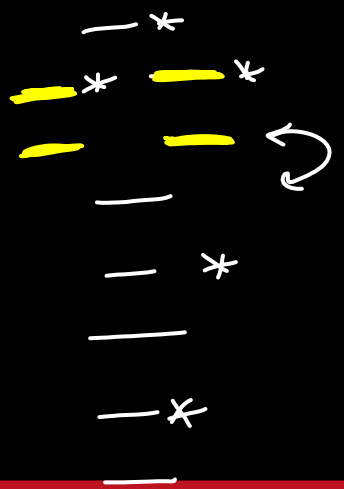


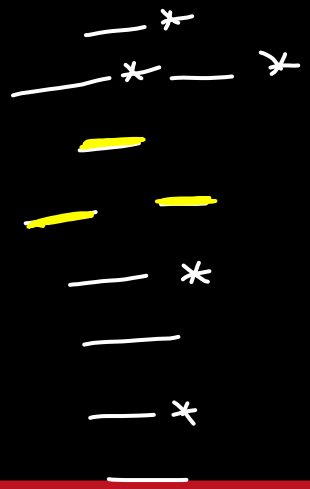
s-p-mixing

B_2, C_2, N_2

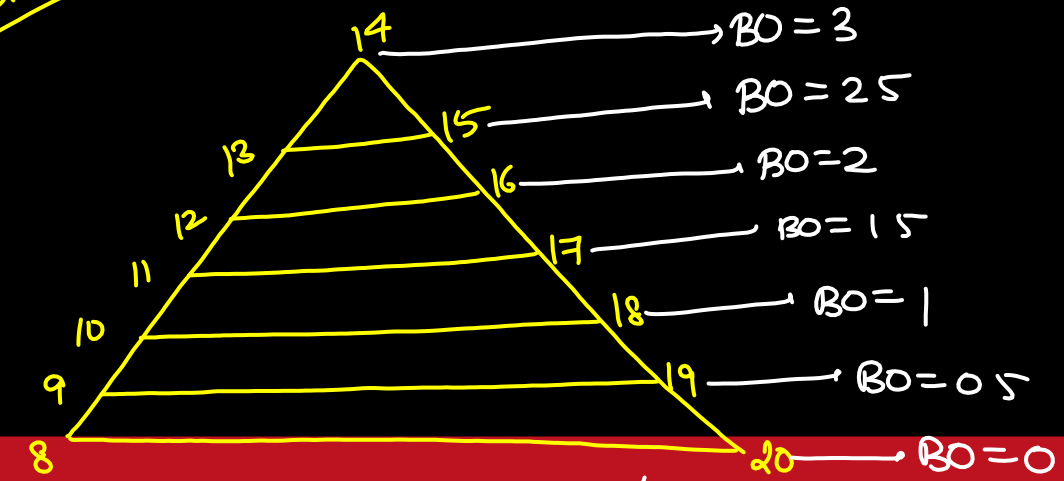
&

রিভার্স





Chotila method



BO = 2.5 → ?

SVshortcut

even no. of e^- → diamag → all e^-s are paired

odd no of e^- → paramag → unpaired e-

10, 16 — even no

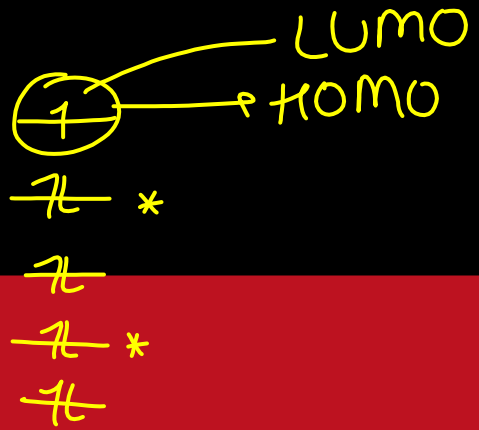
Paramag

HOMO

highest occupied MO

LUMO

lowest unoccupied MO



S_2
Cl_2
Br_2
?

