

EXCEPTIONS AND TRENDS

NITESH DEVNANI

S-BLOCK

G1 :- Reactivity Li < Na < K < Rb < Cs

G2 :- Basic
Character MgO < CaO < SrO < BaO

basic character \propto electropositive
Character

Li^+

Na^+

K^+

Rb^+

Cs^+

(a)

(b)

(c)

(d)

(e)

Cationic Radii :-

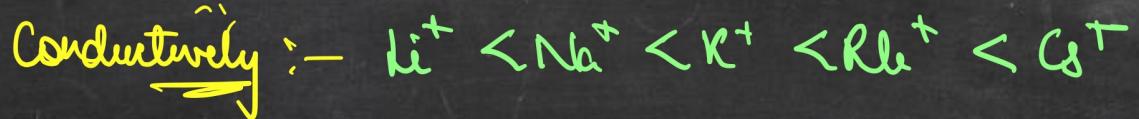
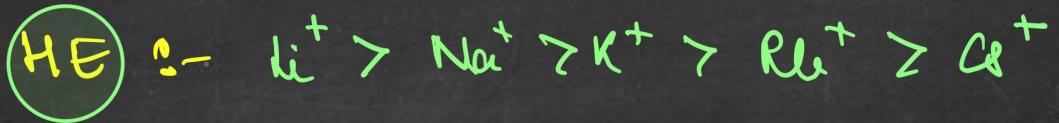


Size :- $a < b < c < d < e$

Conductivity :- $a > b > c > d > e$

Aqueous Phase

Charge
size

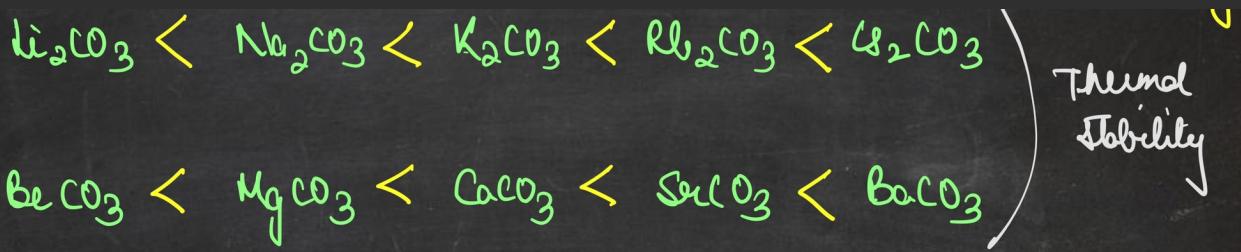


Basic Nature $\text{LiOH} < \text{NaOH} < \text{KOH} < \text{RbOH} < \text{CsOH}$

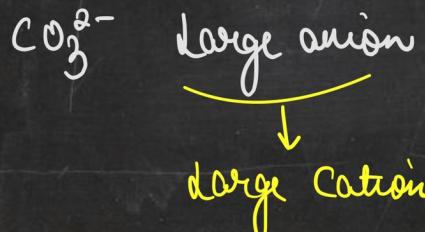
Thermal stability $\text{LiOH} < \text{NaOH} < \text{KOH} < \text{RbOH} < \text{CsOH}$

Solubility :- $\text{LiOH} < \text{NaOH} < \text{KOH} < \text{RbOH} < \text{CsOH}$

$M - \text{OH}$
 \downarrow
weak



Thermal
Stability



Polarisation ↑ Covalent ↑ Ionic ↓ MP/BP ↓ Thermal stability ↓
Character Character

Solubility \propto $\rightarrow \text{ME} > \text{LE}$



P-BLOCK

" - " OS \Rightarrow Electronegativity

Oxidation state

Tendency to form :- N > P > As > Sb > Bi

-3 OS

Tendency to form :- O > S > Se > Te > Po

-2 OS

Stability of $+2$ OS :- $C^{+2} < Si^{+2} < Ge^{+2} < Sn^{+2} < Pb^{+2}$

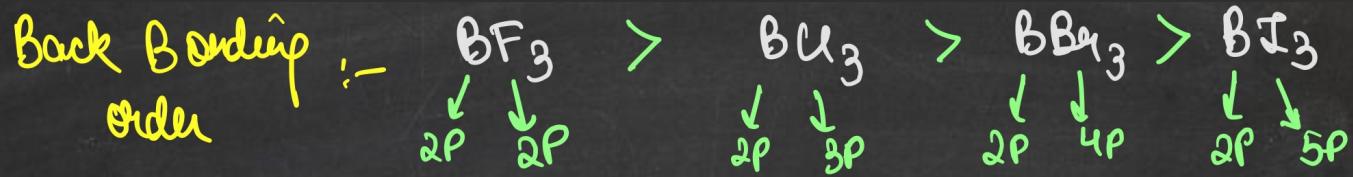
Stability of $+4$ OS :- $C^{+4} > Si^{+4} > Ge^{+4} > Sn^{+4} > Pb^{+4}$

