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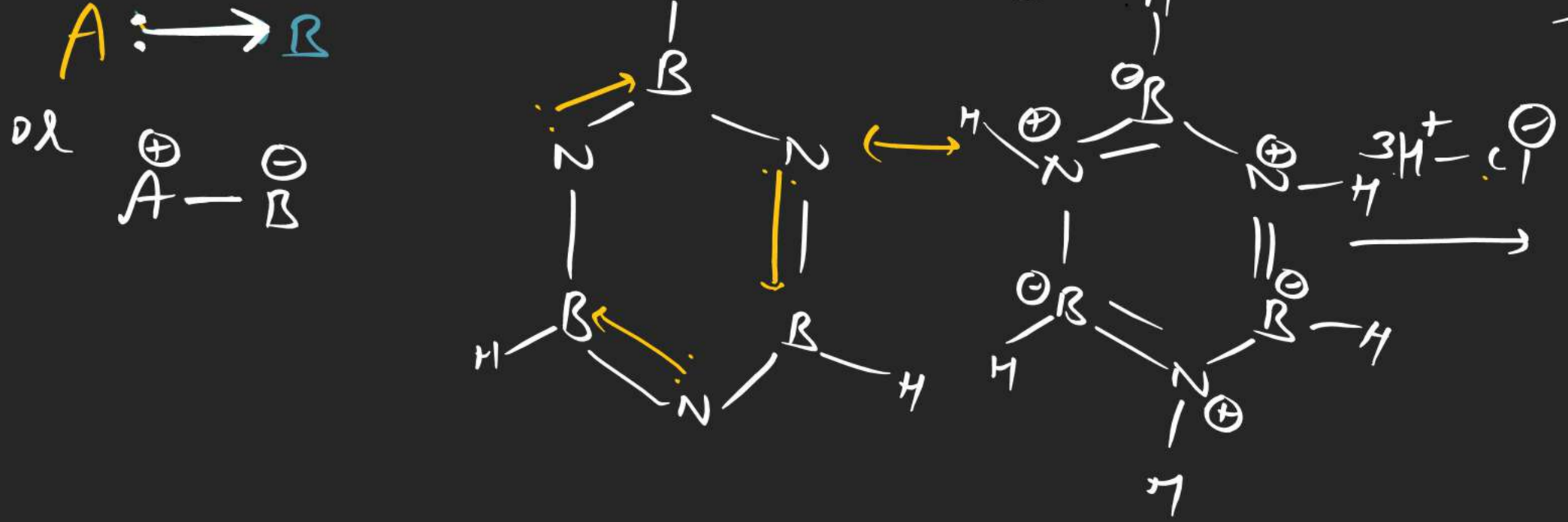
CHEMICAL BONDING

Condition of Back bonding

Inorganic benzene ($B_3N_3H_6$) (borazole / borazine)



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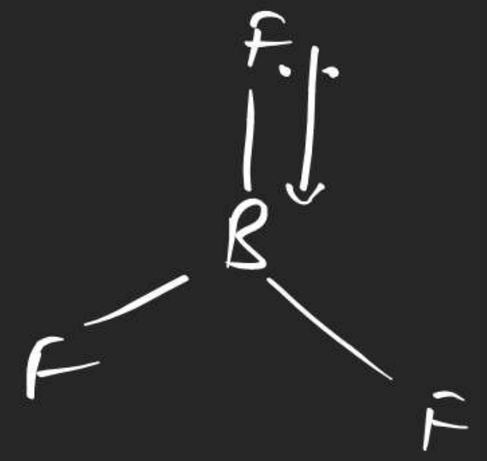
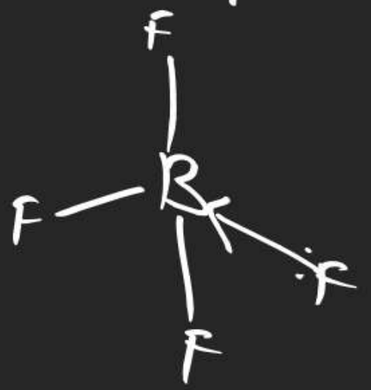


$$BF_3 + F^{\ominus} \longrightarrow BF_4^{\ominus}$$



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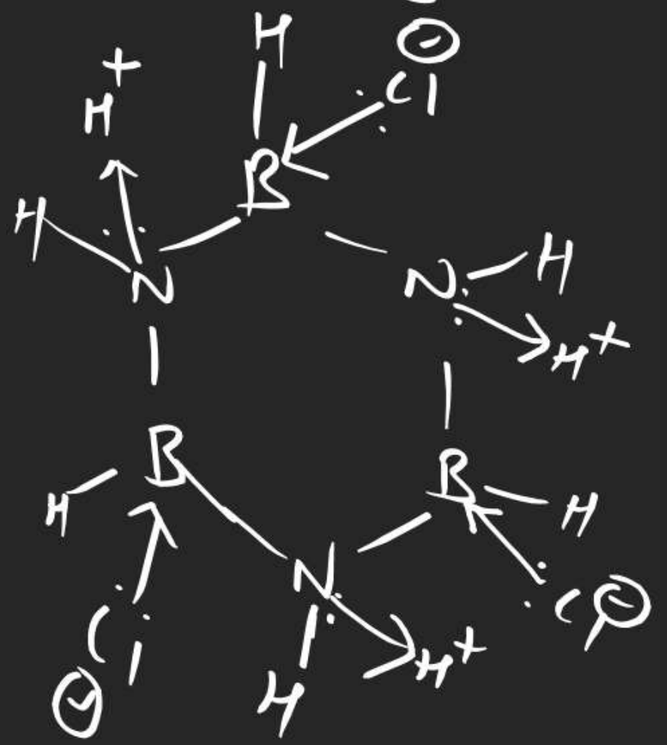
$$B_3N_3H_6 + 3\overset{+}{H}\overset{-}{Cl} \longrightarrow B_3N_3H_9Cl_3$$

