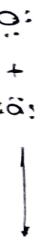


Chemical Bonding

11/01/22

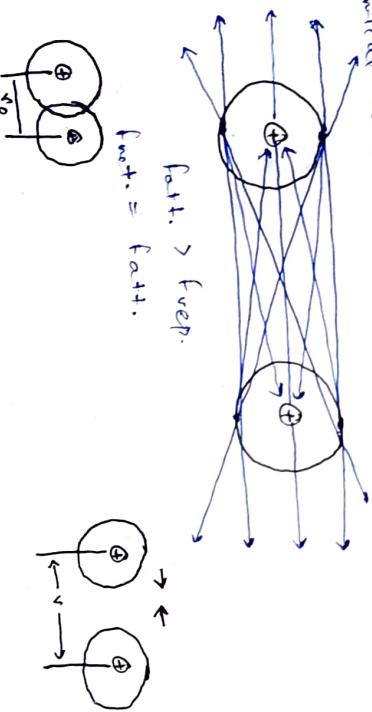
q.



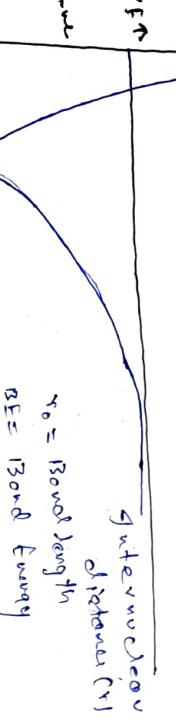
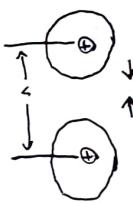
drawn atoms form a chemical bond by lowering of potential energy

① Duet Rule

When two atoms are at infinite separation, their mean potential energy is zero, but when they come under field effect of each other, then attractive force is greater than repulsive force, and simultaneously Attractive force is proportional to each other, and size of molecule. As they come closer P.E decreases, and hence total potential energy of system decreases during which it becomes minimum or equilibrium. This is why a atom forms a chemical bond.



$$\text{Fatt.} > \text{Frep.}$$

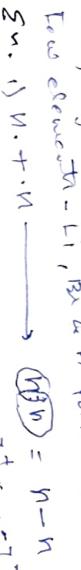


$$\text{r}_e = \text{Bond length}$$

$$\text{BE} = \text{Bond Energy}$$

Duet Rule

We have two electrons in its first and outermost shell (192). This configuration is called closed shell configuration. Hence no electron can move from closed shell to another shell. This configuration is called closed shell configuration. Hence no electron can move from closed shell to another shell.



Violation of Duet Rule

1) Hetero diatomic molecules

These have less than 8 electrons in the valence shell of their central atom.

eg:- B₂H₆, B₂N₃, B₂S₃, Al₂S₃ (metastable)

(Ca₃)₂ Al etc.

