Nishant Jindal

XeO_3

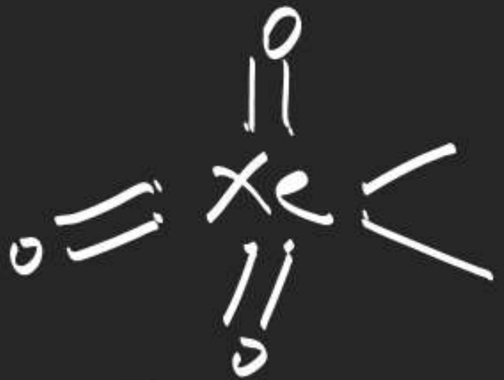
XeO_2F_2

XeO_4

XeO_3F_2

$I_3^{\ominus}$

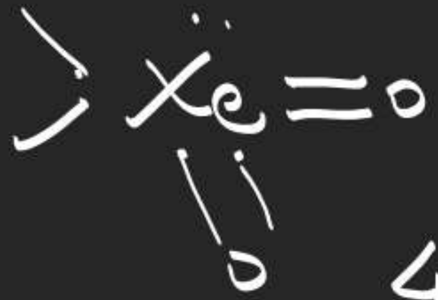
$I_3^{\oplus}$



$5+0=5$

sp^3d

$3+1=4$ sp^3



$4+1=5$ sp^3d

$4+0=4$ sp^3

$I_3^{\ominus}$

$2 + 3 = 5$

sp^3d

$I_3^{\oplus}$

$2 + 2 = 4$ sp^3

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Mixing of atomic orbital

sp $[s + p_x$ or p_y or $p_z]$ linear

sp^2 [s + any two p] trigonal planar

sp^3 $[s + p_x + p_y + p_z]$ tetrahedral

T.B.P

sp^3d — $(s + p_x + p_y + p_z + d_{z^2})$ trigonal bipyramidal

— $s + p_x + p_y + p_z + d_{x^2-y^2}$ (Square pyramidal)

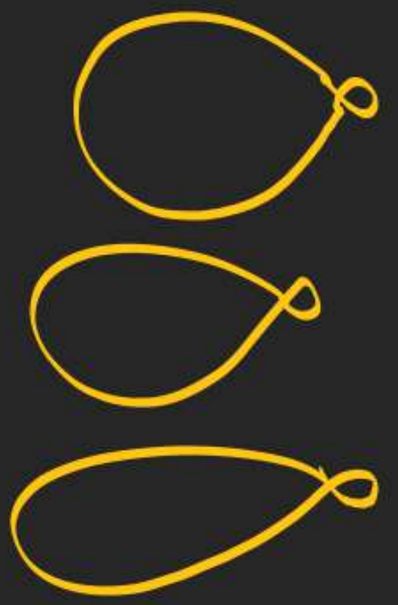
$sp^3d^2 \longrightarrow (s + p_x + p_y + p_z + d_{x^2-y^2} + d_{z^2})$ Octahedral/sq. bipyramidal

$sp^3d^3 \longrightarrow (s + p_x + p_y + p_z + \boxed{d_{x^2-y^2} + d_{z^2}} + d_{xy})$ Pentagonal bipyramidal (P.B.P)

Hybrid orbital

1. it has two lobes · big lobe and small lobe

2.



sp — % of s character $= \frac{1}{2} \times 100 = 50\%$

sp^2 — s% $= \frac{1}{3} \times 100 = 33.33$

sp^3 — s% $= \frac{1}{4} \times 100 = 25$

all hybrid orbital have same shape
but diff size.

Order of size

$sp < sp^2 < sp^3$

$$\boxed{\text{Size of hybrid orbital} \propto \frac{1}{\%\ s\ \text{character}}}$$

s

$s\% \uparrow$ att. $\uparrow$ size of hybrid orbital $\downarrow$

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B.S

$$\underset{1/3}{s} - \underset{1/3}{s} < \underset{1/3}{s} - \underset{1/2}{p} < \underset{1/2}{p} - \underset{1/2}{p} < \underset{1/3}{s} - \underset{98\%}{sp}$$

Hybrid orbitals are more directional then the pure orbitals

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B.S

$sp-sp > sp-sp^2 > sp^2-sp^2 > sp^2-sp^3 > sp^3-sp^3$

$\boxed{B.S \propto \frac{1}{\text{size}} \propto S\%\,Ch \text{ of hybrid orbital}}$

η hyb. orbital

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Que

When pure 2s and 2p orbital involve in bonding of CH_4 then which of the following statements are correct.

~~(a)~~ three C–H bonds are present at right angle, one is diff.

~~(b)~~ three $\boxed{C-H}$ bond have same strength, one diff.

(c) all C–H bonds have same strength

(d) geometry will be tetrahedral.