Stability of $+1$ OS :- $B^+ < Al^+ < Ga^+ < In^+ < Tl^+$

Stability of $+3$ OS :- $B^{+3} > Al^{+3} > Ga^{+3} > In^{+3} > Tl^{+3}$

$n_8^2 nP^{1-6}$

Inert pair effect



Basic Character :-



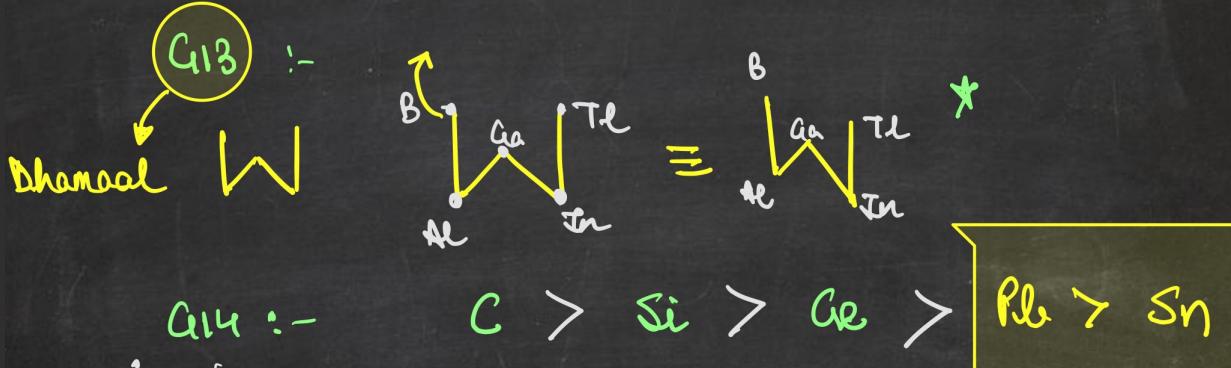
Atomic Radius :- *

D BLOCK contraction \rightarrow d sub



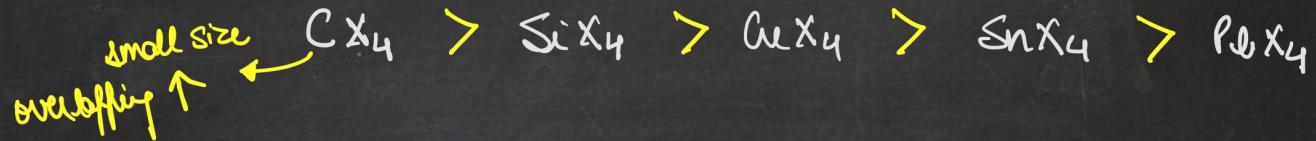
Ionisation Energy

$$B > \text{Te} > \text{Ca} > \text{Al} > \text{In}$$



Ionisation
Energy

Thermal stability

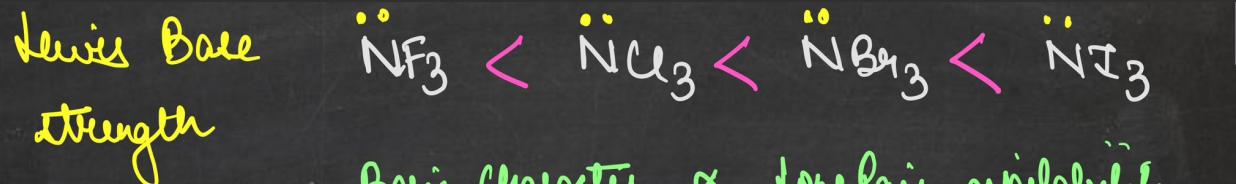


Thermal stability



Thermal stability





strength

Basic character \propto lone pair availability

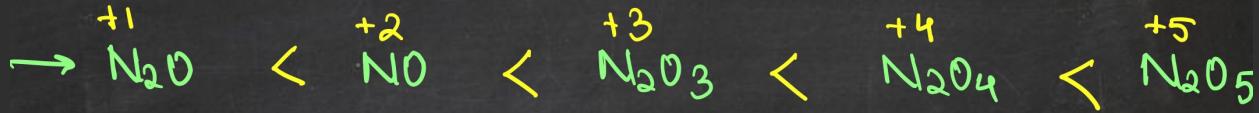


lone pair



lone pair \uparrow

Acidic strength order :-



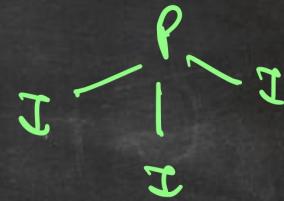
Same element oxides \equiv OS \uparrow acidic \uparrow
strength

Acidic strength order



Different element
oxides \Rightarrow Acidic
strength \propto EN

Bond Angle Order





Bond Angle :- $a > b > c > d > e \longleftrightarrow$ Chemical Bonding

Acidic strength :- $a < b < c < d < e$

Thermal stability :- $a > b > c > d > e$

$\frac{\text{BP order}}{\text{Mass}} :$ $H_2S < H_2Se < H_2Te < H_2Po < H_2O$
 \downarrow
 n.Bonding



Small size $\rightarrow e^- e^-$ repulsions

Filtration Chain

Kithelphy (filtration affinity)



Small size
repulsions

Bond dissociation

Energy.

