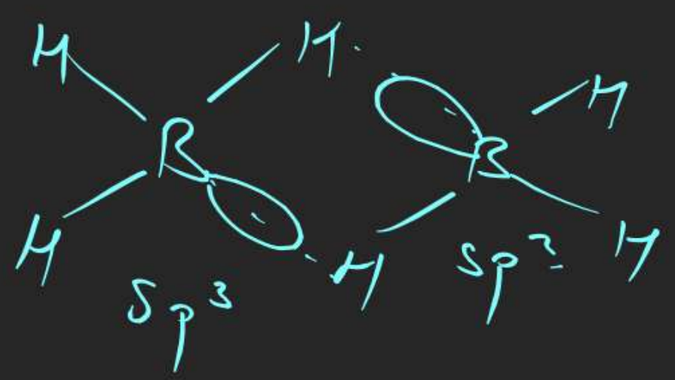
Nishant Jindal

CHEMICAL BONDING

B_2H_6

sp^3



$BeCl_2$

3c-4e⁻

Beach

Cl — Be — Cl

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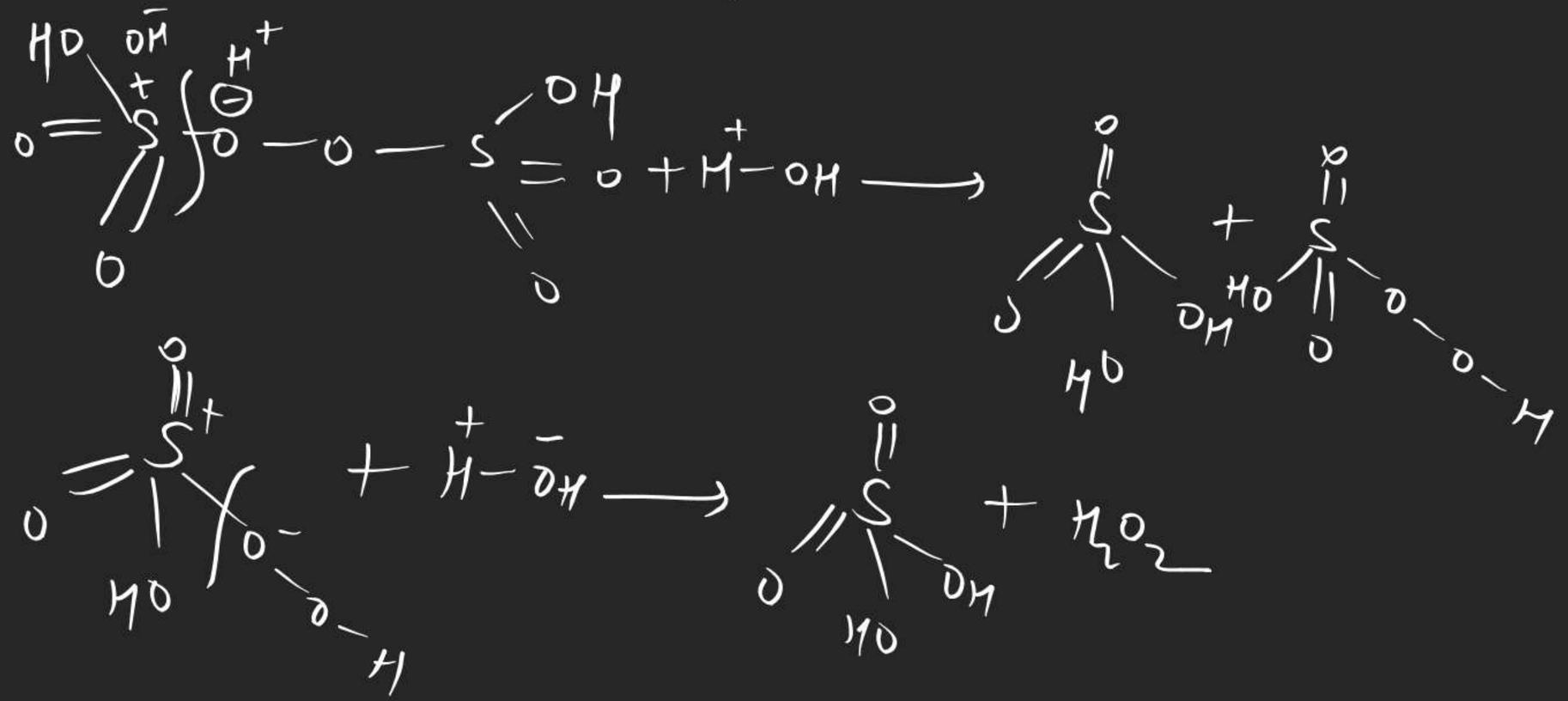
$H_2S_2O_8$ (Marshall's acid)

Peroxodisulphuric acid



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CHEMICAL BONDING

Which of the following can not be hydrolysed.