Draw the structure of $B_3N_3H_9Cl_3$



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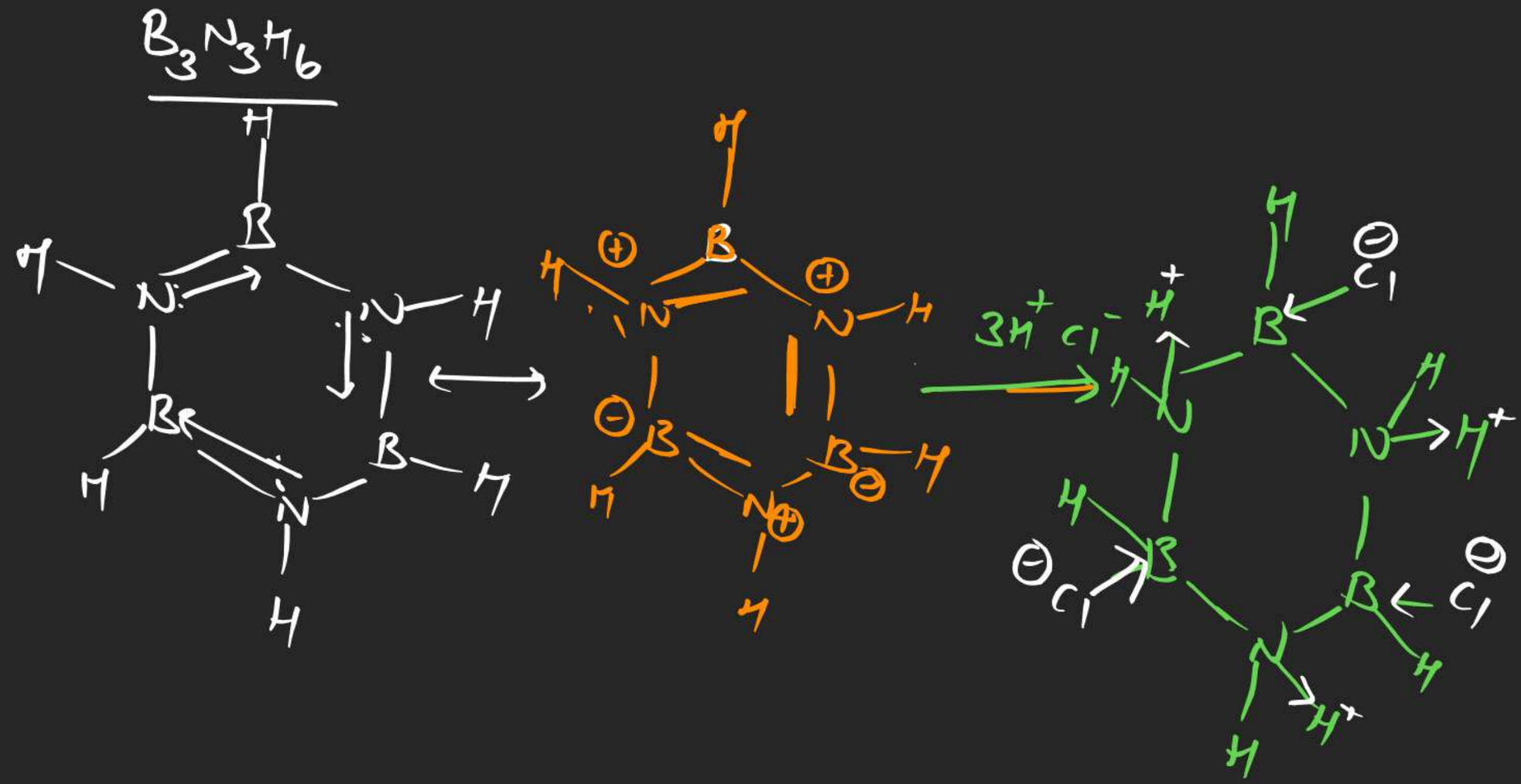
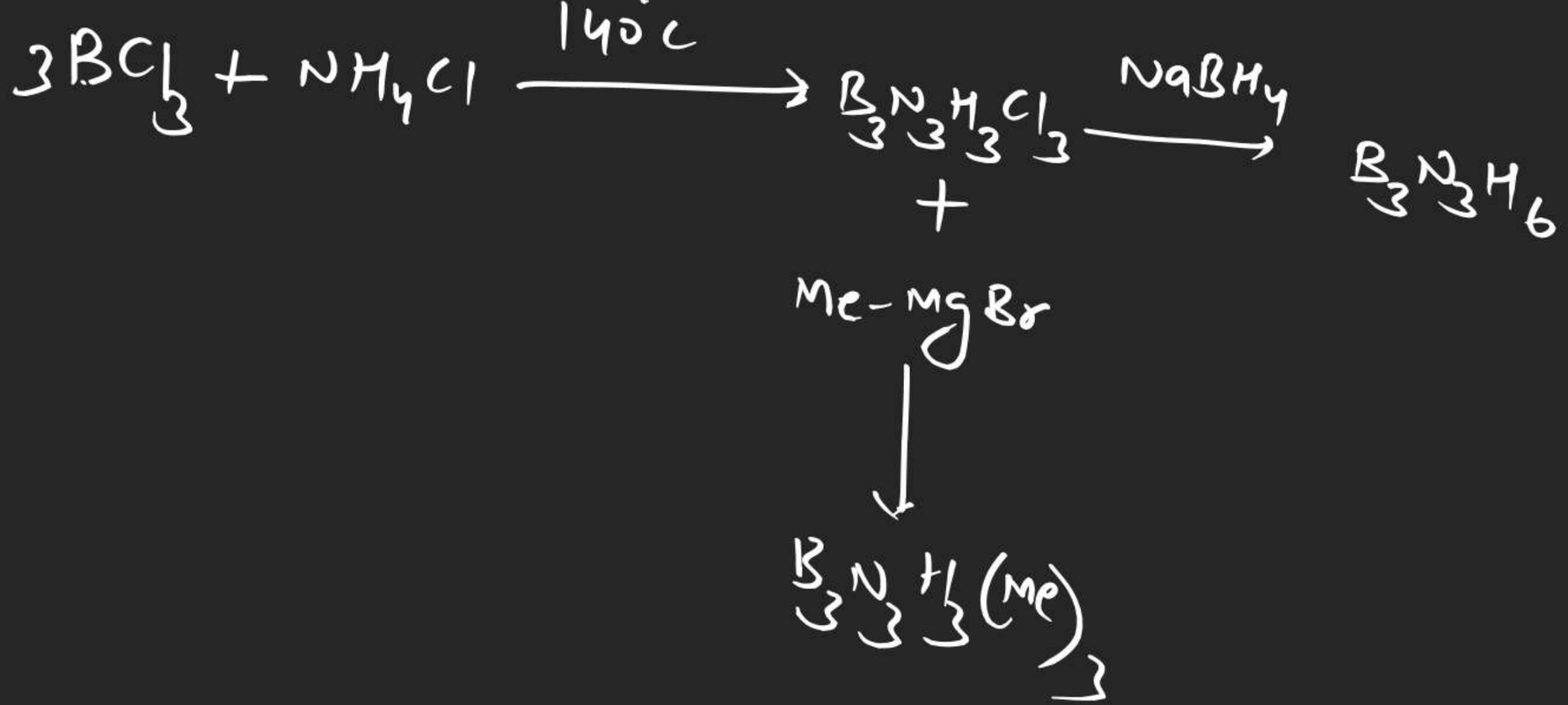