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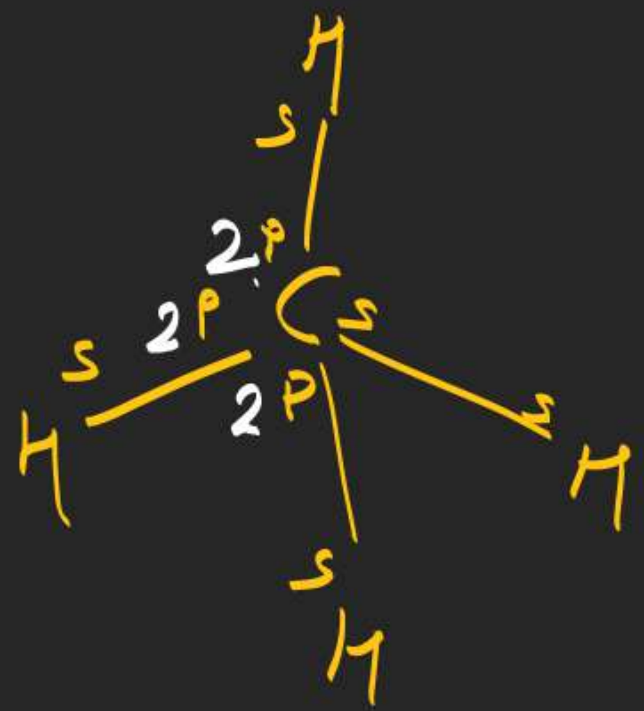
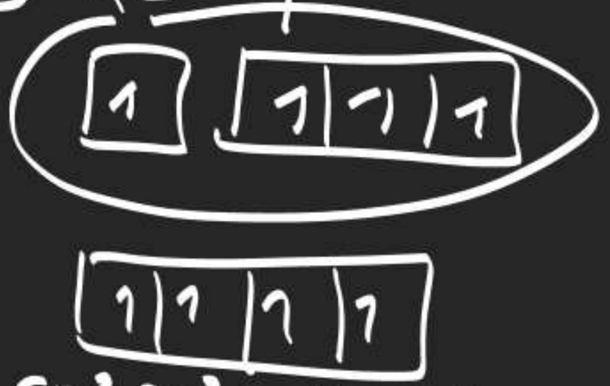
CH_4

$C = 1s^2 2s^2 \underline{2p^2}$

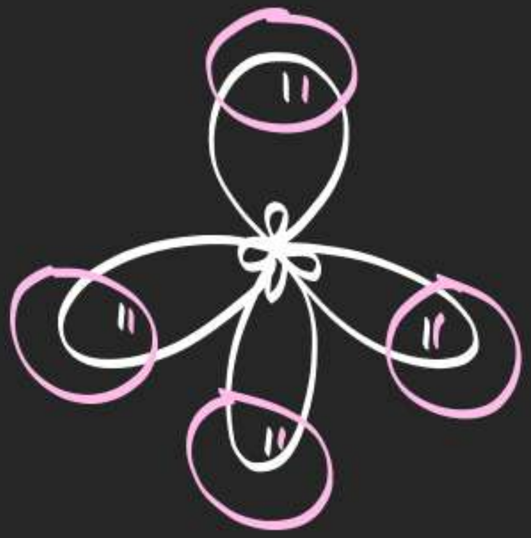


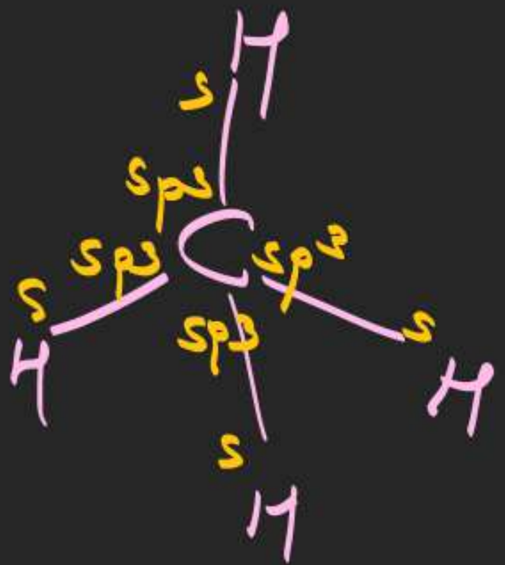
CH_4

$C = 1s^2 2s^2 2p^2$



$sp^3 \; sp^3 \; sp^3 \; sp^3$





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Que When pure orbitals involve in bonding of NH_3, then which of the following statements are correct.

(a) three N – H bonds are present at right angle

(b) three N – H bonds have equal strength

(c) geometry will be pyramidal.

(d) two N – H bonds have equal strength and one diff.