Small
size
 \downarrow
 $e^- e^-$
repulsion

bond
Trigonal

HCl

HBr

HI

Bond
weakness

Thermal stability :- HF > HCl > HBr > HI

Acid strength :- HF < HCl < HBr < HI

HBonding

Reducing Power :- HF < HCl < HBr < HI

Hydrogen

Boiling Point :-

HCl < HBr < HI < HF

D and F BLOCK

Atomic Size



$3d < 4d \approx 5d$



P-BLOCK

MP and BP

G₁₃
G₁₄

→ general trend decreases down the group
 11^{th}

G₁₅
G₁₆
G₁₇
G₁₈

→ general trend increases down the group
 12^{th}

Boiling Point*

G13 :- $B > Al > Cu > In > Tl$

G14 :- $C > Si > Ge > Sn > Pb$

G17 :- $F < Cl < Br < I$

G18 :- $Hg < Ne < Ar < Kr < Xe$

wolffian

G15 :- $N < P < As < Bi < Sb$

G16 :- $O < S < Se < Po < Te$

(15)

No exception

* Melting Point

No exception

$$G17 :- F < \text{Ce} < \text{Br} < I$$

$$G18 :- \text{He} < \text{Ne} < \text{Ar} < \text{Kr} < \text{Xe}$$

$$35 \leftarrow G13 :- B > \text{Al} > \underline{\text{Te}} > \text{In} > \text{Ga}$$

$$45 \leftarrow G14 :- C > \text{Si} > \text{Ge} > \text{Pb} > \text{Sn}$$

$$35 \leftarrow G15 :- N < P < \text{Bi} < \overline{\text{Sb}} < \text{As}$$

$$45 \leftarrow G16 :- O < S < \text{Se} < \underline{\text{Po}} < \text{Te}$$

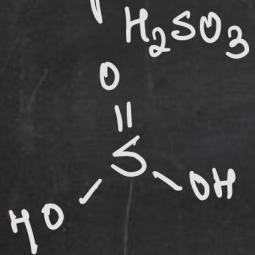
OxidAcids

Sulfur

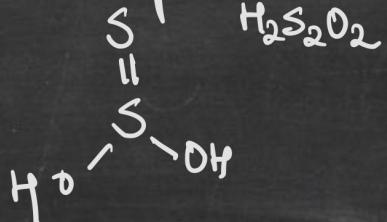


Thio \equiv \textcircled{S}

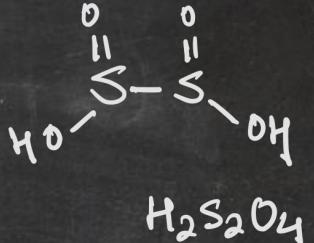
Sulphurous Acid



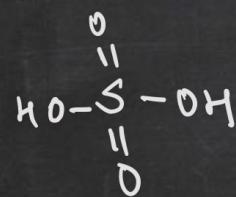
Thiosulphurous Acid



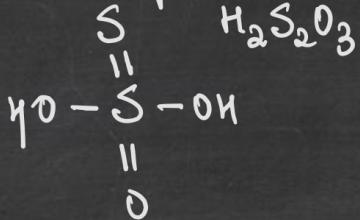
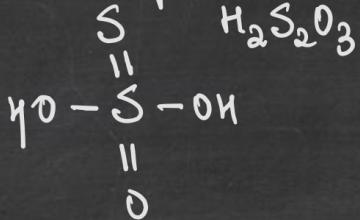
Dithionous Acid



Sulfuric Acid



Thiosulfuric Acid

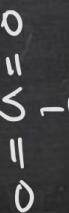
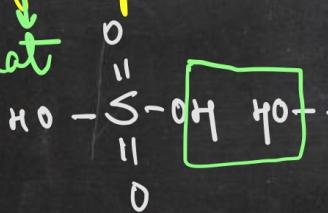


Dithione
Acid

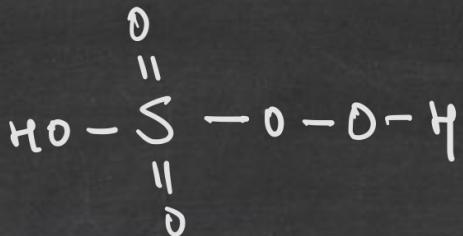
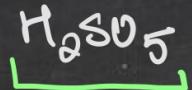