F_2

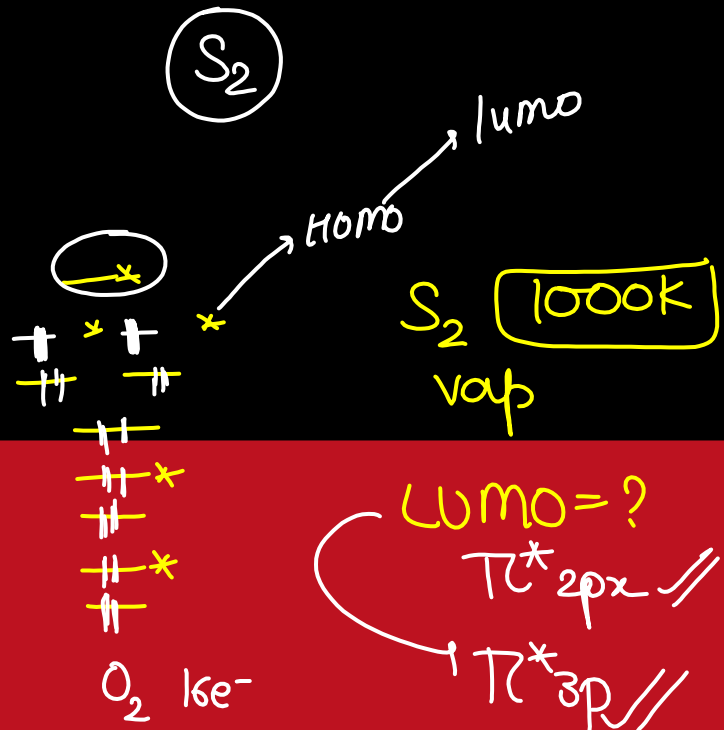
LUMO π^*_{2p}

HOMO σ^*_{2p}

Cl_2

π^*_{3p}

σ^*_{3p}



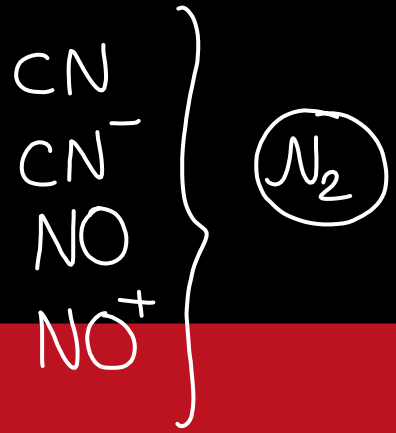
S_2 1000K

vap

LUMO = ?

π^*_{2px} //

π^*_{3p} //


CN
CN⁻
NO
NO⁺
N₂

Fajan's Rule

① bond → 100% ionic 100% covalent

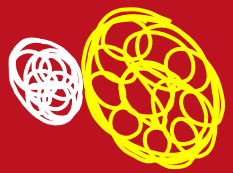
② covalent → % ionic character

③ ionic → % covalent character

④ Na^+Cl^- 100% ionic → spherical e⁻ density

$Na \longrightarrow e^- + Na^+$

$Cl + e^- \longrightarrow Cl^-$



⑤ H—Cl

covalent bond

% ionic character in covalent bond ⟶ Dipole

H—H

100% covalent

NaCl

ionic compound ⟶ cov characte

Polarization

KCl
NaCl
LiCl
} ?

Na^+ Cl^-

Polarize

Fajan's rule

- **Cation**
  - charge ↑
  - size ↓
  - **Polarizing Power** (P.P)
- **Anion**
  - charge ↑
  - size ↑
  - **Polarizability**

