Nishant Jindal

CHEMICAL BONDING

Drago's

one find the number of molecules in which maximum p character involve in bonding

NH_3 PH_3 AsH_3 H_2S H_2Se H_2O

(sp^3)

no Hyb.

bonding → Pure p-orbital

Ans = 4

one if Sb–H bond has 0.5% s Character in SbH_3 then find the s% character in orbital having l.p

✱ Back bonding

Conditions :→

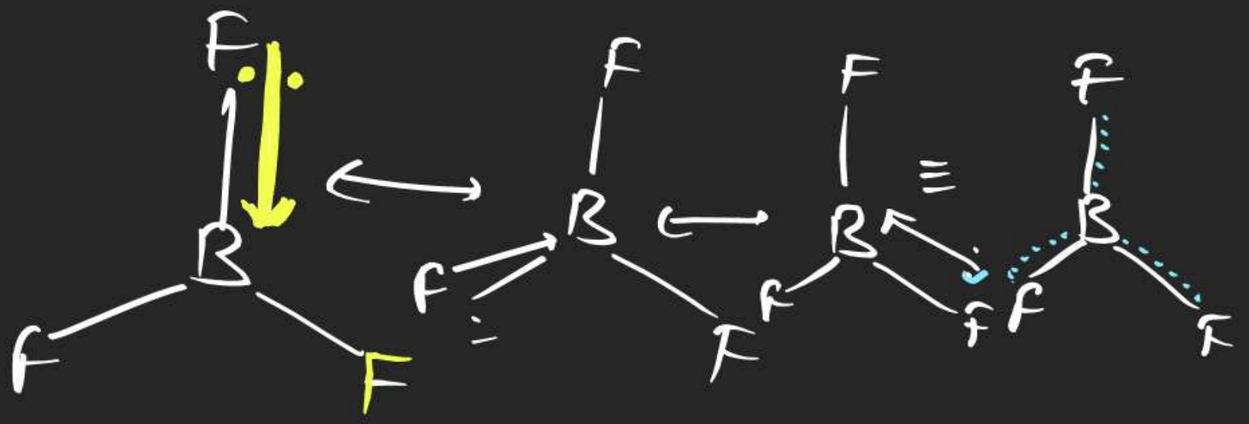
- one bonded atom has vacant orbital and other bonded atom has l.p
- one bonded atom must be of 2nd period and other bonded atom must be of 2nd or 3rd period.

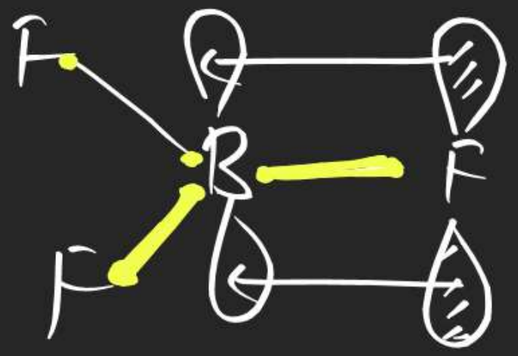
	B.O
H—H	= 1
O=O	= 2
N≡N	= 3

B.O = number of covalent bond b/w two atoms

BF_3

$B = 1s^2 2s^2 2p^1$





$$B.O = \frac{\text{total number of bonds b/w two atoms in all R-S}}{\text{total R-S}}$$

$$= \frac{4}{3} = 1.33$$

Note ⇒ Back bonding is type of sideways overlapping.

