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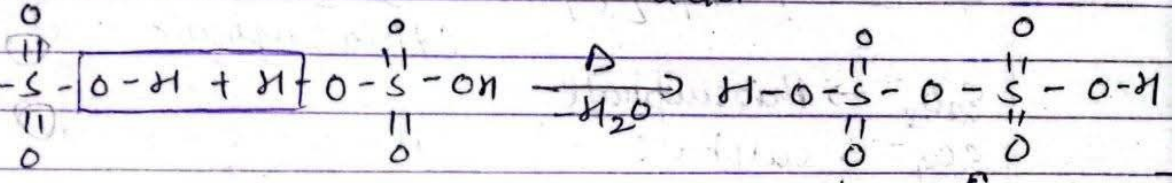
Inorganic basic

- Effect of Heat on Acid:

$$2\,Acid \xrightarrow[-H_2O]{\Delta} \text{pyro acid}$$

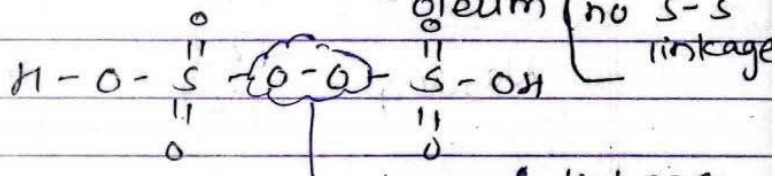
fumes of SO_2 ↑

$$2H_2SO_4 \xrightarrow[-H_2O]{\Delta} H_2S_2O_7$$ (fuming sulphuric acid / pyrosulphuric acid / oleum)



oleum (no S-S linkage)

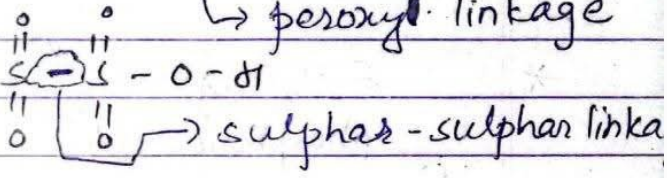
$H_2S_2O_8$ ⟶



peroxy disulphuric acid (Marshall acid)

→ peroxy linkage

$H_2S_2O_6$ ⟶

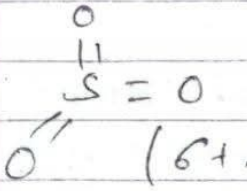


(Dithionic acid)

→ sulphur-sulphur linkage

For below O_6 like $H_2S_2O_5$, $H_2S_2O_4$, oxygen should be removed from any π-bonded sulphur.

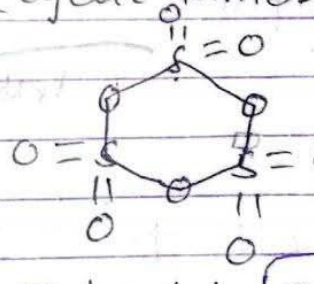
$$3SO_3 \longrightarrow S_3O_9 \text{ (cyclic trimer of } SO_3)$$



(6 + 1p)

∴ 3 + 0

= sp^2 hybridized S.



σ = 12

π = 6

→ S-S linkage absent

π bond is $p\pi - d\pi$

↓

bond formed by the vacant d-orbital of sulphur and lone pair of electron in p-orbital of oxygen.

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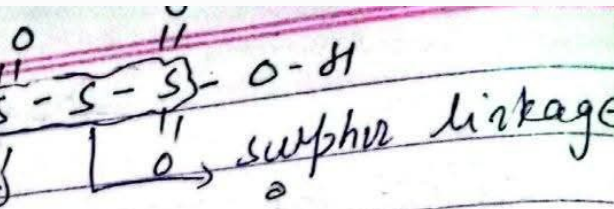
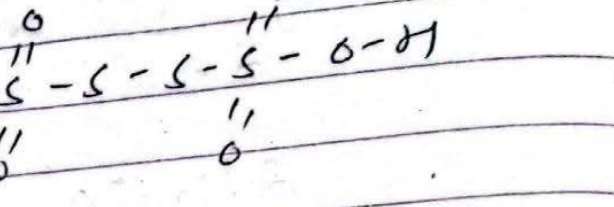
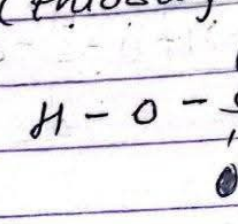
$H_2S_2O_6$ (trithionic acid) $\longrightarrow$ 

$H_2S_4O_6$ (tetrathionic acid) $\longrightarrow$ 

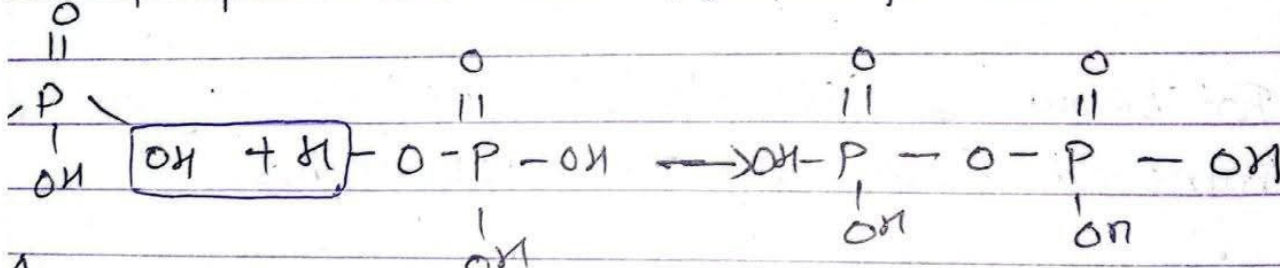
$H_2SO_4 \xrightarrow[+[S]]{-[O]} H_2S_2O_3$ (thiosulphuric acid)