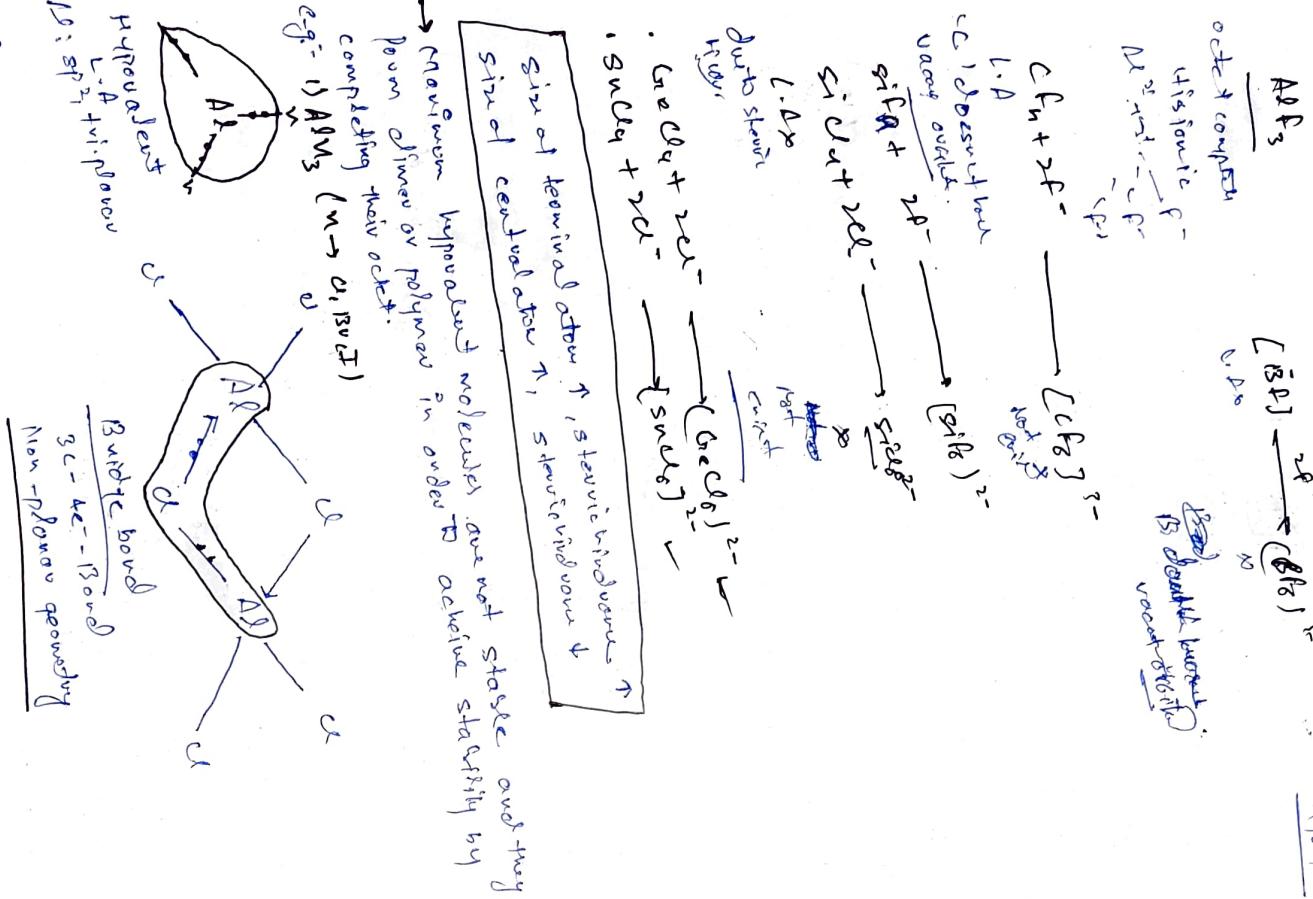
→ All hypervalent molecules has Lewis acid but hypovalent is no any condition to be Lewis acid. Lewis acid is no any valence orbital available.

• presence of valence lone pair. • increased ionic character. • neutral molecules with both cations and anions.

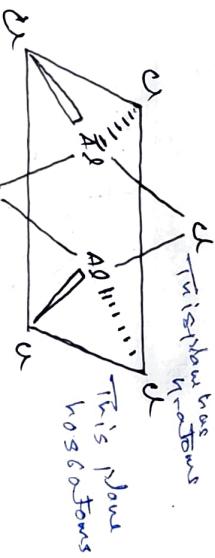
→ All hypervalent

Lewis acid. Lewis acid compounds are covalent, attracted to the anion, and not covalently bonded to the cation.

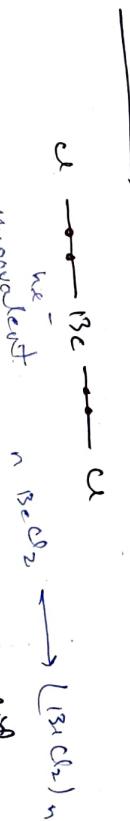
All other elements form covalent bonds involving all unpaired electrons.



Al_2O_6 , $\text{Al}_2\text{B}_2\text{O}_5$, and $\text{Al}_2\text{Si}_2\text{O}_5$ are the volatile compounds. Al_2O_6 volatilizes at 1000°C.



Al₂O₃, Al₂Si, B₄C, and
volatiles and 100°C



we -
hypovolemic
Rx: NaCl
poly ventilation

Polymerized

Non-planar BzC_2 is heated at 500°C , then, there appears in various phases and at 1200°C , it becomes monomer.