order of lewis acid

$BF_3 < BCl_3 < BBr_3 < BI_3$

$2p_\pi \quad 2p_\pi$

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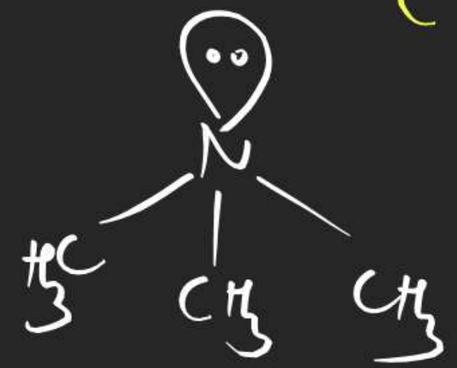
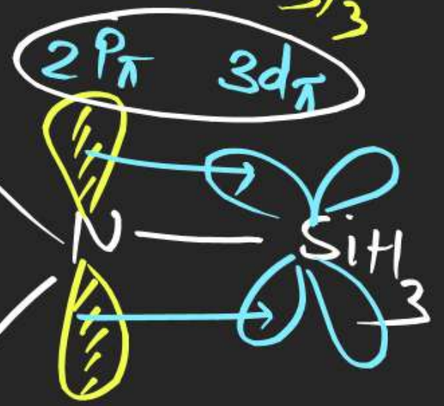
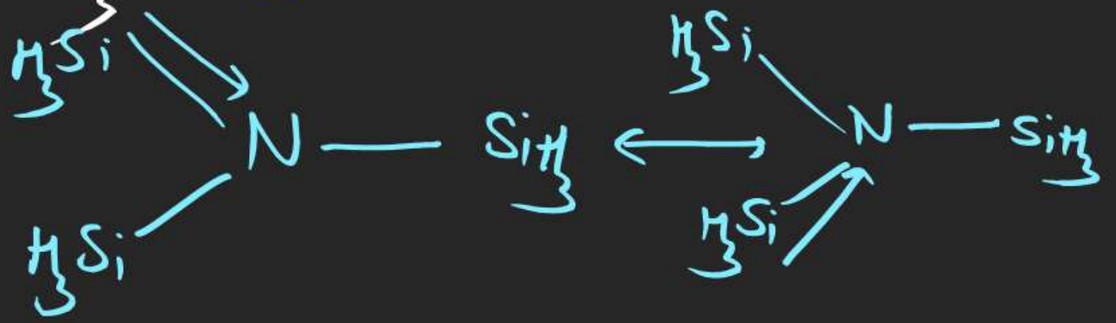
Draw the structure of

$N(CH_3)_3$ $N(SiH_3)_3$ $P(SiH_3)_3$



Pyramidal





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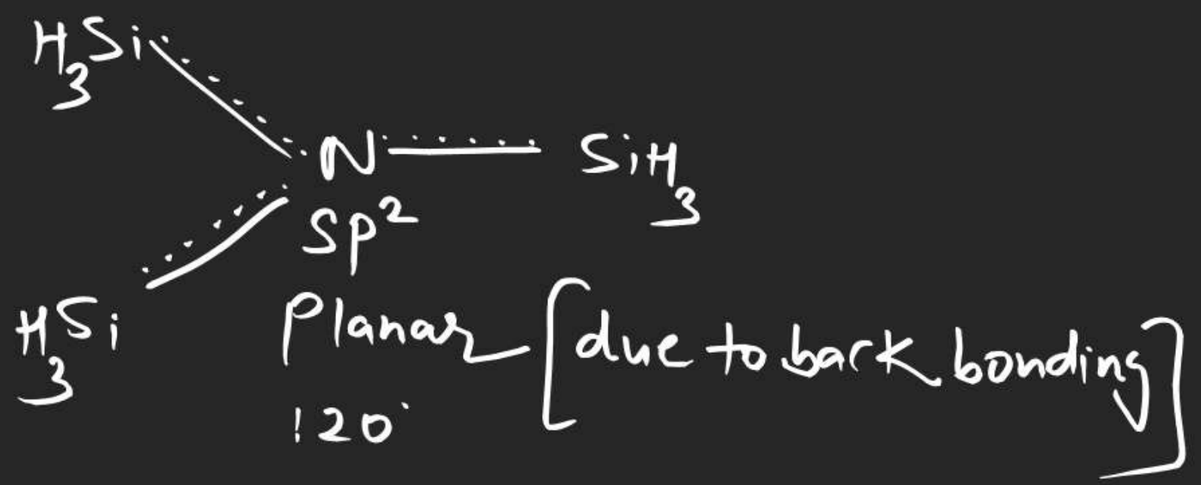