$S_2O_3^{--}$ → thiosulphate
SO_4^{--} → sulphate



$Na_2SO_4 \xrightarrow[+[S]]{-[O]} Na_2S_2O_3$ (sodium thiosulphate)(Hypo)

$2H_3PO_4 \xrightarrow[-H_2O]{\Delta} H_4P_2O_7$ (Diphosphoric acid)
(phosphonic acid) (pyrophosphoric acid)



4 → pyrophosphate

Pyrophosphoric acid
→ Tetrabasic
→ 2-tetrahedral unit joined by common oxygen

Sodium pyrophosphate → $Na_4P_2O_7$

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1 Acid $\xrightarrow[-H_2O]{\Delta}$ Meta acid.

$H_3PO_4 \xrightarrow[-H_2O]{\Delta} HPO_3$

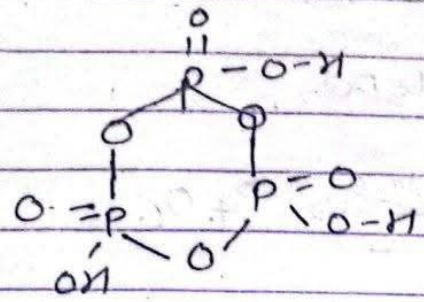
Meta phosphonic acid

↓

exist in cyclic trimer

↓

$H_3P_3O_9$ (cyclotrimetaphosphoric acid)

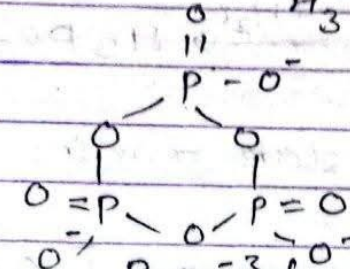


$(H_3P_3O_9)$

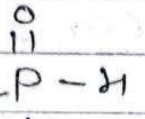
$\sigma = 15$

$\pi = 3$

Single bond = 12

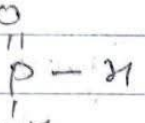


$P_3O_9^{-3}$ (cyclotrimetaphosphate)



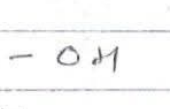
H_3PO_2 ⟶ Hypophosphorus (phosphinic acid) acid

- Monobasic
- 1 reducable hydroger



H_3PO_3 ⟶ phosphorous acid (phosphonic acid)

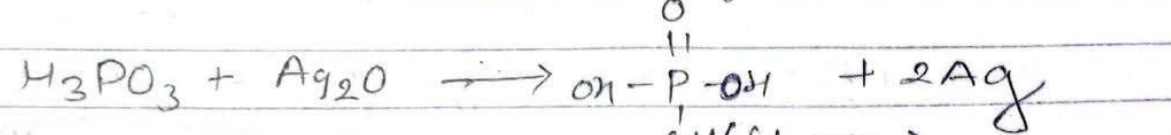
- Dibasic (dibotic)
- 1 reducable hydrog



H_3PO_4 ⟶ orthophosphoric acid

- Tribasic
- No reducable hydroge

H_3PO_2 and H_3PO_3 acts a reducing agent due to presence of reducable hydrogen (P–H), and gives silver mirror with Tollen's reagent.



$H_3PO_3 + Ag_2O \longrightarrow H_3PO_4 + 2Ag$

$H_3PO_2 + 2Ag_2O \longrightarrow H_3PO_4 + 4Ag$

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P_4O_{10} is anhydrate of H_3PO_4.

→ 6 mol of water required

$$P_4O_{10} \xrightarrow{6H_2O} 4H_3PO_4 \xrightarrow[\Delta]{-H_2O} P_4O_{10}$$

P_4O_6 is anhydrate of H_3PO_3.

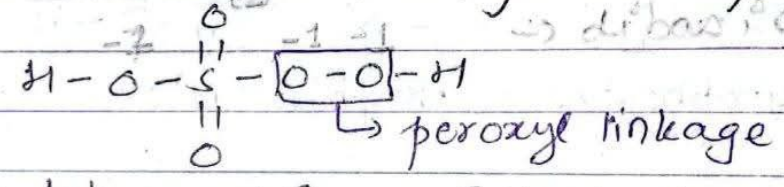
$$P_4O_6 \xrightarrow{+H_2O} H_3PO_3 \xrightarrow[\Delta]{-H_2O} P_4O_6$$

Oxidation state remains comes after hydrolysis. (ie +5)