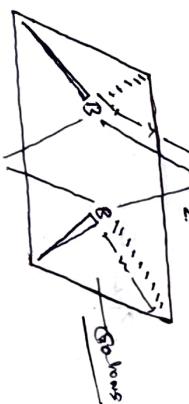
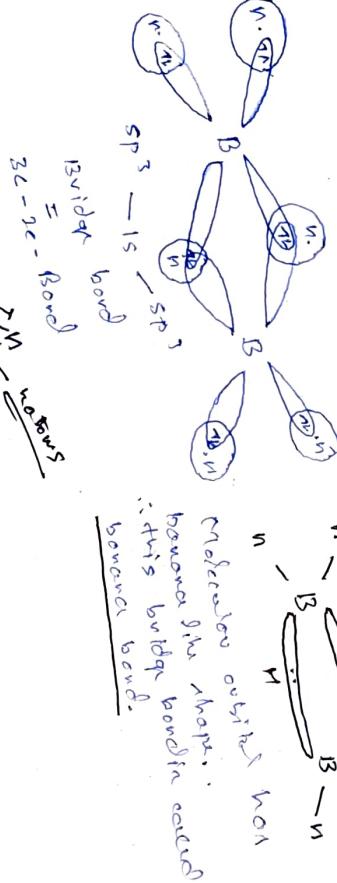
358

卷之三

卷之三

卷之三

→ Step 1: Pre-dinner promotion



→ W is smalles theory, wave function electron
Burg board (center -ze-board). yet, buckled
Building Burg board (ze-ze-board).
→ Building was limited because building decrease

eventually the demand will be satisfied by higher factors

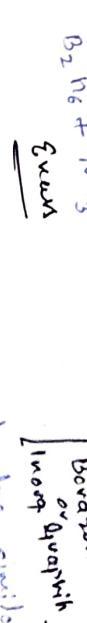
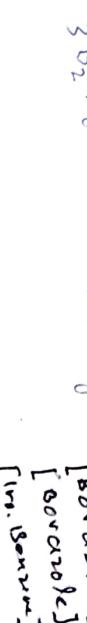
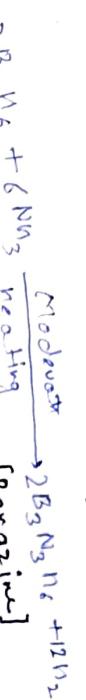
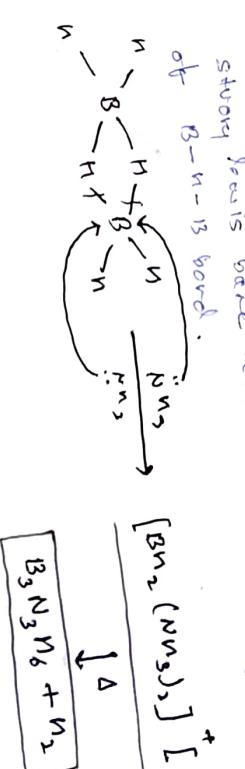
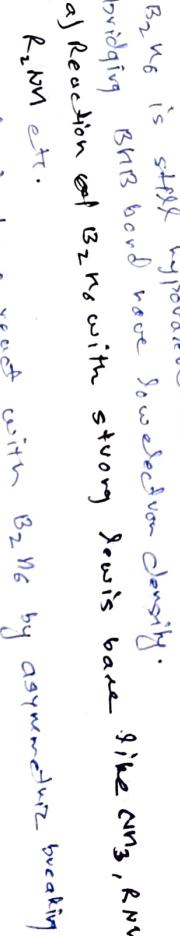
21/07/23

Method portion of divergence

When $B_2 N$ is treated with excess $CuCl_2$, the nitrogenation reaction occurs easily at terminal position and not on bridging position, providing BNB bond closed water break.

$$\text{B}_n + \text{C}_m \xrightarrow{\text{excess}} \text{B}_n\text{C}_m$$

excess



★
Bavaria were followed through
Capatti, & Co. at electric

Journal structure

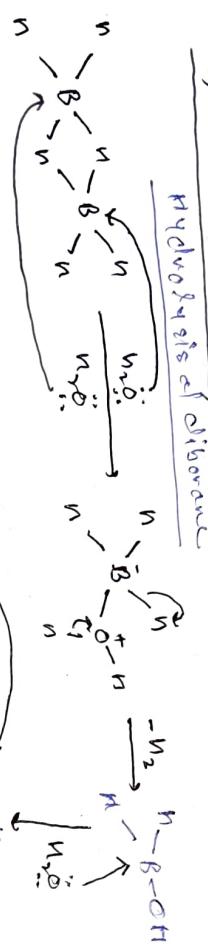
b) weak Lewis base like CO , R_3N , NaO , RON, ROR , O_2

B_2N_6 reacts with B_2H_6 by symmetrical Furan, triphos, O_2 etc. breaking of BNB bond.