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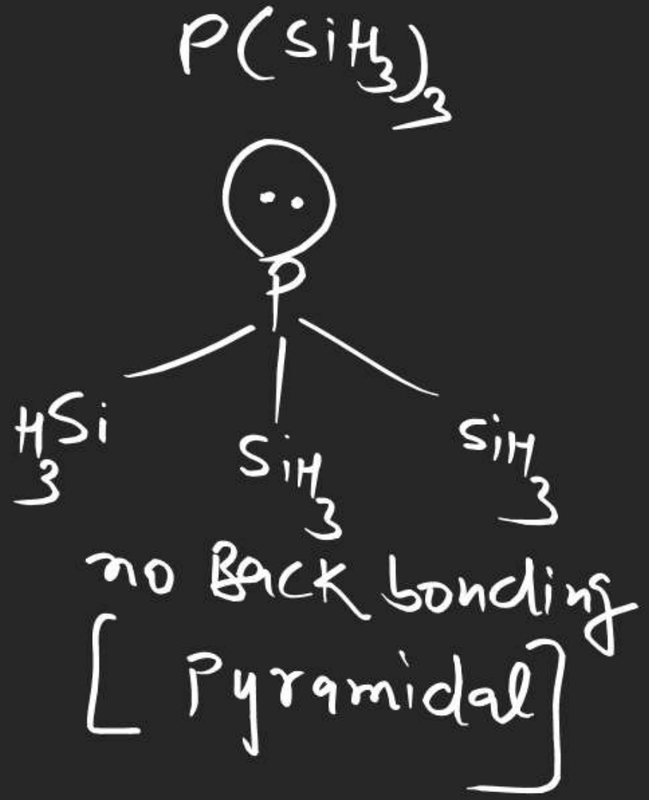

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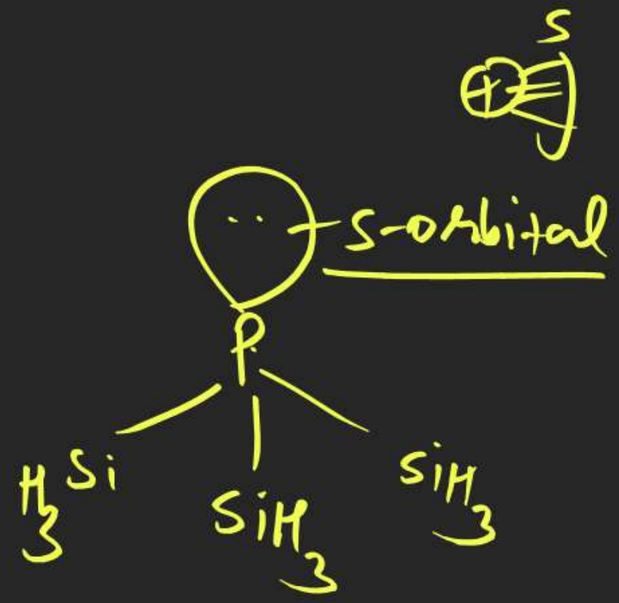

order of Lewis base [l.p donating species]

$N(CH_3)_3$ $P(SiH_3)_3$ $N(SiH_3)_3$

$N(SiH_3)_3 < P(SiH_3)_3 < N(CH_3)_3$

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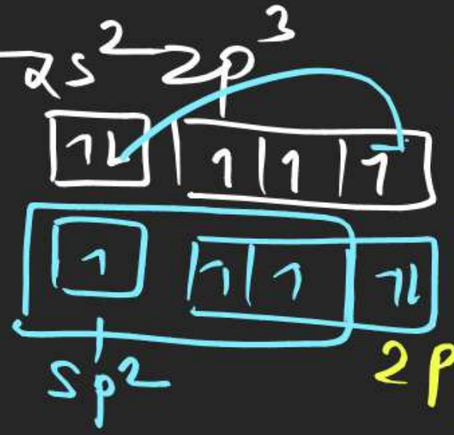
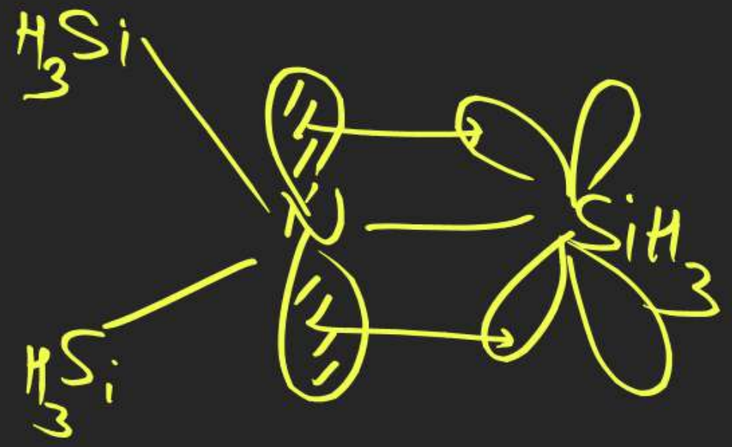
	S%
sp^3	= 25%
sp^2	= 33.33%