Peroxy linkage: $[O^{-1}-O^{-1}]$ linkage

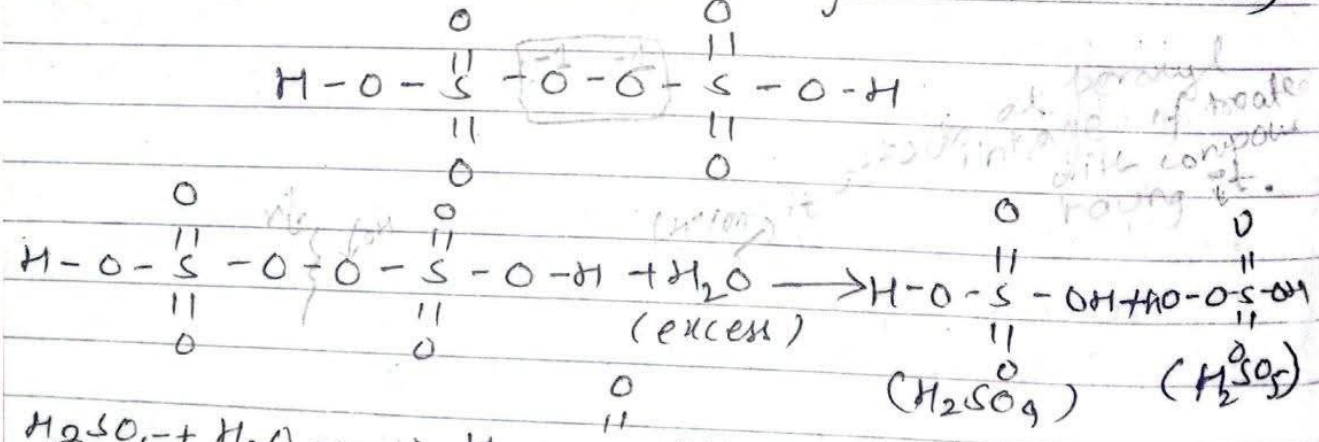
H_2SO_5 : Caro's acid (Peroxymonosulphuric acid)

$H_2SO_4 + O$



O.S of sulphur = +6, sp^3-hybridized

$H_2S_2O_8$: Marshall's acid (Peroxydisulphuric acid)



$$H_2SO_5 + H_2O \longrightarrow H-O-\overset{O}{\overset{\|}{S}}-OH + HO-OH$$

(H_2SO_4) (H_2O_2)

Rxn:

$$H_2S_2O_8 + H_2O \longrightarrow 2H_2SO_4 + H_2O_2$$

(excess)

O^{-2} oxide O_2^{-} peroxide O_2 supersoxide S > P > O [Reducing p

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- Performic acid:

$$H-\overset{O}{\overset{\|}{C}}-O-H + O \longrightarrow H-O-\overset{O}{\overset{\|}{C}}-OH \ (H_2CO_3)$$

formic acid → carbonic acid

$$H-\overset{O}{\overset{\|}{C}}-O-H + O \longrightarrow H-\overset{O}{\overset{\|}{C}}-O-O-H$$

(performic acid) → peroxyl linkage

↳ Monobasic

- Peroxy linkage is present in:

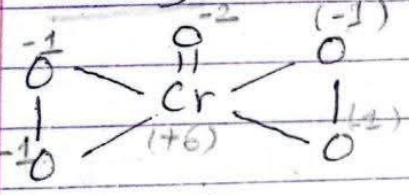
→ $H_2S_2O_8$ → CH_3CO_3H $H_3C-\overset{O}{\overset{\|}{C}}-O-O-H$

→ H_2SO_5 → H_2O_2 $H-O-O-H$

→ H_3PO_5 → Na_2O_2 $Na-O-O-Na$

→ H_3PO_4 (X) → BaO_2 $Ba^{+2}\ O^{-1}-O^{-1}$

→ CrO_5



- Peroxy linkage absent in O_2F_2

$F-\overset{+1}{O}-\overset{+1}{O}-F$

↳ because O in +1 stat

- which is highly volatile?

a) HI b) HF c) HBr d) HCl

F > Cl < Br < I

H-bonding

B.P $\propto \frac{1}{\text{volatility}}$

vanderwal Force $\propto$ m

order of Boiling point : HF > HI > HBr > HCl

volatility : HCl > HBr > HI > HF

Acidic strength : HI > HBr > HCl > HF

* BP : $\{BiH_3 > SbH_3\} > NH_3 > AsH_3 > PH_3$

weak H-bond

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property of attracting anion towards itself

Fajan's rule

property to move towards cations

Polarising power (degree of covalency)

↓

for cations

↓

Charge density (Ionic potential) = $\frac{\text{charge}}{\text{size}}$

↓

Along group charge same
size ↑ hence charge density ↓

Polarsibility

↓

for anion

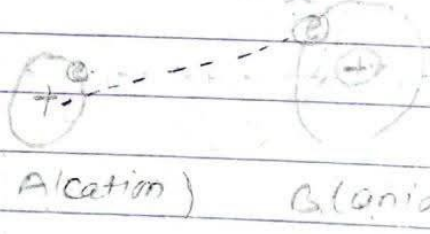
↓

Polarsibility ∝ size

↓

Increases down the group

- Experimentally 100% covalent or 100% ionic bond is not possible.
- Covalent character in ionic compound is explained by polarisation which was explain by Fajan.