T.H.O	no of σ bond	l.p	electron geometry	geometry/shape	bond Angle	example
2	2	0	 linear	 linear	180	$BrCl_2$
2	1	1	 linear	 linear	—	$:C\equiv O:$
3	3	0	 Trigonal planar		120° = 3	BF_3
3	2	1		 V-shape angular Bent	<120°	SO_2
3	1	2		 linear	—	BF^{-2}

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4 4 0  tetrahedral  tetrahedral 109.5° CH_4

4 3 1  tetrahedral  Pyramidal $< 109.5°$ NH_3

4 2 2   Bent shape
V shape
Angular
$<< 109.5°$ H_2O

4 1 3   linear — $^{\ominus}O - \ddot{Cl}:$

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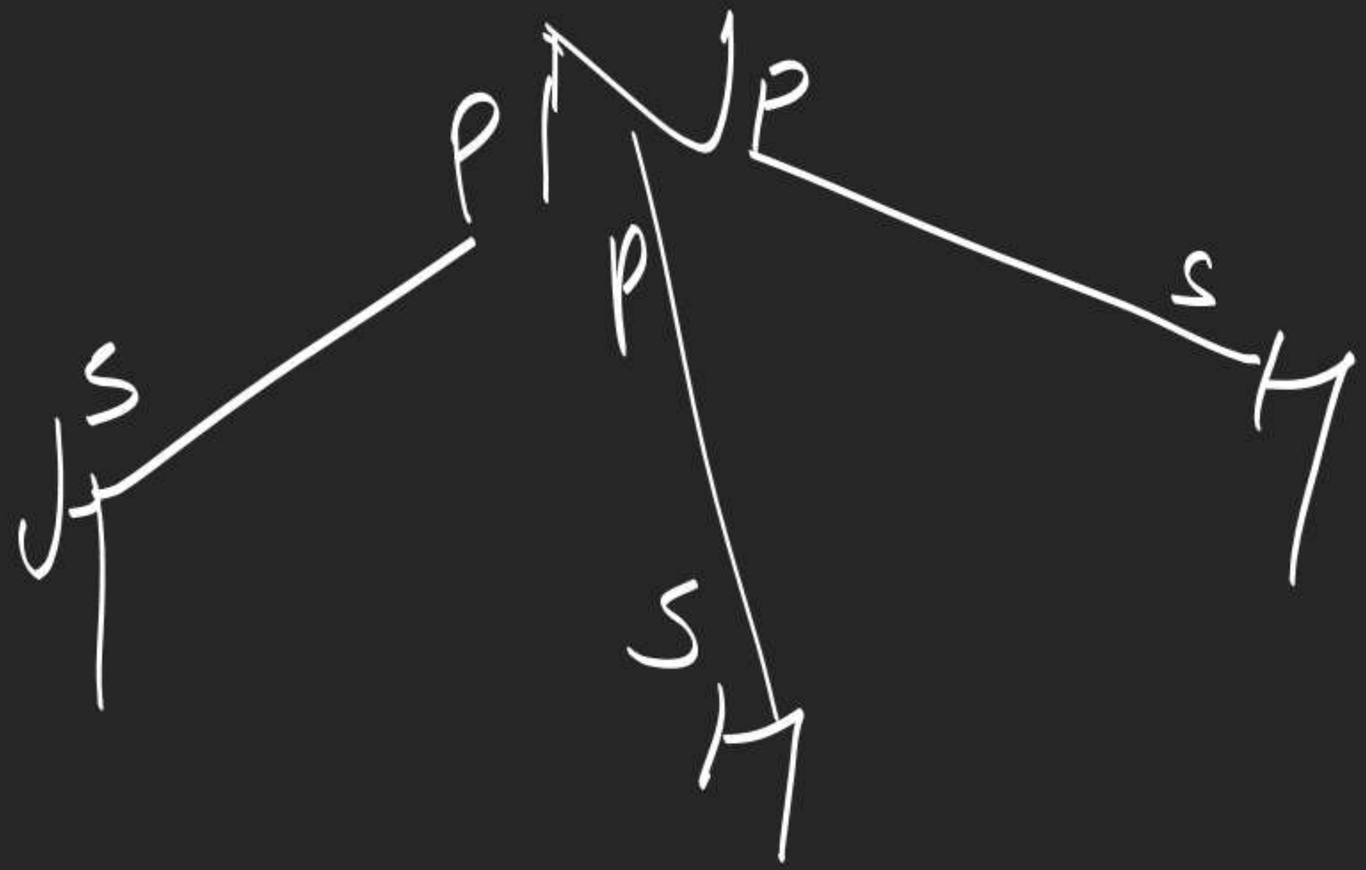
NH_3

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



d_{xy} d_{yz} d_{zx}

non axial

$d_{x^2-y^2}$ d_{z^2}

axial

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$I_3^{\ominus}$

$2+3=5$

sp^3d

$I_3^{\oplus}$

$2+2=4$ $\underline{sp^3}$