1. F^- Cl^- Br^- I^- — max. Polarizability
2. N^{3-} O^{2-} F^- — min polarizability

* Cation of PP $\propto$ Z_{eff}

Na^+ Mg^{2+} Al^{3+}

PP $\longrightarrow$ max Al^{3+}

Q Mn^{2+} Mn^{+7}

low PP

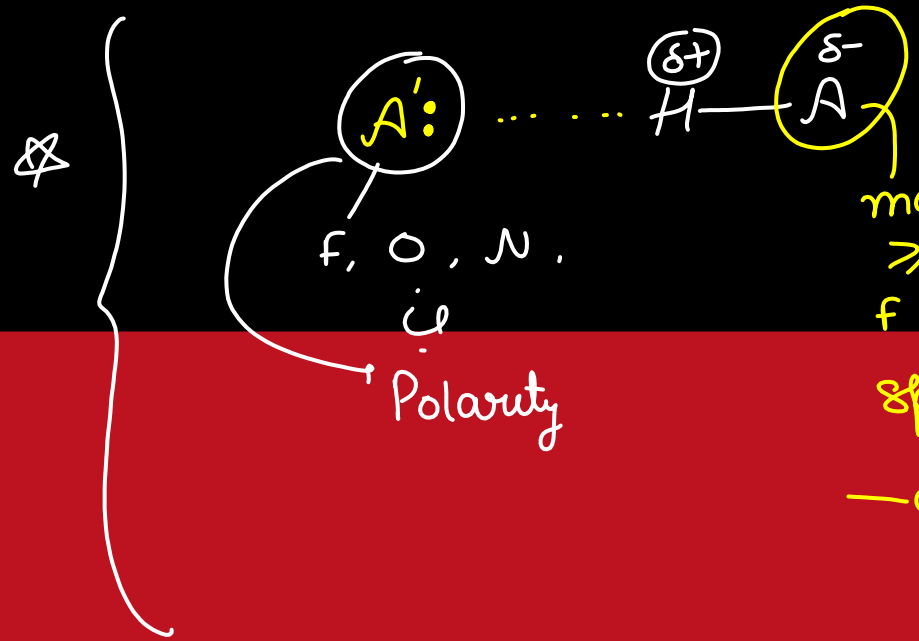
★ Covalent character $\propto$ Polarization

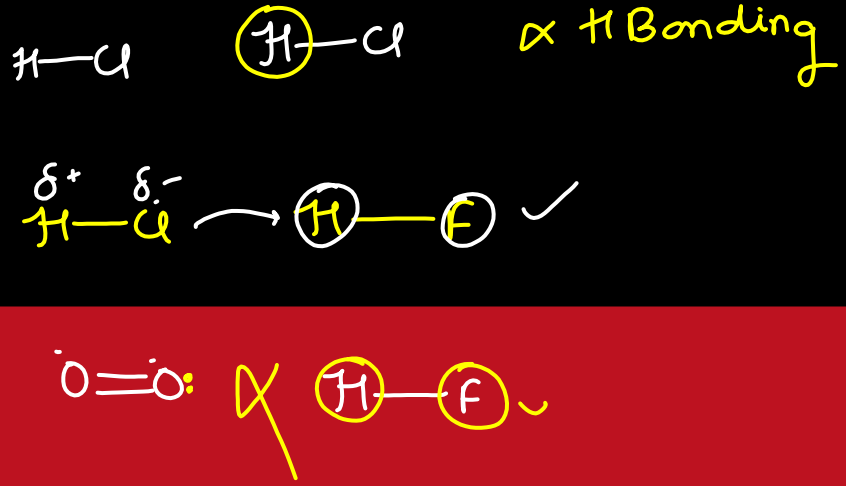
Ionic character $\propto \frac{1}{\text{Polarization}}$

Ques $\underset{+2}{PbCl_2} < \underset{+4}{PbCl_4}$

more covalent character

H-Bonding


A:
δ+
H
δ-
A
F, O, N.
Polarity
more eneg
⩾ 3
F O N Cl
More size
sp hyb C → 50/ s
F
F
F
Cl
Cl
Cl


H—Cl
H—Cl
∝ H Bonding
δ+ δ−
H—Cl
H—F
O=O:
H—F

① st of hydrogen bond.

$H-F\cdots H-F$

$H_2O\cdots H_2O$

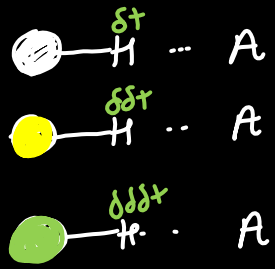
$NH_3\cdots NH_3$

$H-F\cdots H-F$

$H-F\cdots H_2O$

$H-F\cdots NH_3$

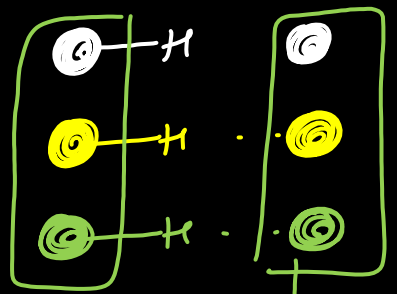
Case 1.