- According to Fajan rule, when ionic bond is formed, cation and anion come close to each other in isolated condition.
- Then e⁻ cloud of anion is attracted by charge of cation. similarly e⁻ cloud of cation is attracted by nucleus of anion. As a result distortion is created in e⁻ cloud of both

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ions but distortion of e^- cloud of cation is negligible because of its small size (ie e^- cloud of cation is strongly hold by its nucleus).

- Distortion in e^- cloud of anion by cation is called polarisation. The tendency of cation to distort anion is called polarising power of cation
- The ability of anion to get polarised called polarisibility
- charge of cation ↑, polarising power ↑, covalent character ↑
- size of cation ↓, PP ↓, covalent character ↓
- size of anion ↑, polarsibility ↑, covalent character ↑
- Charge of anion ↑, Polarisibility ↑, covalent character ↑

Pseudo inert gas configuration:

Cu^+ : $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}$ [$4s^1$] (18 e^-)

Zn^{2+} : $1s^2, 2s^2, 2p^6, 3s^2, 3p^6, 3d^{10}$ [$4s^2$] (18 e^-)

IB (11th group)	IIB (12th group)	
Cu^+	Zn^{2+}	pseudo inert gas config
Ag^+	Cd^{+2}	
Au^+	Hg^{+2}	→ Polarising power increases down the group for pseudo inert gases, just opposite of others.

- Polarising power is maximum for pseudoinert gases.
  - ↓
  - seen if charge & shape/size are almost equal.

Eg: $NaCl$ & $CuCl$, KCl & $AgCl$

same ↓ charge & size

Cu ↑ polarising power of Cu^+ ↑

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Application of Fajan Rule:

- Polarisation ↑, covalent charcter ↑, IC ↓, M.Pt ↓ and solubility in H_2O ↓.

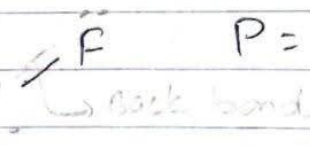
i.e Covalent character $\propto \frac{1}{\text{Ionic character}} \propto \frac{1}{M.Pt} \propto \frac{1}{\text{solubility in } H_2O}$

Back Bonding:

Conditions:

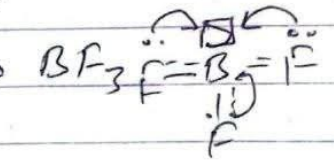
- One bonded atom must have lone pair and other bonded atom must have vacant orbital.
- One bonded atom must be of 2nd period & other bonded atom must be of 2nd or 3rd period.

Eg. • PF_3



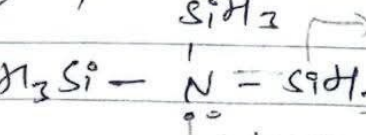
$P = 1s^2, 2s^2, 2p^6, 3s^2, 3p^3, 3d^0$

• BF_3



→ vacant p orbital of boron and lone pair of fluorine

Because of back bonding there is development of partial double bond.



→ vacant 3d present in Si

Trisylyl amine

Hybridization of N
= lp + 6
= 3 + 0 ⇒ sp^2

lone pair ⊥ in backbonding not

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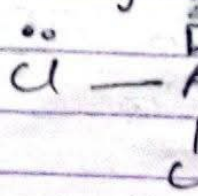
- Backbonding not seen in $AlCl_3$.

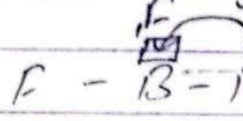


→ Having both lone pair & vacant orbital but is not back bonding because lone pair and vacant orbital both are of 3rd shell

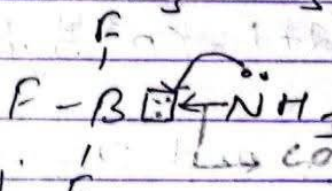
* Which molecule is planar?

a) $(CH_3)_3N$ b) $(SiH_3)P$ c) $(SiH_3)_3N$ d) b and c

- Bond length of BF_3 and $BF_3 \cdot NH_3$ of B-F.



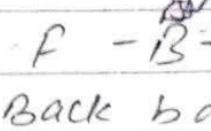
back bonding



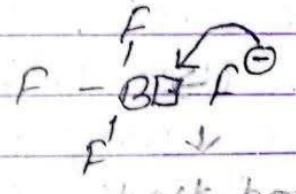
↳ back bonding not possible

∴ Bond length: $BF_3 < BF_3 \cdot NH_3$ since vacant orbital is occupi

- BF_3 and BF_4^-



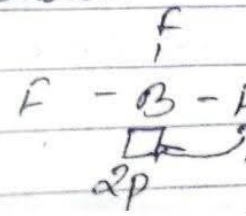
Back bonding

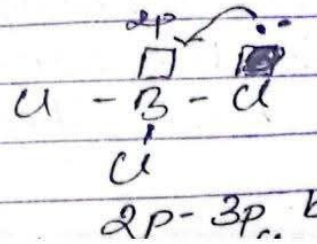


back bonding not possible since the required electron is given by F to boron.

- Backbonding completely does not satisfies the need of electron whereas coordinate bond does.