Ex:



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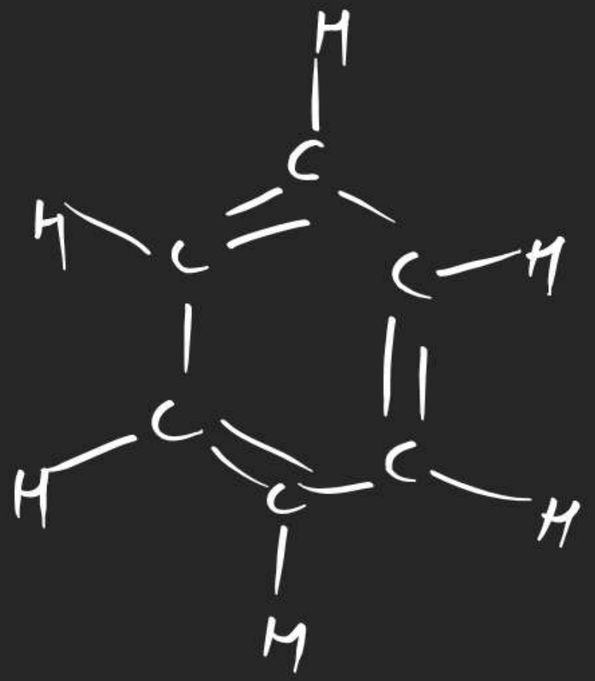

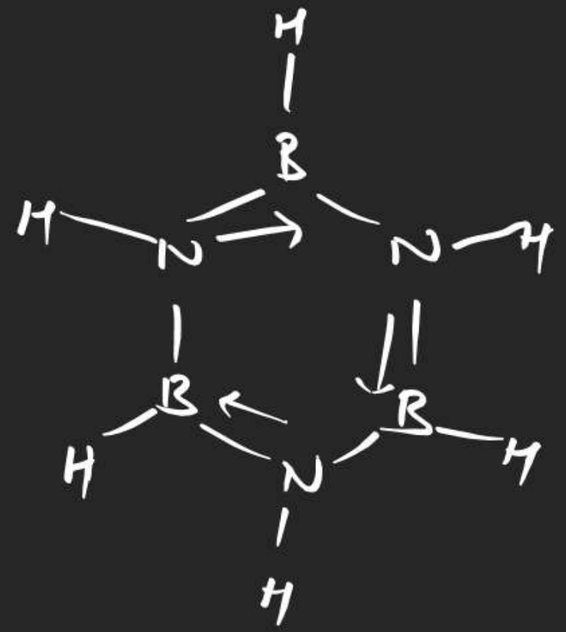

Organic benzene and Inorganic benzene are Isostructural.