Pyrosulfuric Acid

Heat

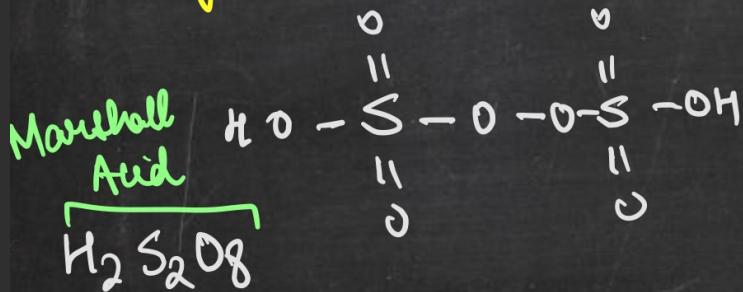


Peroxy sulphuric acid



Cato's Acid

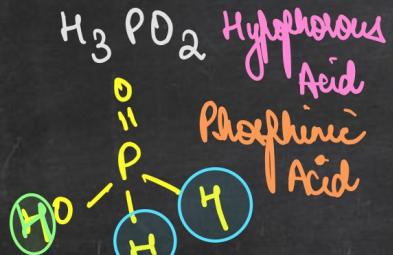
Peroxy disulphuric acid



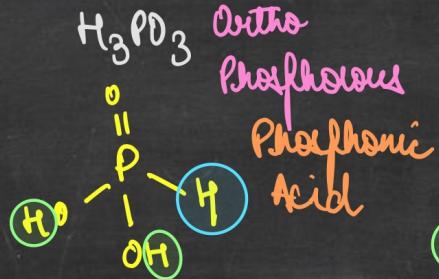
Oxoacids

Reducing character :- $\text{H}_3\text{PO}_2 > \text{H}_3\text{PO}_3 > \text{H}_3\text{PO}_4$

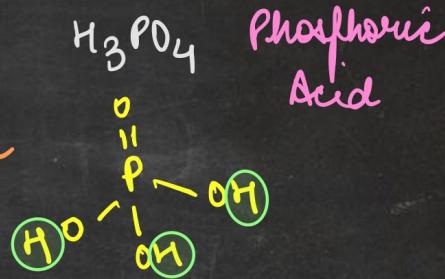
Phosphorous



B basicity = 1



B basicity = 2

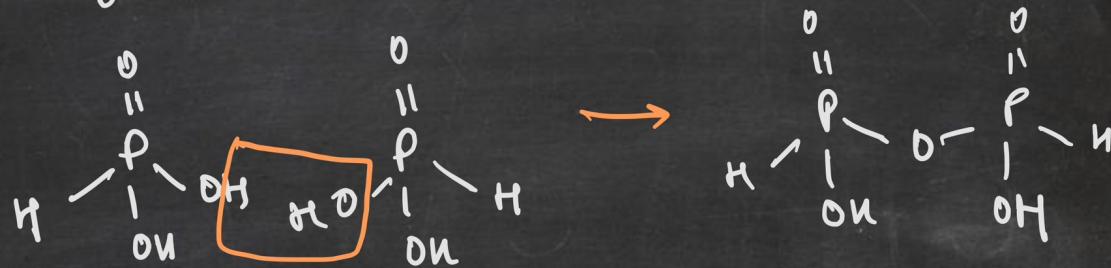


B basicity = 3

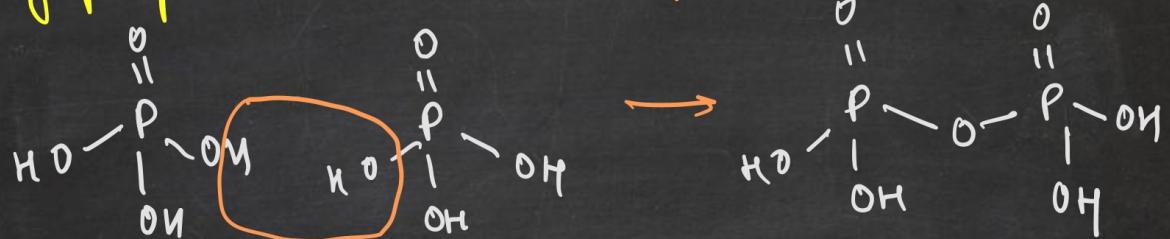
Hypophosphorous Acid $\rightarrow \text{H}_4\text{P}_2\text{O}_5$



heat



Pyrophosphoric Acid \rightarrow $H_4P_2O_7$



Hypophosphoric Acid \rightarrow $H_4P_2O_6$