TeF_6 ✓ $\longrightarrow$ H_6TeO_6

SF_6 ✗ $\longrightarrow$ ✗

due to steric crowding

NCl_3 ✓

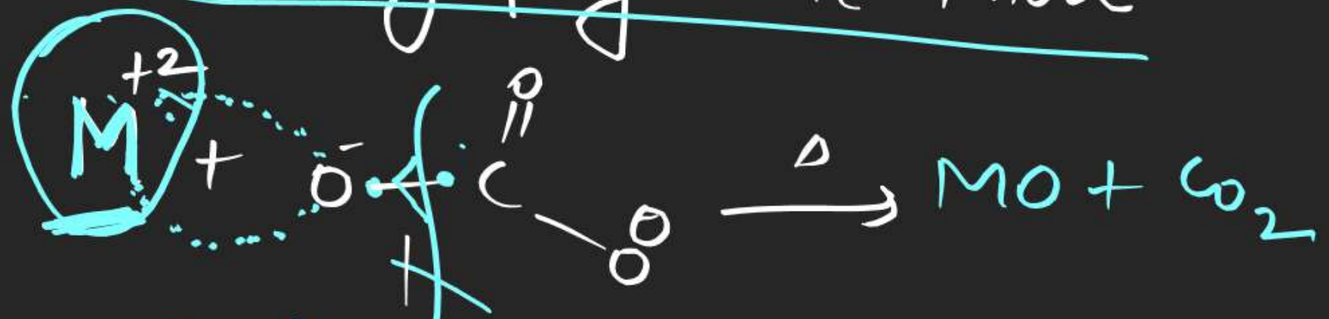
NF_3 ✗ $\longrightarrow$ ✗

due to Vac. orbitals of N

Application of Fajan's Rule

① Thermal stability

(a) Thermal stability in Ionic compound having polyatomic anion



ϕ ↑ T.S ↑

Ionic compound having polyatomic anion ↓

Ionic Compound

Polyatomic anion	Monoatomic anion
CO_3^{-2}	F^-
SO_4^{-2}	Cl^-
SO_3^{-2}	Br^-
NO_3^-	
HCO_3^-	

Order of T.S

$Li_2CO_3 < \cdots < Cs_2CO_3$

$BeCO_3 < \quad < BaCO_3$

$LiNO_3 < \quad < CsNO_3$

$Be(NO_3)_2 << Ba(NO_3)_2$

$Li_2SO_4 < \quad < Cs_2SO_4$

$BeSO_4 < \quad < BaSO_4$

$NaHCO_3 < \quad < CsHCO_3$

$Be(HCO_3)_2 << Ba(HCO_3)_2$

Li^+ Be^{+2}

Na^+ Mg^{+2}

K^+ Ca^{+2}

Rb^+ Sr^{+2}

Cs^+ Ba^{+2}

$\phi \downarrow$ T.S of Ionic Compound having polyatomic anion $\uparrow$

Heating effect

① Metal Carbonate $\xrightarrow{\Delta}$ Metal oxide + CO_2

$CaCO_3 \xrightarrow{\Delta} CaO + CO_2$

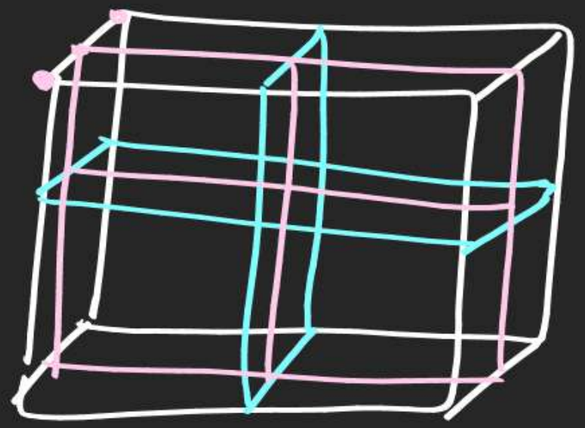
$PbCO_3 \longrightarrow PbO + CO_2$

$FeCO_3 \longrightarrow FeO + CO_2$

$Li_2CO_3 \longrightarrow Li_2O + CO_2$

$ZnCO_3 \longrightarrow ZnO + CO_2$

Note ⇒ Metal Carbonate of Na^+ K^+ Rb^+ Cs^+ do not decompose on Heating they melt on High temp.