Note

Note → Inorganic benzene is more reactive than organic benzene due to bond polarity

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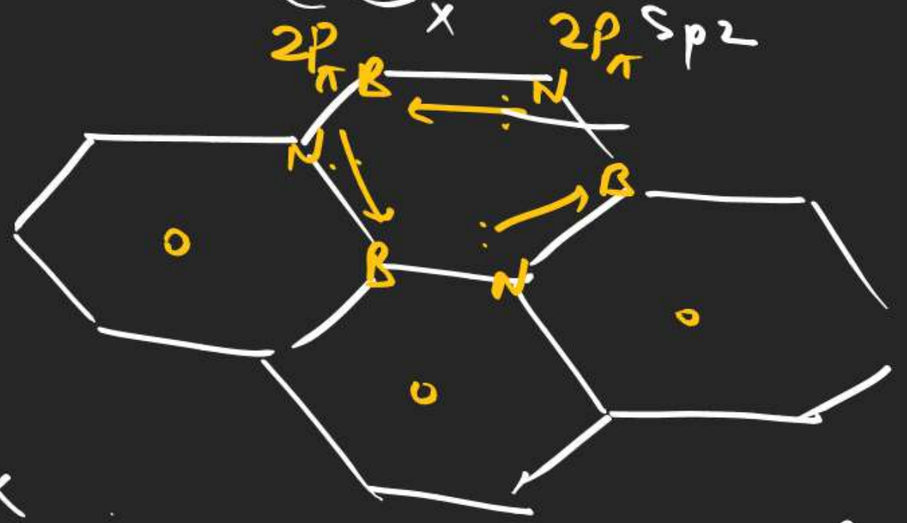
Inorganic graphite / Borazone

$(BN)_x$



Sp^2 Planar (White)

2D sheet like hexagonal planar

$(BN)_x \xrightarrow{3000^\circ C} (BN)_x$

Boron nitride

hardest substance

3D network like structure non planar

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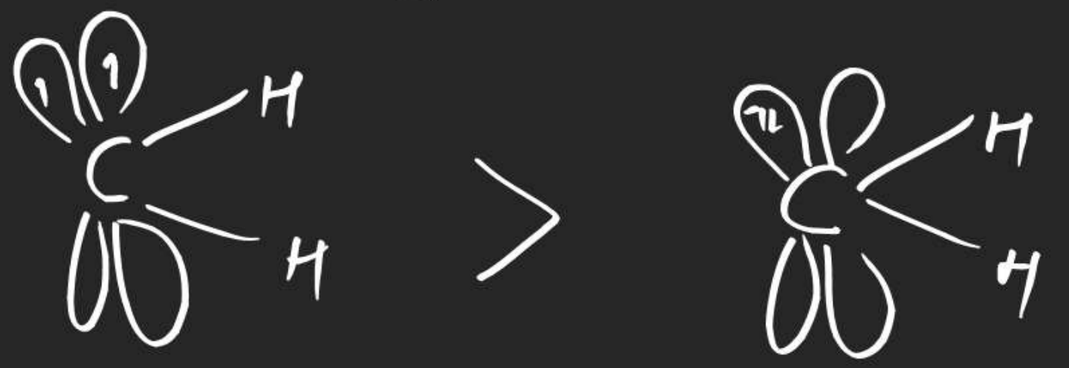
1 L

$s = \pm 1/2$ $s = \pm 1/2$: CH_2 Carbene



triplet > singlet

multiplicity = $2|S| + 1$

S = total spin

$2 \times 1 + 1$

3

$2 \times 0 + 1$

1

Singlet

Note

Triplet Carbene is more stable than Singlet Carbene due to Hund's Rule

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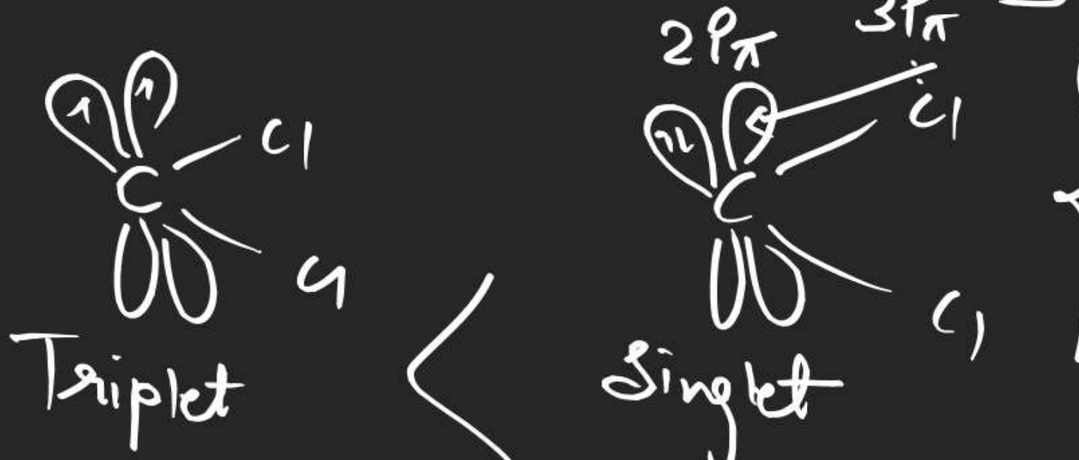
: CCl_2 [dichloro carbene]