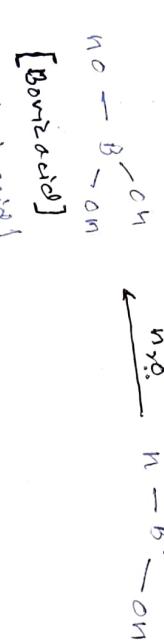
i) Reaction with CO



v) Reaction with NO_2



vii) Reaction with H_2O



viii) Reaction with alcohol

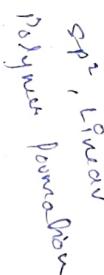
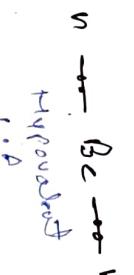


$\text{RO} - \text{B} - \text{OH}$

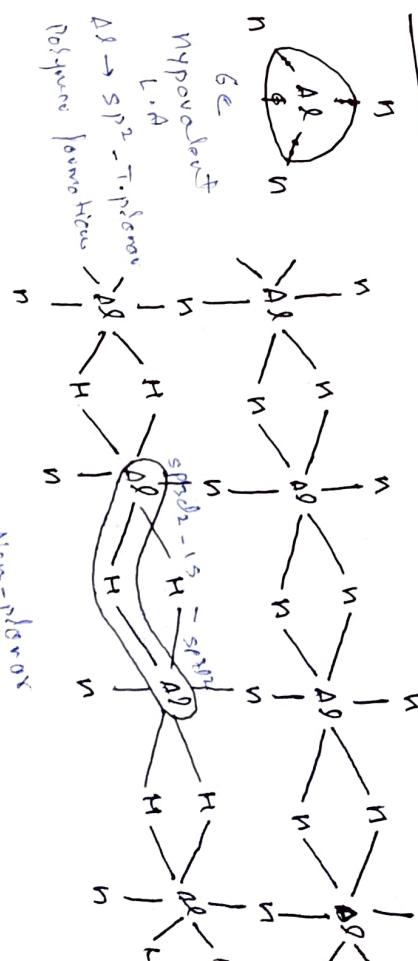
[Trialkyl borane]



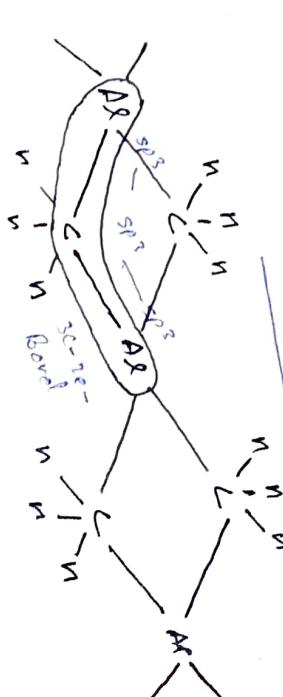
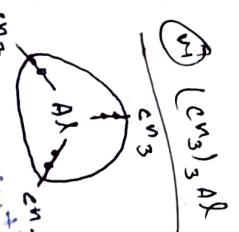
④ BeH_2



⑤ Al_2R_3



Non-polar



2107123

Noble Gas Family

E.C. in ground state: $\boxed{1\ 1}$ $\boxed{1\ 1\ 1}$
 E.C. in excited state: $\boxed{1\ 1}$ $\boxed{1\ 1\ 1}$
 E.C. in ionization state: $\boxed{1\ 1\ 1}$ $\boxed{1\ 1\ 1\ 1}$



ref. HFB₃, F₂, Cl₂, Br₂, I₂, BrCl, IBr, F₂Br

11/6/23

(CBSE) Type of chemical Bond



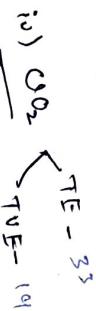
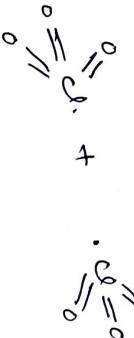
Bent-shaped
of isomers

\rightarrow In liquid state, NO_3^- has two structures in dynamic equilibrium



N
 \rightarrow In solid state, NO_3^- is linear.
 Solid $\text{NO}_3^- = [\text{NO}]^+ [\text{NO}_2]^-$
 Due to solid

B



In deionized

become unpaired electrons become paired electrons of chlorine.