$N(SiH_3)_3$

$N = 1s^2 2s^2 2p^3$

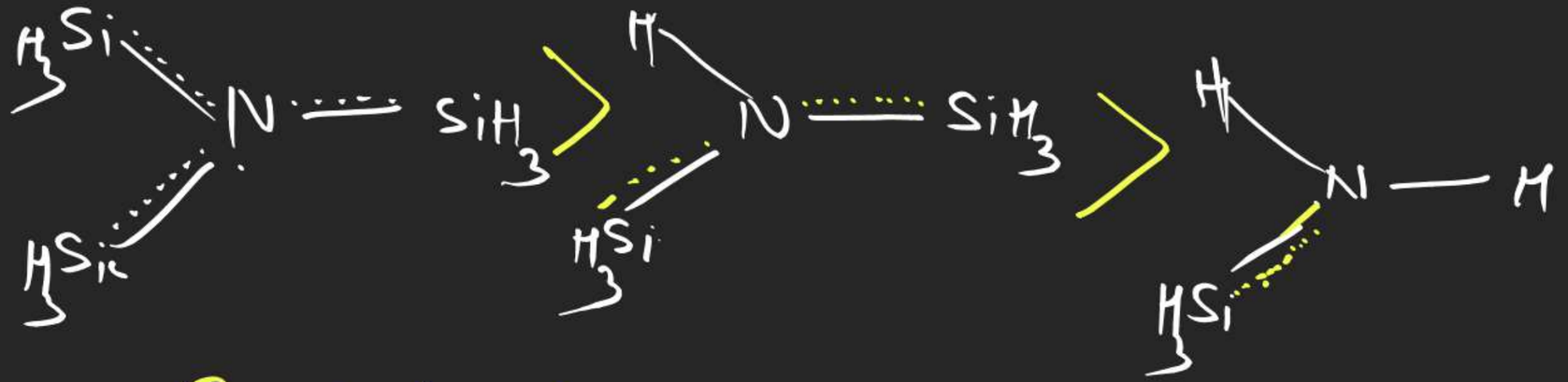


In Nitrogen atom back bonding is possible after excitation.



Compare N—Si Bond length

$N(SiH_3)_3$ $N(SiH_3)_2H$ $NH_2(SiH_3)$



Back bonding strength

$N(SiH_3)_3 < N(SiH_3)_2H < N(SiH_3)H_2$

ans Which of the following molecule has higher barrier for rotation arround B–N bond in following molecule.