$C_1 = 1s^2 2s^2 2p_x^2 2p_y^2 3p_z^1$

$\uparrow\downarrow \; \uparrow\downarrow \; \uparrow$

$2p_\pi - 3p_\pi$ — Back bonding

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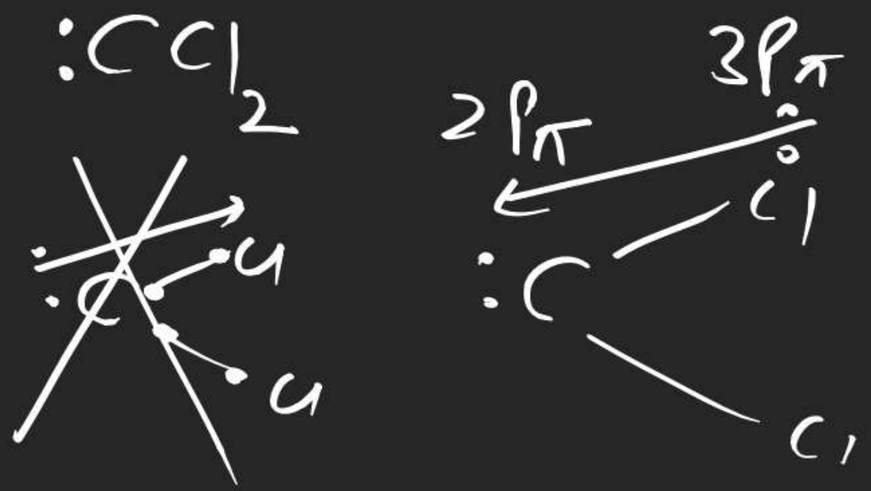


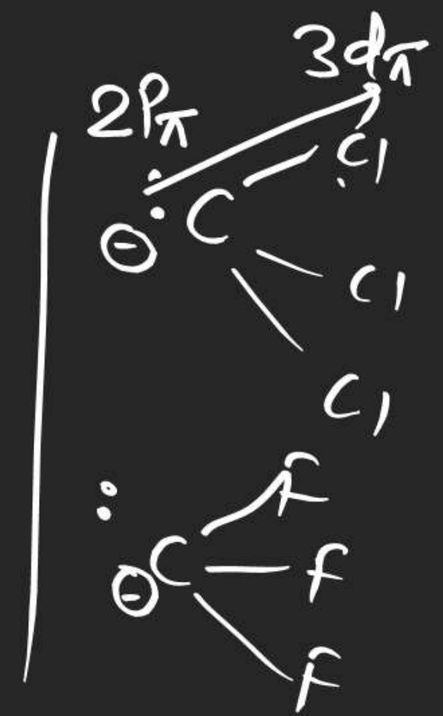
Que Which is better proton donor acid

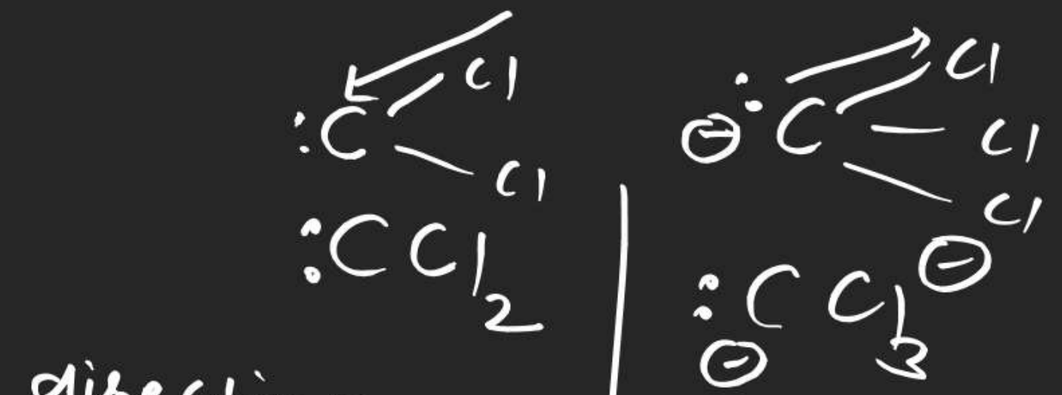
$CHCl_3$ CHF_3

Ans — $CHCl_3$

$CHCl_3 \longrightarrow H^+ + \overset{\ominus}{C}Cl_3$

$CHF_3 \longrightarrow H + \overset{\ominus}{C}F_3$





direction of Back Bonding

$C \longrightarrow Cl$

both have opposite direction of Back bonding

$C \longrightarrow Cl$

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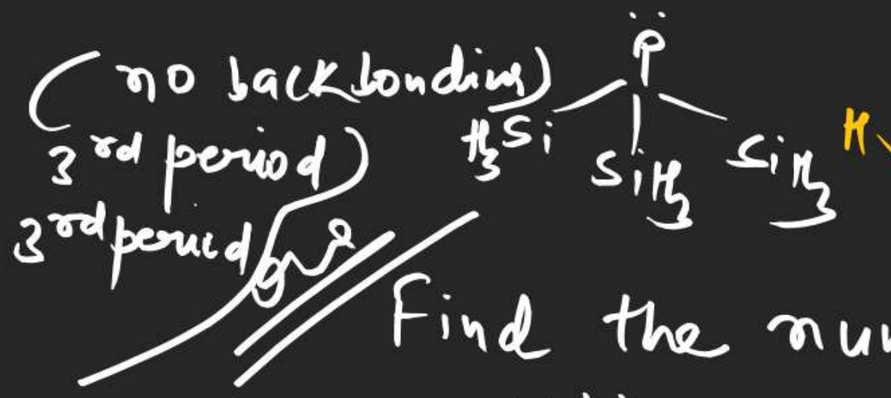
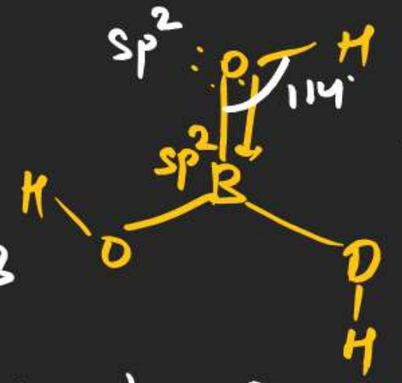
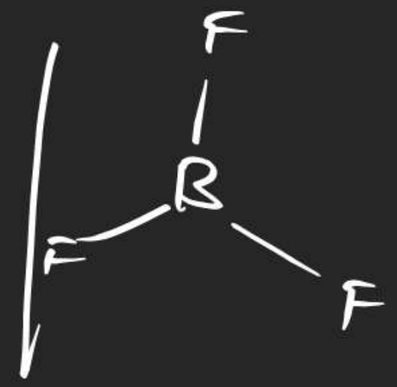