It also occurs due to loss of electron.



covalent bond
Coordinate bond
Ionic bond



δ -bond

Theory and concept of covalent bond,

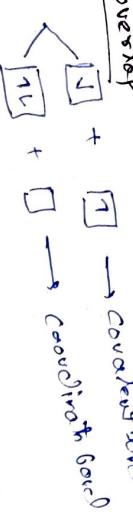
- ① VBT
- ② VSEPR
- ③ Hybridization
- ④ MOT

① Valence Bond Theory

② Covalency or coordinate bond is formed by overlap of valency orbitals of

conjugating atoms.

③ Type of overlap



④ Directional overlap

Along INA \rightarrow axial overlap \rightarrow σ bond

Perpendicular \rightarrow overlap \rightarrow π bond

To direction of INA

leads to formation of σ -bond

⑤ condition of overlap

- Orbital must have same symmetry and should not have large angular diff.

2P
3P
3S

11/6/23

11/6/23

1051

12108123

۲۱۸

1251

→ S-S overlap

The diagram illustrates the formation of a sigma (σ) bond between two atoms. Two circular p-orbitals are shown, each with a vertical axis of symmetry. The top orbital has a '+' sign at its bottom lobe and a '-' sign at its top lobe. The bottom orbital has a '-' sign at its bottom lobe and a '+' sign at its top lobe. These two orbitals overlap end-to-end along their vertical axis, creating a horizontal sigma bond represented by a thick horizontal line. A vertical line passes through the center of the overlap, representing the internuclear axis. The label 'sigma' is written above the top orbital.

$$\frac{N \cdot p = 0}{15 + 15} = \underline{\hspace{1cm}}$$

三
二
一

ψ S-P overlap

and overlap

$$g = 59.0$$

Eqs. 15-29, 15-30, 15-31, 15-32

Note: Books spherical & very organized never fit down our signs card.

\rightarrow $A_1 - A_2$ output

12
Detailed account of C.P., B.C. —
 $\frac{I}{T} = \frac{1}{2}, \frac{1}{4}, \frac{1}{8}, \dots$

Q uick of following in nonsense numbered?

- $$\begin{aligned} & \text{1) } p_1 + p_2 \\ & \text{2) } p_1 + p_2 \\ & \text{3) } p_1 + p_2 \end{aligned}$$

Ques

- $P_x + P_y$
- $P_z + P_x$
- $P_x + P_z$

Ans: The nuclear axis is ~~axis~~, then as we have seen, the p -orbital has two lobes, one above and one below the nuclear axis.

$$E_m = \frac{0}{\frac{\sigma}{2\rho\pi - 2\rho\pi}} = 0, \quad N = \frac{\frac{\sigma}{2\rho\pi - 2\rho\pi}}{\frac{\sigma}{2\rho\pi - 2\rho\pi}} = N$$

Lateral Overlays

⑩ draw overlap

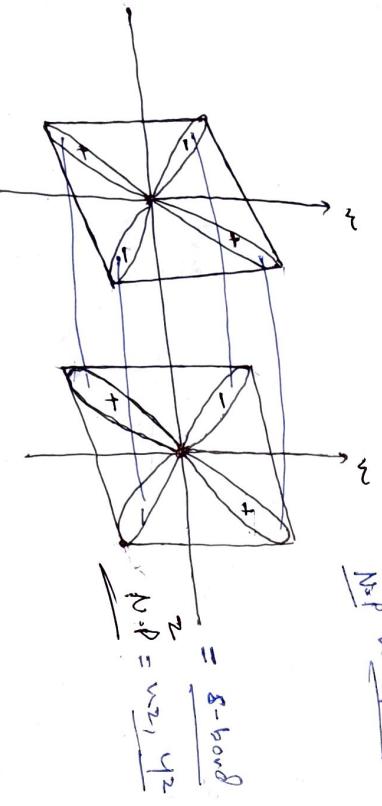
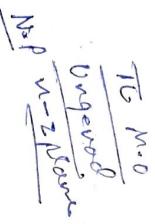
one evening

as these lobes are not on axis. They do lateral overlap and form pincer and delta teeth. They do lateral overlap and form pincer and delta teeth. They do lateral overlap and form pincer and delta teeth.