$B(NR_2)_3$ $BH(NR_2)_2$ BH_2NR_2

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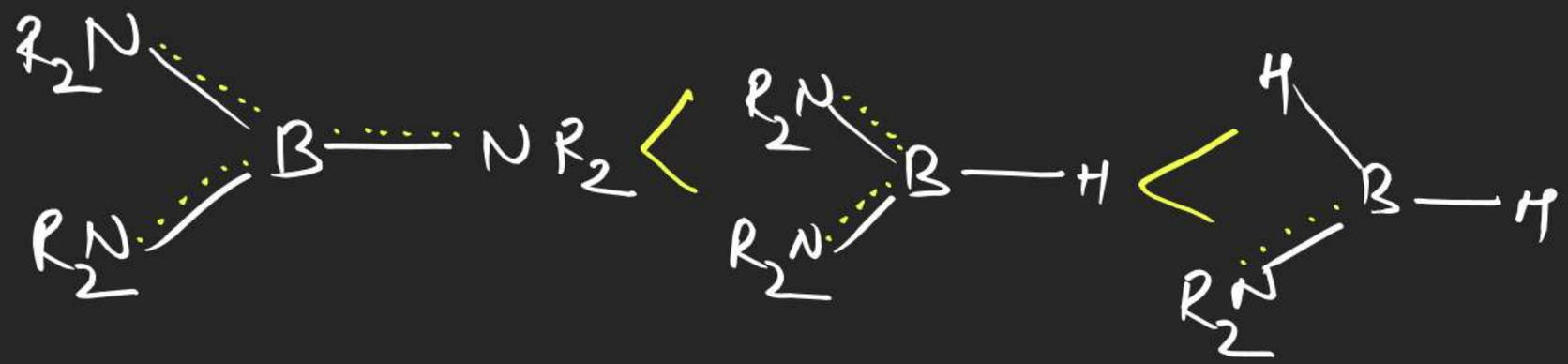

One

$N(SiH_3)_3$ molecule is

(a) planar

(b) non planar

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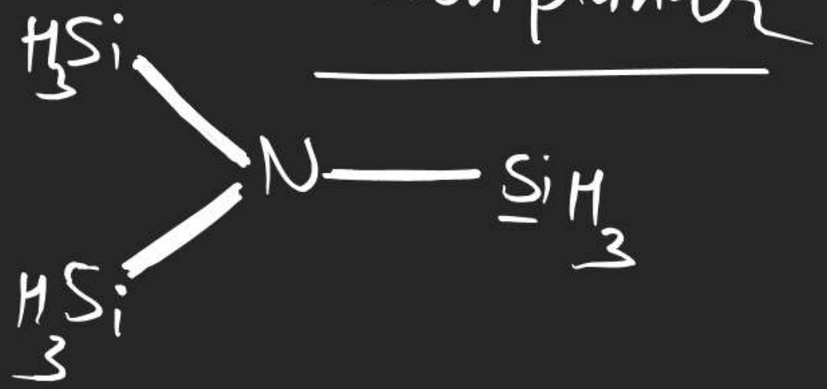
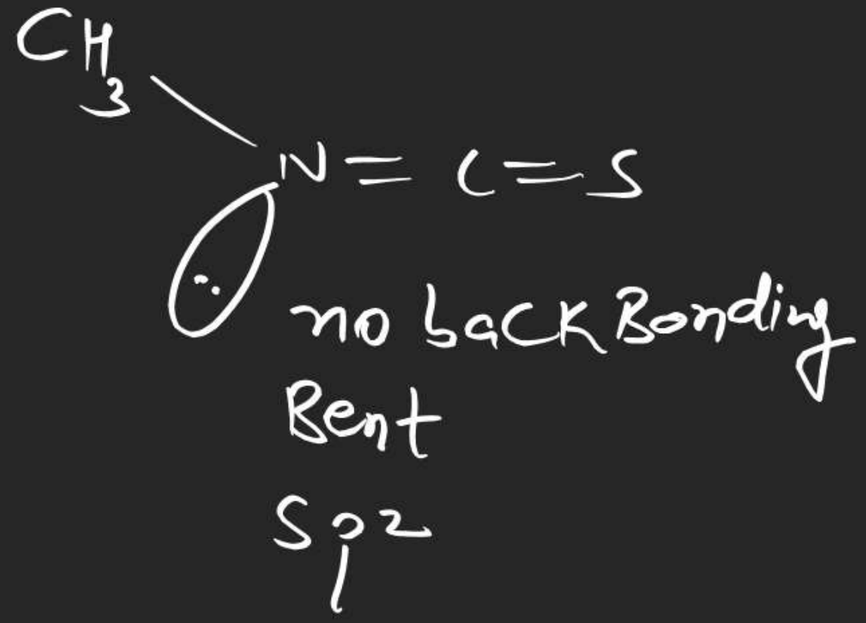
Ques $N(\underline{SiH_3})_3$ Molecule is Planar or nonplanar W.r.t underline atom