↳ e neg of this atom
e neg ↑ H-Bond ↑

Case 2

Case 3



e neg

↳ good lewis base

1

H—F · H—F } a max H-bond (c)

H_2O · · · H—F } b

NH_3 · · · · $\overset{\delta+}{H}$—F } c

at↑

2

~~H—F~~ · · · $\overset{\delta+}{H}$—F a

H_2O · · · H_2O b

NH_3 · · · NH_3 c

max H-bonding

max rep

a > b > c

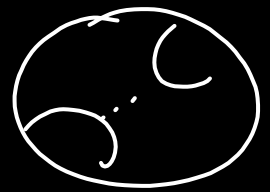
~~a < b < c~~

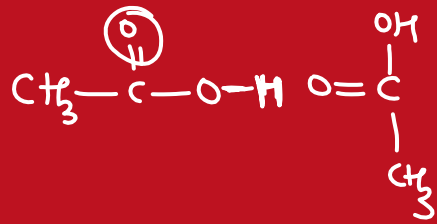
3

H-Bond

intermolular

intra-molular





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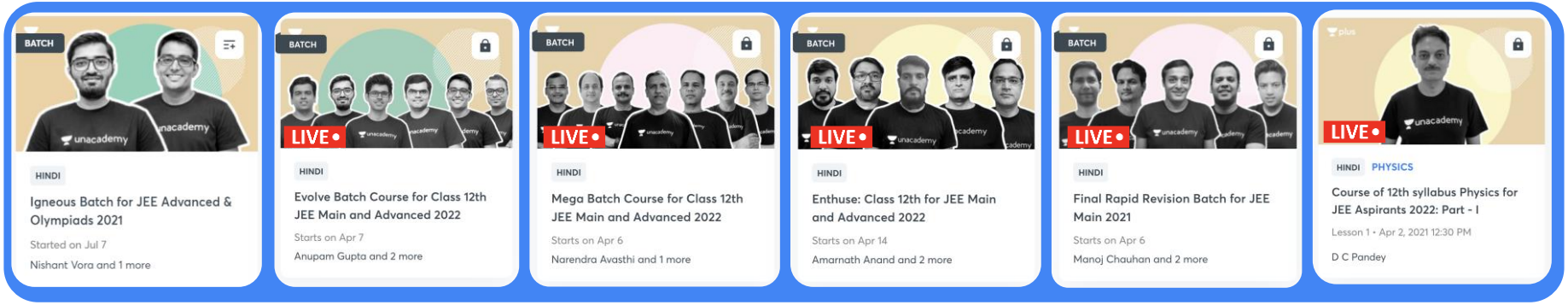

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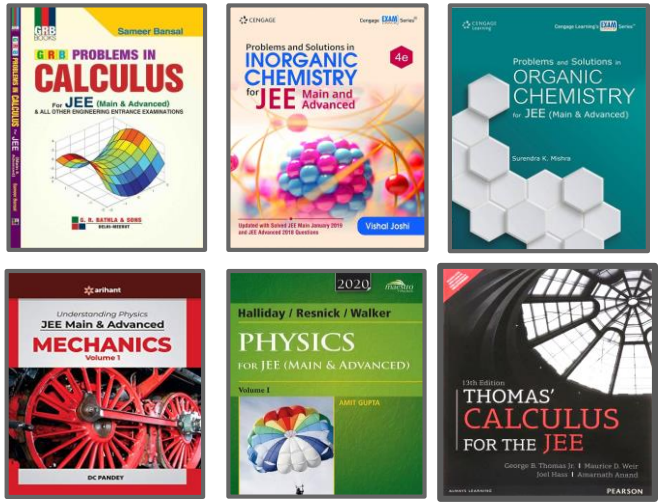