- Effective back-bonding is seen in similar size orbitals





2p-3p bonding

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lewis acid → Accepts pair

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Since the bonding is more effective in BF_3 then BCl_3, the need of electron in BF_3 will be more satisfied then in BCl_3.

So, BF_3 is weaker lewis acid then BCl_3.
↳ which need more electron

$CH_3-\ddot{N}=C=S$ — $H_3Si-\ddot{N}=C=S$

methyl isocyanate — silyl isocyanate

methyl isocyanate: no back bonding, $N = 2+1 = sp^3$ hybrized

silyl isocyanate: back bonding possible, $N = 2+2 = sp^2$

$\ddot{N}H_3$ and $\ddot{P}H_3$

In $\ddot{N}H_3$ the electrons are dispersed in very small area but in PH_3, the electrons are dispersed in large area, so the electrons are stable in PH_3 then NH_3. So, the lone pair electron are not ready to bind with H^+ are is less basic then NH_3.

Basic strength: $\ddot{P}H_3 < \ddot{N}H_3$

$N(SiH_3)_3$ $SiH_3-\ddot{N}-SiH_3$
SiH_3

In this compound the lone pair electrons undergo back-bonding hence are not avaible for H^+. So the compounds going back-bonding are less basic then others.

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- ~~Acidi~~ lewis acidic order of $AlCl_3$, $AlBr_3$ & AlI_3:

Since none the above compound undergo back-bonding so, in this case we observe electronegativity of central or side atom.

LA ∝ EN of central/side atom.

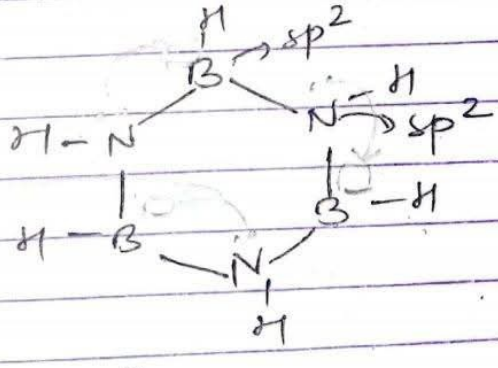
Here central atom Al is common is all but EN is of order Cl > Br > I.

So, L.A order: $AlCl_3 > AlBr_3 > AlI_3$

- $BF_3 < BCl_3 < BBr_3 < BI_3$ [lewis Acid]

$B_3N_3H_6$: Inorganic benzene

→ Bora-zole, Borazine



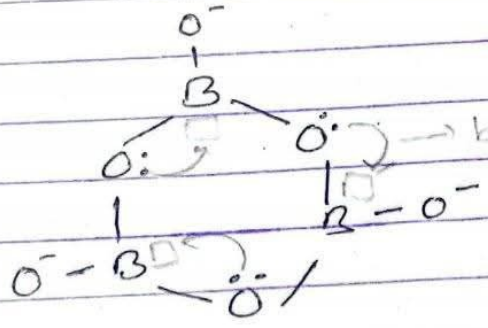
→ planar

→ $\mu = 0$

→ Non-polar

Back bonding possible

$B_3O_6^{-3}$:



→ back bonding possible

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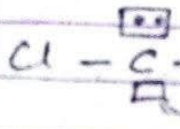
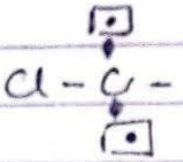
- CCl_2 exist in two forms → singlet, → triplet.



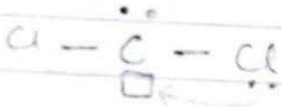


Singlet → backbonding possible

Hence, a > b [stability]

triplet → backbonding not possible

- CCl_2 and CCl_3



Backbonding from Cl → C.
($3p\pi - 2p\pi$)

Back bonding from C → Cl.
($2p\pi - 3d\pi$)

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Thermal stability

Polyatomic anion: CO_3^{-2}, SO_4^{-2}, NO_3^-, HCO_3^-, OH^-, O_2^{-2}, O_2^-.

Monoatomic anion; X^-, O^{-2}, N^{-3}, H^-

- Thermal stability of ionic compound having monoatomic anion

$$M^+X^- \xrightarrow{\Delta} M^+ + X^-$$

Thermal energy decided by Lattice energy.

$$\text{Lattice energy} = K\frac{q_1 q_2}{r(r_c + r_a)}$$

$$L.E \propto \text{charge} \quad \& \quad LE \propto \frac{1}{r(r_c+r_a)}$$

Thermal stability $\propto$ Lattice energy

Eg: $Li^+Cl^- > Na^+Cl^- > K^+Cl^- > Rb^+Cl^- > Cs^+Cl^-$

Same charge, so then check size, smaller size greater lattice energy and greater is thermal stability.

- $KF > KCl > KBr > KI$
- $Li_2O > Na_2O > K_2O > Rb_2O > Cs_2O$ [these are monoatomic]
- $LiH > NaH > KH > CsH$
- $Ca_3N_2 > Sr_3N_2$ → these are monoatomic. Their charges make them polyatomic like

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- Thermal stability of polyatomic anion:

Down the group, Thermal stability $\propto \frac{1}{\phi}$ increases [ϕ = Polarising power $= \frac{\text{charge}}{\text{size}}$]

- $BeCO_3 < MgCO_3 < CaCO_3 < BaCO_3$

$$M^{+2} + O-C(=O)-O \rightarrow MO + CO_2$$

- $CaO_2 < SrO_2 < BaO_2$

Thus, thermal stability increases down the group.