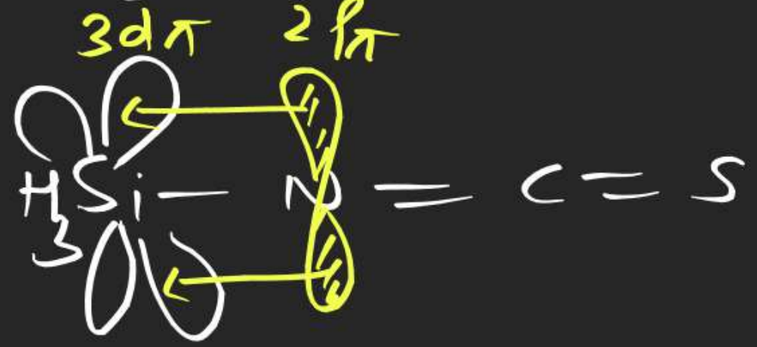
nonplanar



Q.1 Draw the structure of CH_3NCS SiH_3NCS



SiH_3NCS



$H_3Si \cdots N = C = S$

sp

linear

180°

effect of back bonding :→

1. B.L must ↓
2. Bond angle may change
3. Hyb. may change

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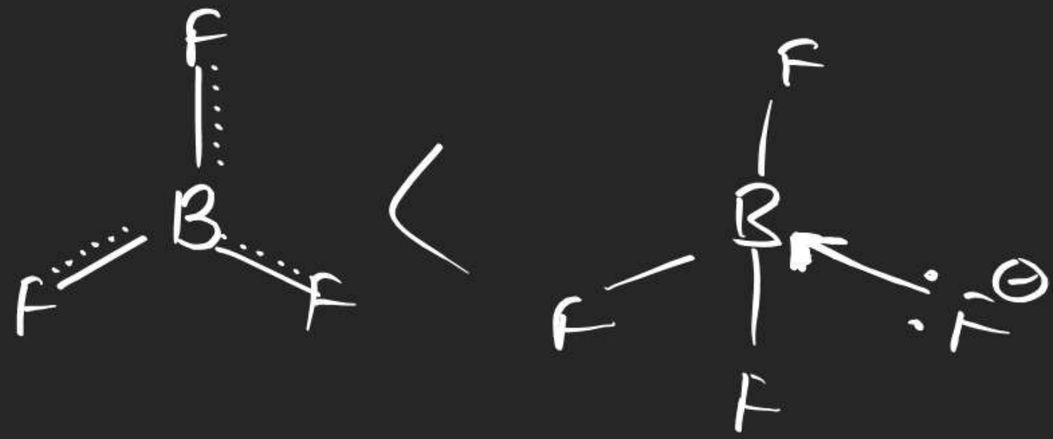
Compare B–F B.L in BF_3 and $BF_4^{\ominus}$



$\{$ B.L ↑ B.O ↓

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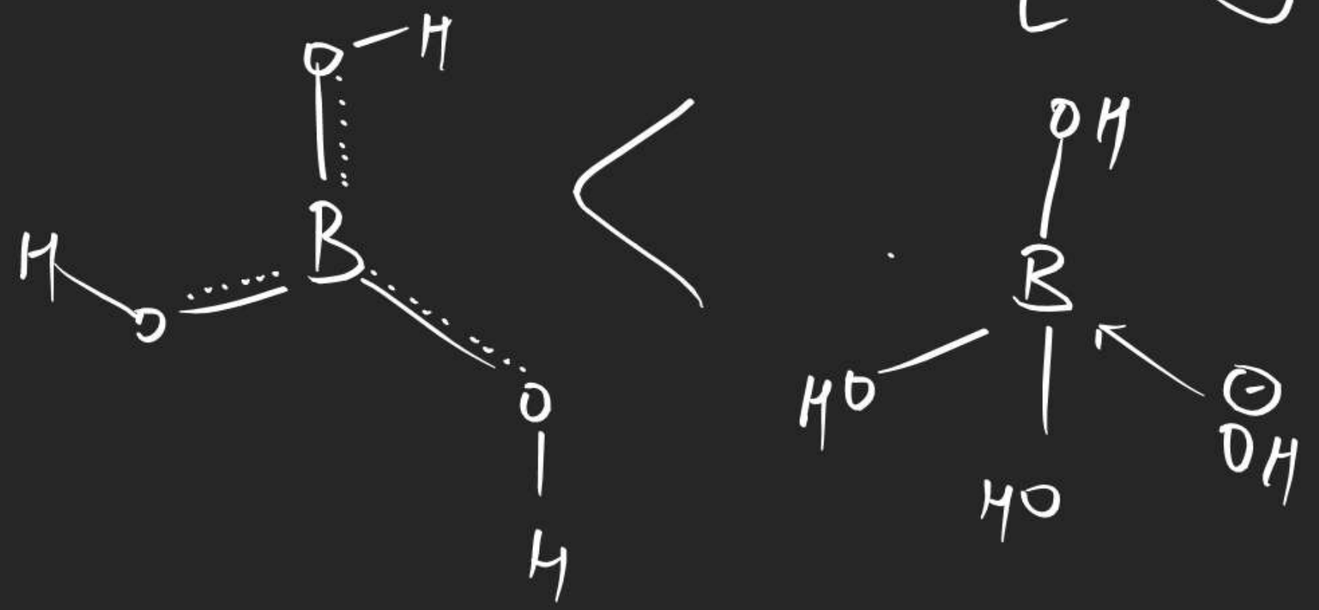
Compare B–O B·L in