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$$MgCO_3 \xrightarrow{\Delta} MgO + CO_2$$

Metal sulphate $\xrightarrow{\Delta}$ Metal oxide + SO_3

$SO_3 \xrightarrow{T > 800^\circ C} SO_2 + \frac{1}{2}O_2$

$PbSO_4 \longrightarrow PbO + SO_3$

$ZnSO_4 \longrightarrow ZnO + SO_3$

$CuSO_4 \longrightarrow CuO + SO_3$

Metal Nitrate $\xrightarrow{\Delta}$ metal oxide + $NO_2 + \frac{1}{2}O_2$

$Be(NO_3)_2 \xrightarrow{\Delta} BeO + NO_2 + \frac{1}{2}O_2$

$Cu(NO_3)_2 \xrightarrow{\Delta} CuO + NO_2 + \frac{1}{2}O_2$

Note ⇒ oxides of native metals (Ag | Hg | Pt | Au) less stable so further decompose on Heating

$AgNO_3 \xrightarrow{\Delta} Ag_2O + NO_2 + \frac{1}{2}O_2$

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$$Hg(NO_3)_2 \xrightarrow{\Delta} Hg + NO_2 + \frac{1}{2}O_2$$

(except Na / K / Rb / Cs)

Metal bicarbonate $\xrightarrow{\Delta}$ Metal carbonate + CO_2 + H_2O

$\downarrow \Delta$

Metal oxide + CO_2

$NaHCO_3 \xrightarrow{\Delta} Na_2CO_3 + CO_2 + H_2O$

$Mg(HCO_3)_2 \xrightarrow{\Delta} MgO + CO_2 + H_2O$

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$LiHCO_3$ ⇒ exist in solution State due to uncomparable size of cation and anion. and high polarising power of metal cation.

$NaHCO_3$ $KHCO_3$ $RbHCO_3$ $CsHCO_3$

exist in solid state

$Be(HCO_3)_2$ $Mg(HCO_3)_2$ $Ca(HCO_3)_2$ $Sr(HCO_3)_2$ $Ba(HCO_3)_2$

exist in solution state

Order of Covalent Character

$ZnCl_2 < CdCl_2 < HgCl_2$

$Zn^{+2} = 3d$

$Cd^{+2} = 3d\ 4d$

$Hg^{+2} = 3d\ 4d\ 5d\ (4f)$

↓

due to poor S.E of 4f subshell

2. Select the correct reduction process:

(A) $2[Ag(CN)_2]^- + Zn \longrightarrow [Zn(CN)_4]^{2-} + 2Ag$

(B) $CuO + H_2 \longrightarrow Cu + H_2O$

(C) $Al_2O_3 + 3Zn \longrightarrow 2Al + 3ZnO$

(D) $MgO + C \xrightarrow[\text{temp.}]{\text{high}} Mg + CO$

1. Choose the correct order for barrier to rotation around the $B - N$ bond of the following compounds.

(A) $BH(NR_2)_2 > B(NR_2)_3 > BH_2 - NH_2$

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

(C) $BH_2 - NR_2 > BH(NR_2)_2 > B\,(NR_2)_3$

(D) $B(NR_2)_3 > BH(NR_2)_2 > BH_2 - NR_2$

2. Hydrolysis of one mole of Peroxo-disulphuric acid produces.

(A) Two moles of sulphuric acid

(B) Two moles of peroxomono-sulphuric acid

(C) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid

(D) One mole of sulphuric acid, one mole of peroxomono-sulphuric acid and one mole of hydrogen peroxide.

$$H_2S_2O_8 + H_2O \longrightarrow H_2SO_4 + H_2SO_5$$

7. Which of the following halides cannot be hydrolysed?

(I) TeF_6 (II) SF_6 (III) NCl_3 (IV) NF_3

Choose the correct code :

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

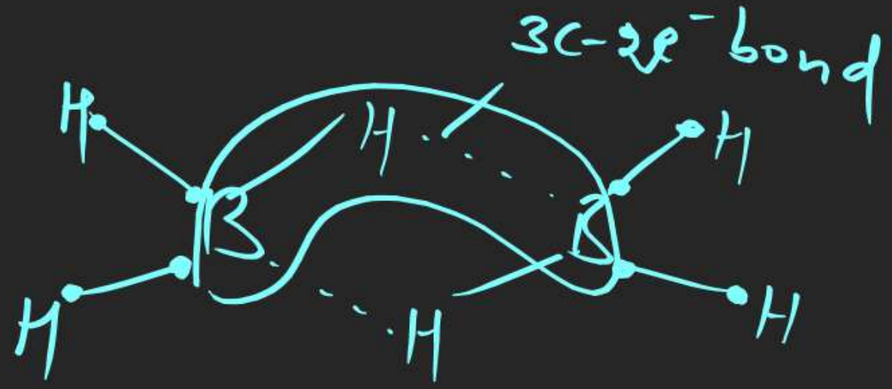
8. The structure of diborane (B_2H_6) contains