* Carbonates and sulphates of Group IA do not break to give respective compounds rather melt except Lithium.

$$Li_2CO_3 \xrightarrow{\Delta} Li_2O + CO_2$$
$$Li_2SO_4 \xrightarrow{\Delta} Li_2O + SO_3$$

But, $Na_2CO_3 \xrightarrow{\Delta}$ melt

$Cs_2SO_3 \xrightarrow{\Delta}$ melt

* But such effect is not seen in Group IIA.

$BeCO_3 \xrightarrow{\Delta} BeO + CO_2$

$BaCO_3 \xrightarrow{\Delta} BaO + CO_2$

- Washing soda loses wt on heating due to
a) H_2O b) CO_2 c) CO d) a & b

$Na_2CO_3 \cdot 10H_2O \rightarrow Na_2O_2 + 10H_2O$

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Carbonates $\xrightarrow{\Delta}$ $CO_2 + MO$ } MO → metal oxide

Sulphate $\xrightarrow{\Delta}$ $SO_2 + MO$

Nitrate $\xrightarrow{\Delta}$ $NO_2 + \frac{1}{2}O_2 + MO$

Hydroxide $\xrightarrow{\Delta}$ $H_2O + MO$

Peroxide $\xrightarrow{\Delta}$ $O_2 + MO$

Superoxide $\xrightarrow{\Delta}$ $O_2 + MO$

- $CuCO_3 \cdot Cu(OH)_2 \xrightarrow{\Delta} CuO + CO_2 + CuO + H_2O$
  (Malachite green) $\quad 2CuO + CO_2 + H_2O$
- $Al(OH)_3 \xrightarrow{\Delta} Al_2O_3 + H_2O$
- $MgSO_4 \cdot 7H_2O \xrightarrow{\Delta} MgO + SO_3 + 7H_2O$
- $K_2SO_4 \cdot Al_2(SO_4)_3 \cdot 24H_2O \longrightarrow Al_2O_3 + SO_3 + K_2SO_4 + 24H_2O$
  does not break (potash alum)

- Among $CaCO_3$ and $ZnCO_3$, $ZnCO_3$ is more stable then $CaCO_3$ being pseudoinest gas. ~~we~~ If we have to compare alkali metal with these pseudo inert gas then pseudo inest gas are priority.

	Cu^+	Zn^{2+}
* Elements below Cu in electrochemical	Ag^+	Cd^{2+}
sesies such as Ag, Hg, Au	Au^+	Hg^{+2}

and Pt are called noble metal. These metal show very less affinity with oxygen so get decomposed into metal and oxygen.

$AgNO_3 \xrightarrow{\Delta} Ag_2O + NO_2 + \frac{1}{2}O_2$ [Break down to metal]

$\downarrow$

$Ag + NO_2 + \frac{1}{2}O_2$

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$LiNO_3 \xrightarrow{\Delta} Li_2O + NO_2 + \frac{1}{2}O_2$

Reddish brown gas

$NaNO_3 \xrightarrow{\Delta} NaNO_2 + \frac{1}{2}O_2$

$KNO_3 \xrightarrow{\Delta} KNO_2 + \frac{1}{2}O_2$

Group IA metal except Li decompose partially to give metal nitrate

$NH_4NO_3 \xrightarrow{\Delta} N_2O + 2H_2O$

Laughing gas

Both gaseous state so no residue left

Effect of heat on Gypsum:

$CaSO_4 \cdot 2H_2O \xrightarrow[\Delta]{110^\circ} CaSO_4 \cdot \frac{1}{2}H_2O$

(Gypsum) Plaster of paris

$CaSO_4 \cdot \frac{1}{2}H_2O \xrightarrow[\Delta]{200^\circ C} CaSO_4$

Dead burnt sulphur

$CaSO_4 \xrightarrow[\Delta]{1000^\circ C} CaO + SO_3$

Metal bicarbonate (All metals) $\xrightarrow{\Delta}$ Metal carbonate $+ CO_2 + H_2O$

Metal carbonate $\xrightarrow{\Delta}$ Metal oxide $+ CO_2\uparrow$

Group IA bicarbonate metals except Li exist as solid state

$NaHCO_3, KHCO_3, RbHCO_3, CsHCO_3$ - solid state

$LiHCO_3$ → solution state

Group IIA metals exist in solution state.

Stability • $H_2O > H_2S > H_2Se > H_2Te$ } Because of bond length. shorter bond length, greater stability

• $HF > HCl > HBr > HI$

• $NH_3 > PH_3 > AsH_3 > SbH_3$

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Hydrolysis :

surrounding the atom by H_2O molecule.

• Hydrolysis of halide ∝ covalent character
Ionic chloride undergo hydration process.

$$Na^+Cl^- \xrightarrow{H_2O} \underbrace{[Na(H_2O)_n]^+}_{\text{Hydration}} + [Cl(H_2O)_n]^-$$

But covalent chloride hydrolysed by H_2O.

Condition for undergoing hydrolysis:

• Vacant orbital and +ve charge present simultaneou at same atom.