Planar

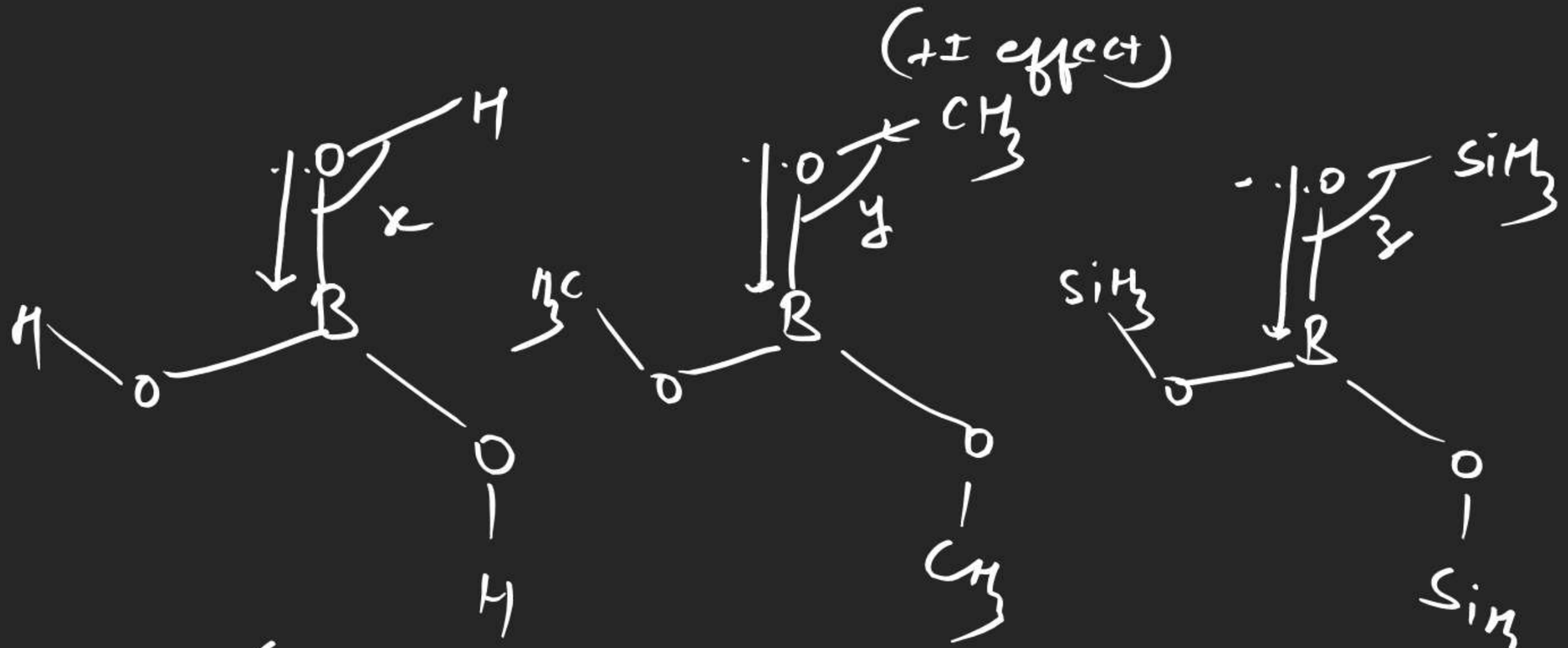


Find the number of Molecule in which B.A Change due to Back bonding w.r.t (B), O, N

Ans = 4

$P(SiH_3)_3$ H_3BO_3 $N(SiH_3)_3$ OCl_2 $O(SiH_3)_2$ BF_3

(w.r.t Oxygen (B.A Change))