H_3BO_3 and $[B(OH)_4]^{\ominus}$ [Borate ion]



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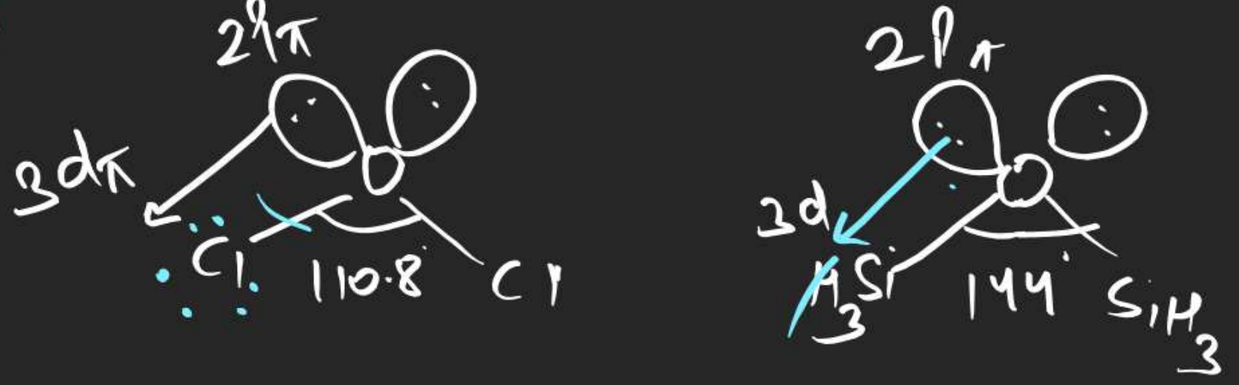
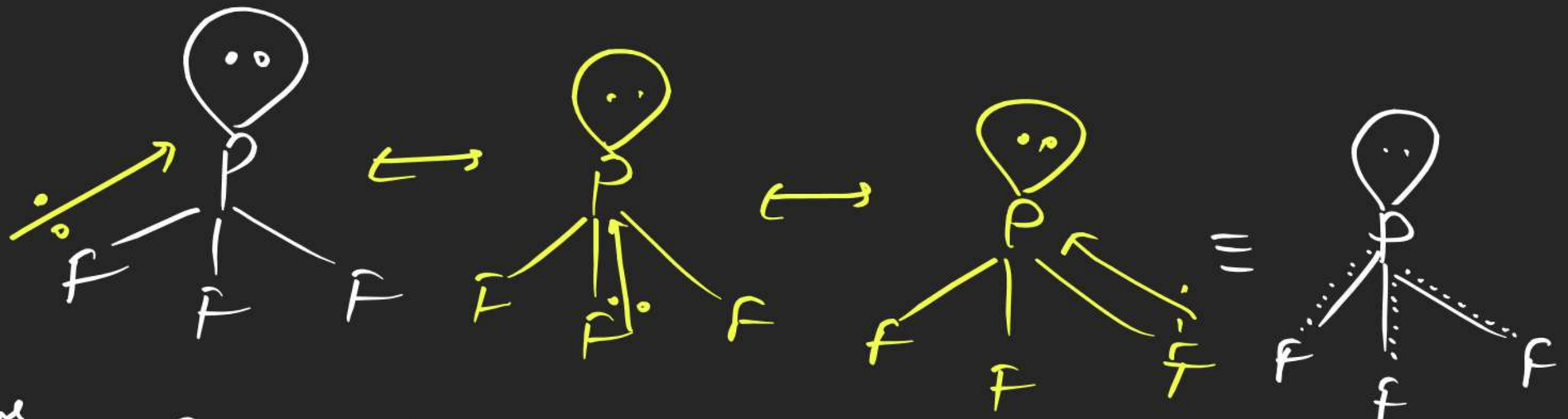