• CCl_4 : $Cl-\overset{Cl}{\underset{Cl}{C}}-Cl$ (no hydrolysis)

$C = 1s^2, 2s^2, 2p^2$ (1s, 2s, 2p) no vacant orbital prese hence no hydrolysis.

• $SiCl_4$: $Cl-\overset{Cl}{\underset{Cl}{Si}}-Cl$ (hydrolysis)

undergo hydrolysis because of present of 3d-vacant orbit

• NCl_3 : $Cl-\overset{\cdot\cdot}{N}-Cl$ (hydrolysis) — $\chi_N \approx \chi_{Cl}$, but because small size of N it has a little more EN than N so get $-\delta$.

$$Si(Cl)_4 + 4H_2O \longrightarrow Si(OH)_4 + 4HCl$$

$Si(OH)_4$ → H_4SiO_4 (silicic acid)

Note: If acid has oxygen and hydrogen, it is calle oxyacid.

Hybridization in intermediate product is always +1 H.C. the reactant. Eg: reactant sp^3, intermediate sp^3d

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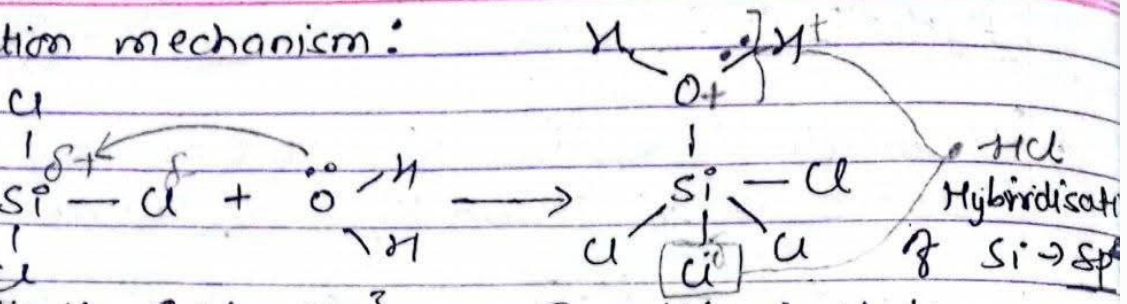
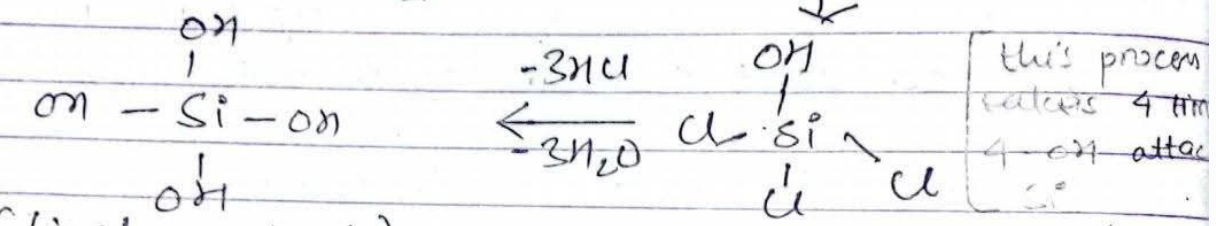
Reaction mechanism:



Hybridisation of Si → sp^3 Transitional state



(final product)
(silicic acid)

- $BCl_3 + 3H^{\delta+}-OH^{\delta-} \longrightarrow B(OH)_3 + 3HCl$
- $PCl_3 + 3H^{\delta+}-OH \longrightarrow P(OH)_3 + 3HCl$
  $\downarrow$
  H_3PO_3 (phosphorous acid)
- $NCl_3 + 3H^{\delta+}-OH \longrightarrow NH_3 + 3HOCl$

Keypoints of hydrolysis: The result of hydrolysis is oxyacids.

P: +3 → H_3PO_3; +5 → H_3PO_4

S: +4 → H_2SO_3; +6 → H_2SO_4

As: +3 → H_3AsO_3; +5 → H_3AsO_4

N: +3 → HNO_2; +5 → HNO_3

Si: +4 → H_4SiO_4

B: +3 → H_2BO_3

Se: +4 → H_2SeO_3; +6 → H_2SeO_4

(X)Cl: +1 → HClO; +3 → $HClO_2$; +5 → $HClO_3$

trivial

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$\overset{+5}{PCl_5} + H_2O \longrightarrow H_3PO_4$

$\overset{+4}{SF_4} + H_2O \longrightarrow H_2SO_3$

$\overset{+4}{SOCl_2} + H_2O \longrightarrow H_2SO_3$

$\overset{+6}{SOCl_4} + H_2O \longrightarrow H_2SO_4$

$\overset{+1}{NCl_3} \xrightarrow{H_2O} HClO$

$\overset{+6}{SO_2Cl_2} \xrightarrow{H_2O} H_2SO_4$

$\overset{+3}{P_4O_6} \xrightarrow{H_2O} H_3PO_3$

$\overset{+5}{POCl_3} \xrightarrow{H_2O} H_3PO_4$

$\overset{+5}{P_4S_{10}} \xrightarrow{+H_2O} H_3PO_4 + H_2S$

$\overset{+5}{P_4O_{10}} \xrightarrow{6H_2O} 4H_3PO_4$

$\overset{+1}{ICl} \longrightarrow HIO$

$\overset{+3}{ClF_3} \longrightarrow HClO_2$

$\overset{+7}{IF_7} \longrightarrow HIO_4$

Rate of hydrolysis : $\propto$ covalent character.