Compare

B.A = x < y < z

Order of Lewis acid

Halogens

$-I_{eff} > +M$

$BF_3 < BCl_3 < BBr_3 < BI_3$

Order of lewis acid

or

$SiF_4 > SiCl_4 > SiBr_4 > SiI_4$

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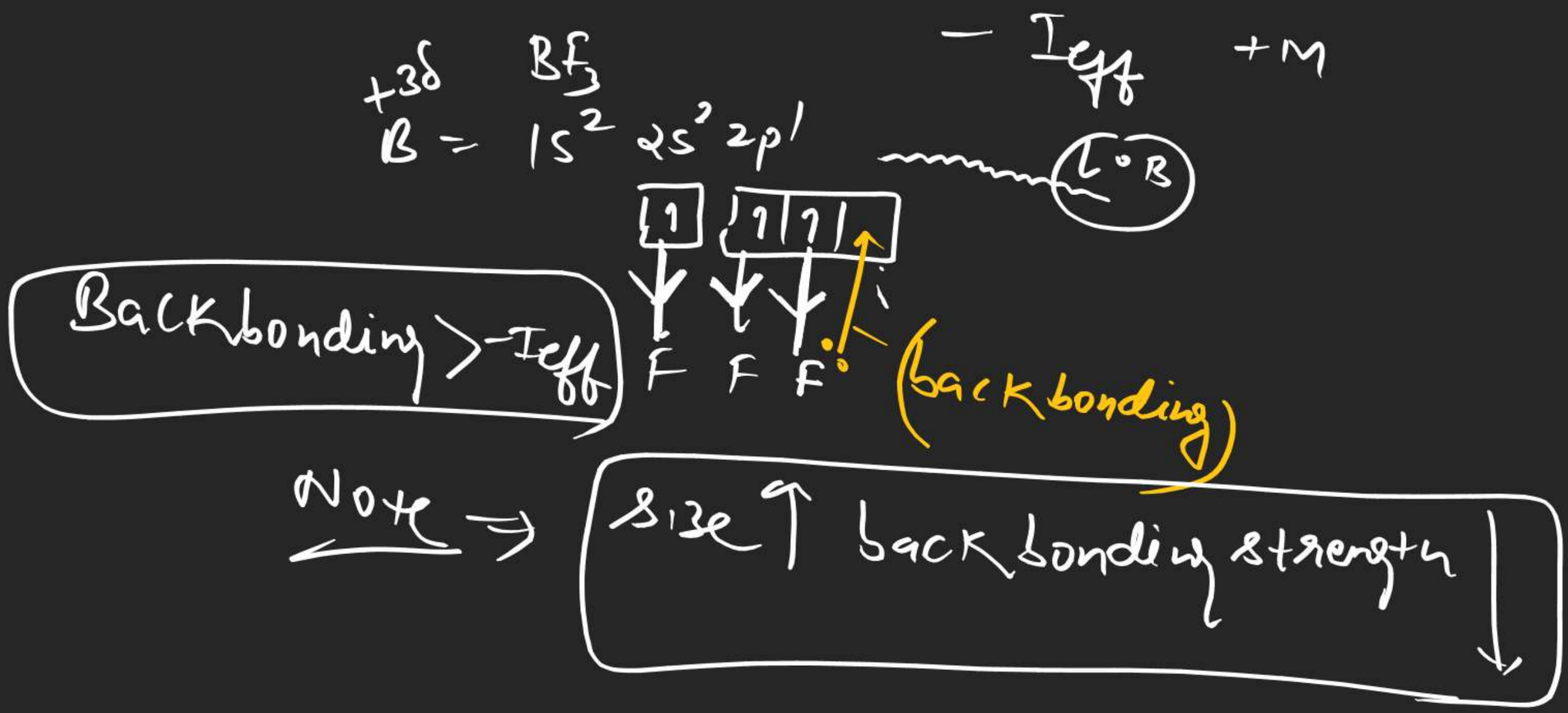