one When l.p of Central atom involve in back bonding then Bond angle increases due to

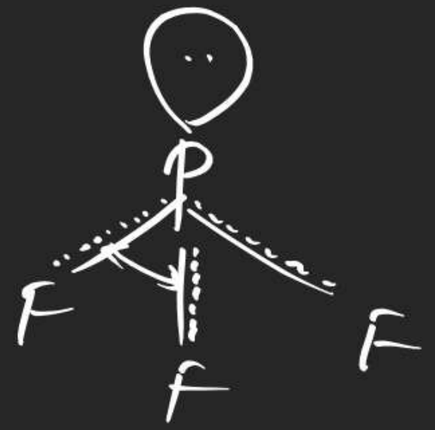
1. l.p - l.p rep.
2. l.p - B.p rep.
3. B.p - B.p rep.
4. all otwise ✓



Here P–F bond have partial double bond character due to back bonding

When l·p of S·A involve in back bonding then B·A ↑ due to

1. B·P – B·P repulsion ↑
2. B·P – B·P repulsion ↓
3. l·p – l·p ↓
4. l·p – B·P ↓



ans ★ Compare B.A in PH_3 and PF_3

drago's Rule

(a) $PH_3 < PF_3$ [Back bonding]

PH_3 (no Hyb.)

B.A ≈ 90°

(b) $PH_3 > PF_3$

(c) $PH_3 = PF_3$

(d) none

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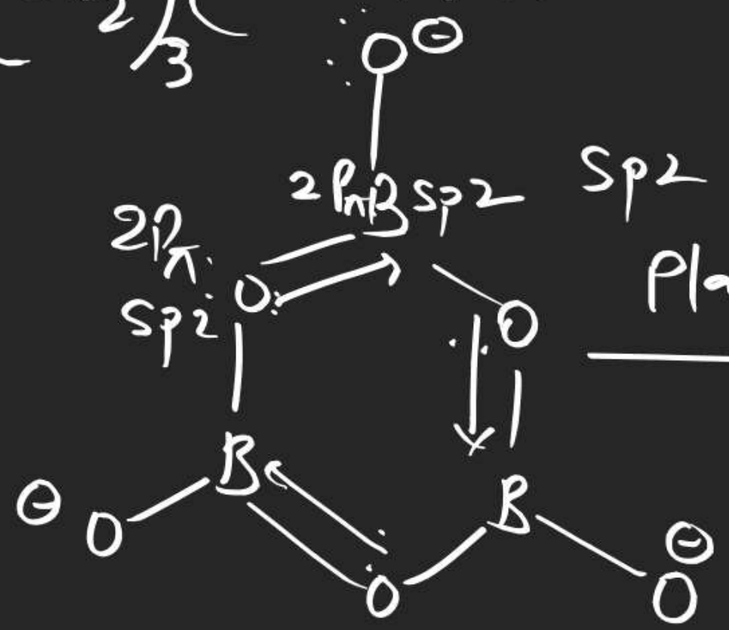
HBO_2 [metaboric acid]

$(BO_2^-)_3$ (metaborate ion)



Planar

H·W

Sheet

① V·W·F

② Bent's and Dragol's

DPP → 1, 2

3 & Homework