$PCl_3 > AsCl_3 > SbCl_3 > BiCl_3$ [Charge same then size]

$FeCl_2 < FeCl_3$ [$FeCl_3$ → Fe has +3 charge hence more covalent character]

$CCl_4 < MgCl_2 < AlCl_3 < SiCl_4 < PCl_5$

↳ no hydrolysis

SF_6 does not undergo hydrolysis, because of crowding → small size of fluorine, high crowding near sulphur, so does not let H_2O attack.

SCl_6, SBr_6 → undergo hydrolysis because of larger size

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* $PCl_5 \longrightarrow POCl_3$ (intermediate) $\longrightarrow$

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Qn: $P_4 \xrightarrow[\text{(limited)}]{Cl_2} ? \xrightarrow{H\text{-}OH} ?$

→ Soln:

$P_4 \xrightarrow[(lim)]{Cl_2} \overset{+3}{PCl_3} \xrightarrow{H\text{-}OH} H_3PO_3$

But if,

$P_4 \xrightarrow[excess]{Cl_2} \overset{+5}{PCl_5} \xrightarrow{H\text{-}OH} H_3PO_4$

* $SbCl_3$ and $BiCl_3$ does not go complete hydroly but partial because of less covalent character.

$SbCl_3 + H_2O \longrightarrow SbOCl + HCl$

$BiCl_3 + H_2O \longrightarrow BiOCl + H_2O$

(white pearl) (milky solutio

* BCl_3, $SiCl_4$ fumes in air but CCl_4 not.

$BCl_3 + H_2O \longrightarrow B(OH)_3 + HCl$

$SiCl_4 + H_2O \longrightarrow Si(OH)_3 + HCl$

white fum

* Rate of hydrolysis decreases down the group since covalent character decreases.

LiCl	$BeCl_2$	BCl_3
NaCl	$MgCl_2$	$AlCl_3$
K		$GaCl_3$
		$InCl_3$
		$TeCl_3$

Hydrolysis ← | Nohydrolysis

• If covalent compound has water $\xrightarrow{\Delta}$ metal oxid

Ionic compound has water $\xrightarrow{\Delta}$ waters (as

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which compound on heating form anhydrous chloride?

a) covalent $AlCl_3 \cdot 6H_2O$ b) covalent $FeCl_3 \cdot 6H_2O$ c) $CaCl_2 \cdot 6H_2O \rightarrow CaCl_2 + 6H_2O$ d) covalent $MgCl_2 \cdot 6H_2O$

Inert pair effect : p-block element

$2p^1$	B	C	N	Al → $3s^2, 3p^1$
$3p^1$	Al → +1 → +3	Si	P	↓ it can lose only one electron to get +1 o.s or lose all 3 electron to get +3 state.
$4p^1$	Ga	Ge	As	
$5p^1$	In	Sn	Sb	
$6p^1$	Tl	Pb	Bi	→ only applicable to these elements

Strong attraction $6s^2, 6p^1$, being far is less attracted

f subshell - poorest shielding

d subshell - poor

Due to poor shielding effect of f & d subshell, the electrons beyonds are easily / strongly attracted towards nucleus. As above eg: $6s^2$ electron is tightly hold by nucleus and is not available for bonding, so only elelectron of $6p^1$ takes part in bonding.

Eg: $PbCl_2$ (Pb^{+2}) is more stable than $PbCl_4$ (Pb^{+4}), But $SnCl_4$ is more stable than $SnCl_2$ because it does not show inert pair effect.

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Cl_2 → dried by conc H_2SO_4

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Drying agent:

H_2S not dried by H_2SO_4 because H_2SO_4 is drying and oxidising agent.

$$H_2S \xrightarrow{H_2SO_4} \downarrow S + SO_2$$

NH_3 is not dried by H_2SO_4, because H_2SO_4 be acid reacts with Base NH_3 to form salt.

$$NH_3 + H_2SO_4 \longrightarrow$$

P_2O_5 is also not used to dry NH_3, because, P_2O_5 reacts with moisture forming H_3PO_4, which reacts with ammonia to fom salt.

$$P_2O_5 \xrightarrow{H_2O} H_3PO_4$$

$$H_3PO_4 + NH_3 \longrightarrow \underset{\text{salt}}{(NH_4)_3PO_4}$$

Anhydrous $CaCl_2$ also cannot be used because it along with absorbing H_2O reacts with NH_3.

$$\text{An. } CaCl_2 + H_2O \longrightarrow CaCl_2 \cdot 6H_2O$$

$$\text{An. } CaCl_2 + NH_3 \longrightarrow CaCl_2 \cdot 6NH_3$$

So NH_3 is dried by CaO, because it reacts with H_2O to form $Ca(OH)_2$ which being base does not react with NH_3

$$CaO + H_2O \longrightarrow Ca(OH)_2 \quad \text{(no reaction with } NH_3\text{)}$$