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- Systematically designed courses
- Strengthen JEE problem-solving ability

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Mathematics Maestro

Nishant Vora
Mathematics Maestro

Ajit Lulla
Physics Maestro

Abhilash Sharma
Physics Maestro

Sakshi Vora
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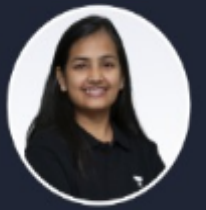

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- Strengthening the problem-solving ability of JEE level problems

For more details, contact **8585858585**

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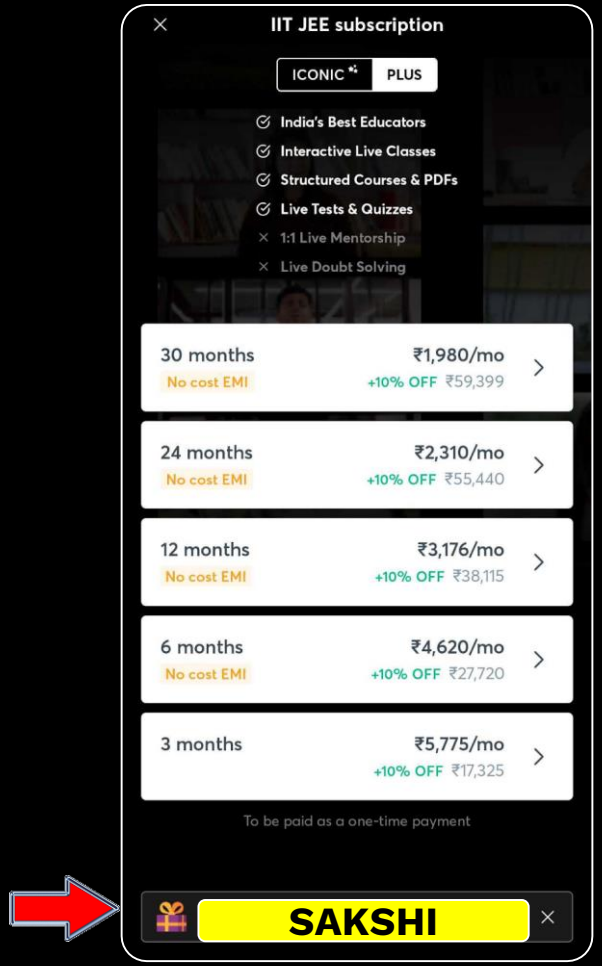
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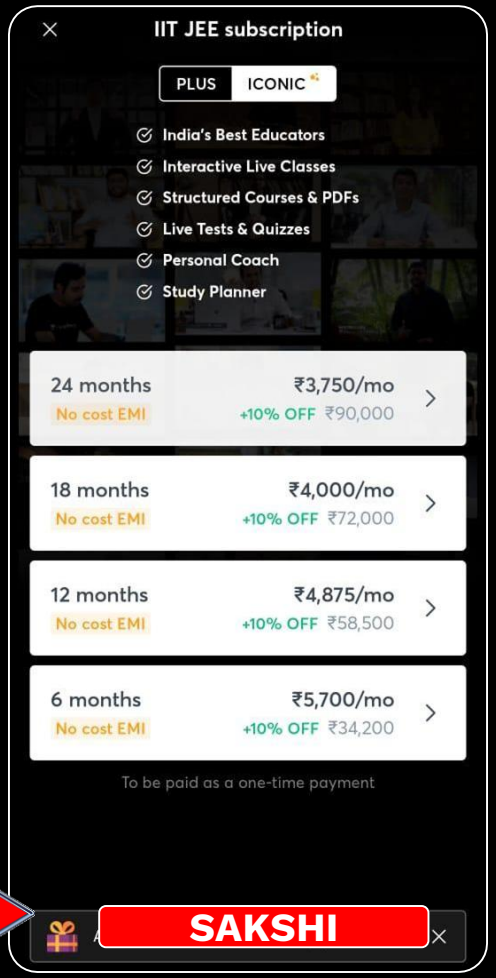
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