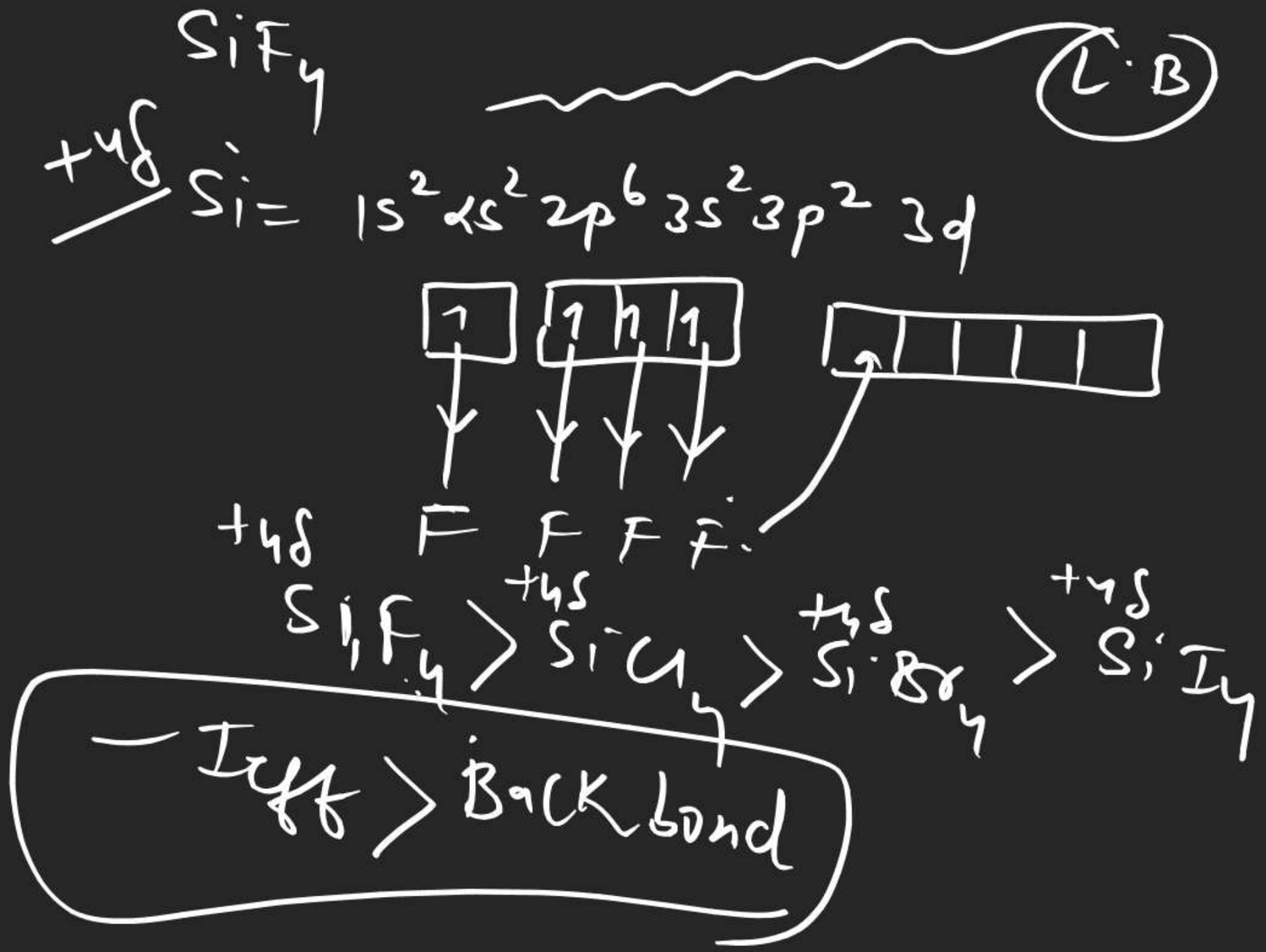

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Strength of back bonding

BF_3 BCl_3 BBr_3 BI_3

tri Halides of boron

Note ⇒ boron tri Halides have partial double bond character due to back bonding

Strength Back bonding

$SiF_4 > SiCl_4 > SiBr_4 > SiI_4$

Silicon tetrahalide have partial double bond character due to back bonding

Si ····· X (F Cl Br I)

B ····· X (F Cl Br I)

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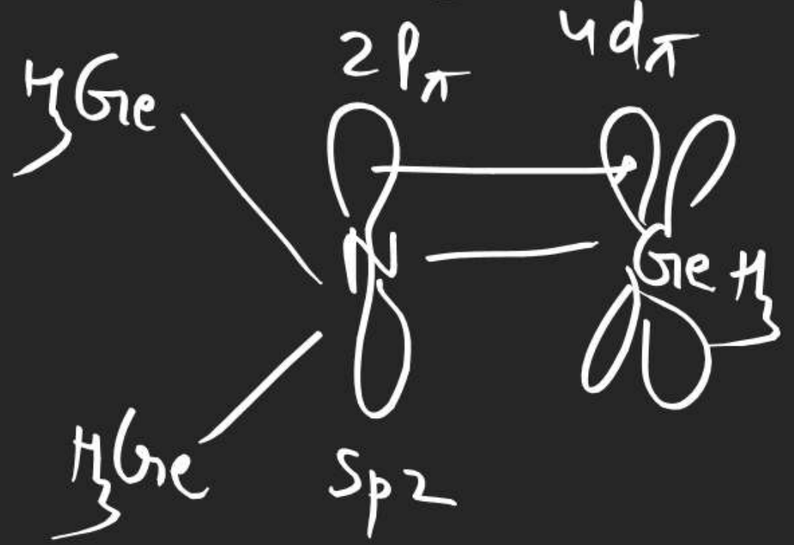
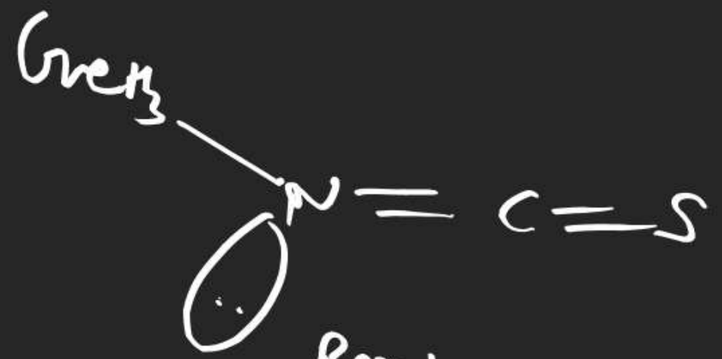
$N(GeH_3)_3$



Planar

120°

GeH_3-NCS Draw the structure



Bent

Sp2

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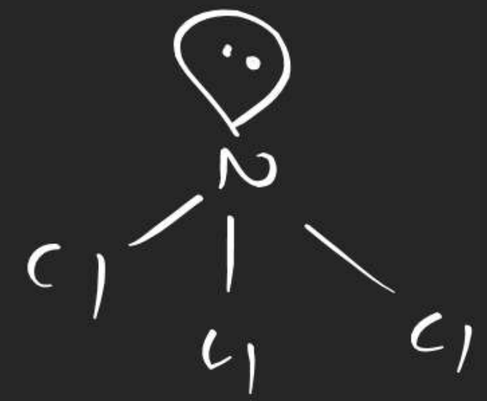
NCl_3



No back bonding

NF_3 ⇒ Non explosive

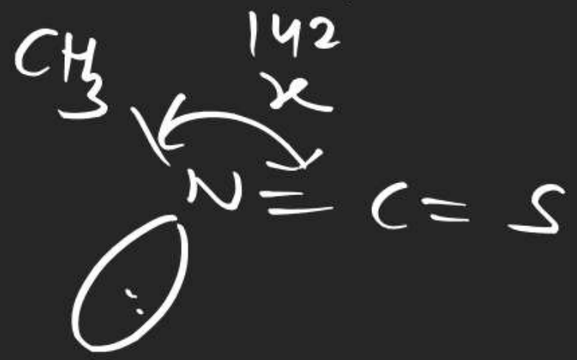
NCl_3

NBr_3

NI_3

} explosive

Most Important Question



One B.A x will be

(a) $x > 120°$

(b) $x < 120°$

(c) $x = 120°$

(d) none