(A) Four $(2C-2e^-)$bonds and two $(2C-3e^-)$bonds

(B) Two $(2C-2e^-)$bonds and two $(3C-2e^-)$bonds

(C) Four $(2C-2e^-)$bonds and four $(3C-2e^-)$bonds

(D) None



9. Find out the total number of all $2C - 2e^-$ and $3C - 4e^-$ bond in $BeCl_2$.

$2C - 2e^- = two$

$3C - 4e^- = 0$

$2 + 0 = 2$

10. Predict the basicity of final product (having sulphur) obtained when SF_4 undergoes hyrolysis.

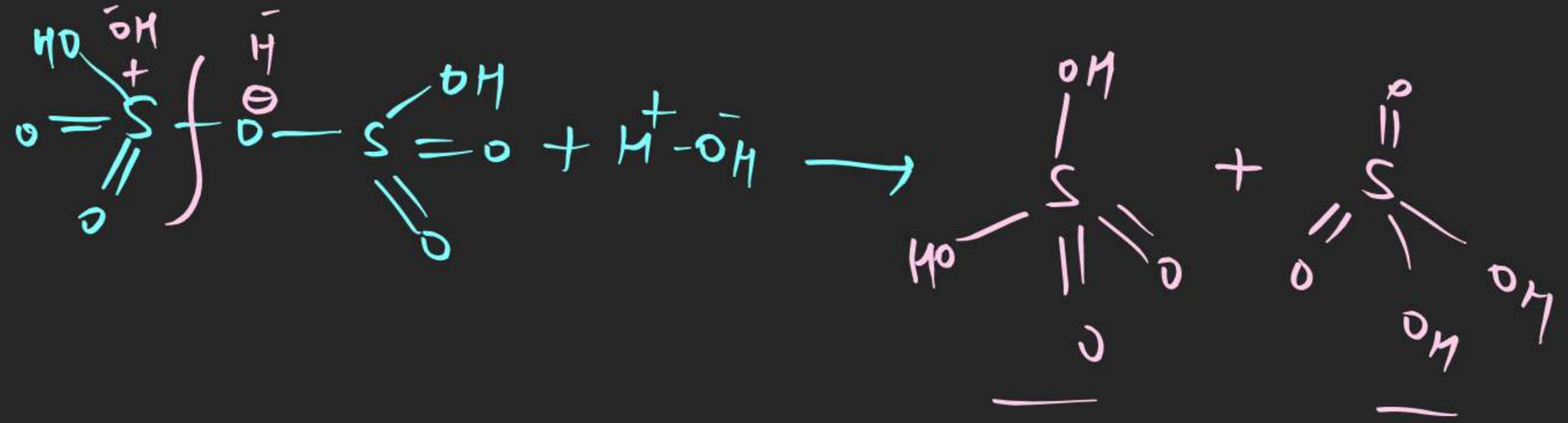
Ans = 2

$SF_4 + H_2O \longrightarrow H_2SO_3$

basicity = 2

11. When oleum $(H_2S_2O_7)$ is completely hydrolyzed, then how many acidic hydrogens are present in the final product?

(2)



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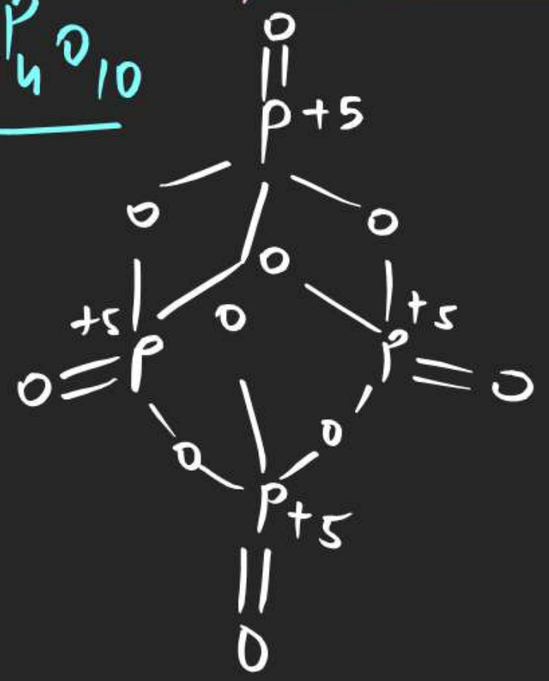
P_4O_7 P_4O_8 P_4O_9

P_4O_{10}



P_4O_6