(ii) during orbital can be divided as -
through lateral overlap it form only delocalized and net p-orbital
and orbital can't be lateral overlap due to electronic repulsion
and hence it doesn't form S-bond.

三〇

o) dry -



1
Overview

丁
乙

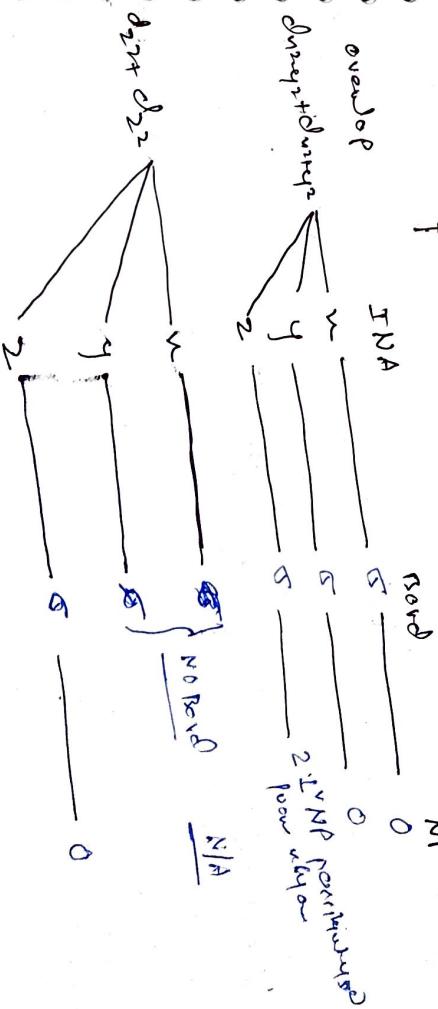
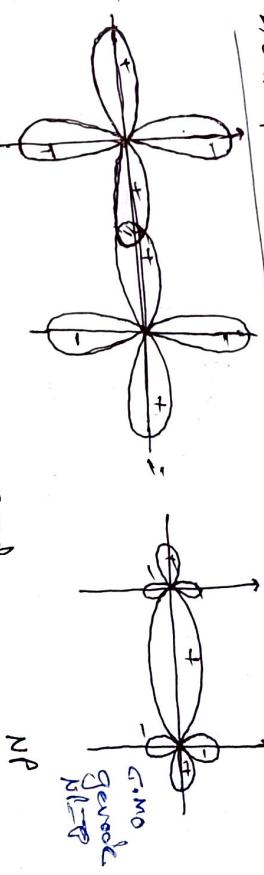
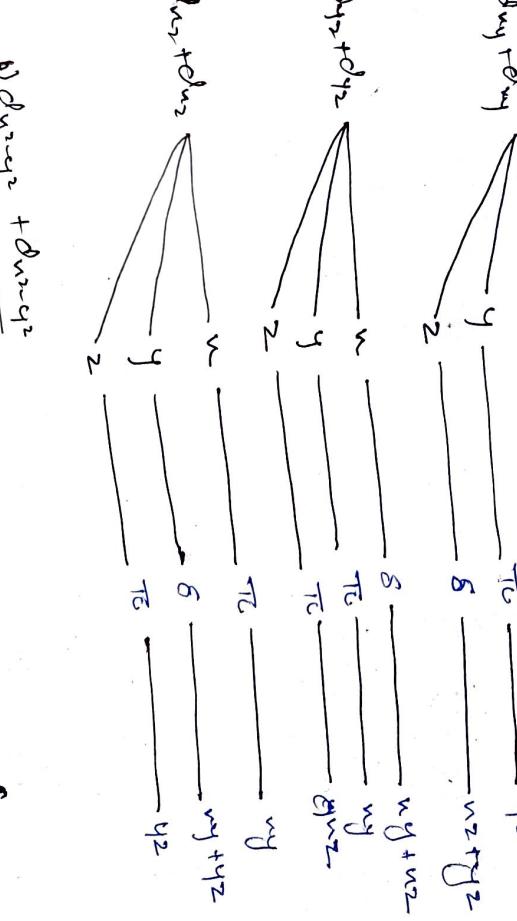
2

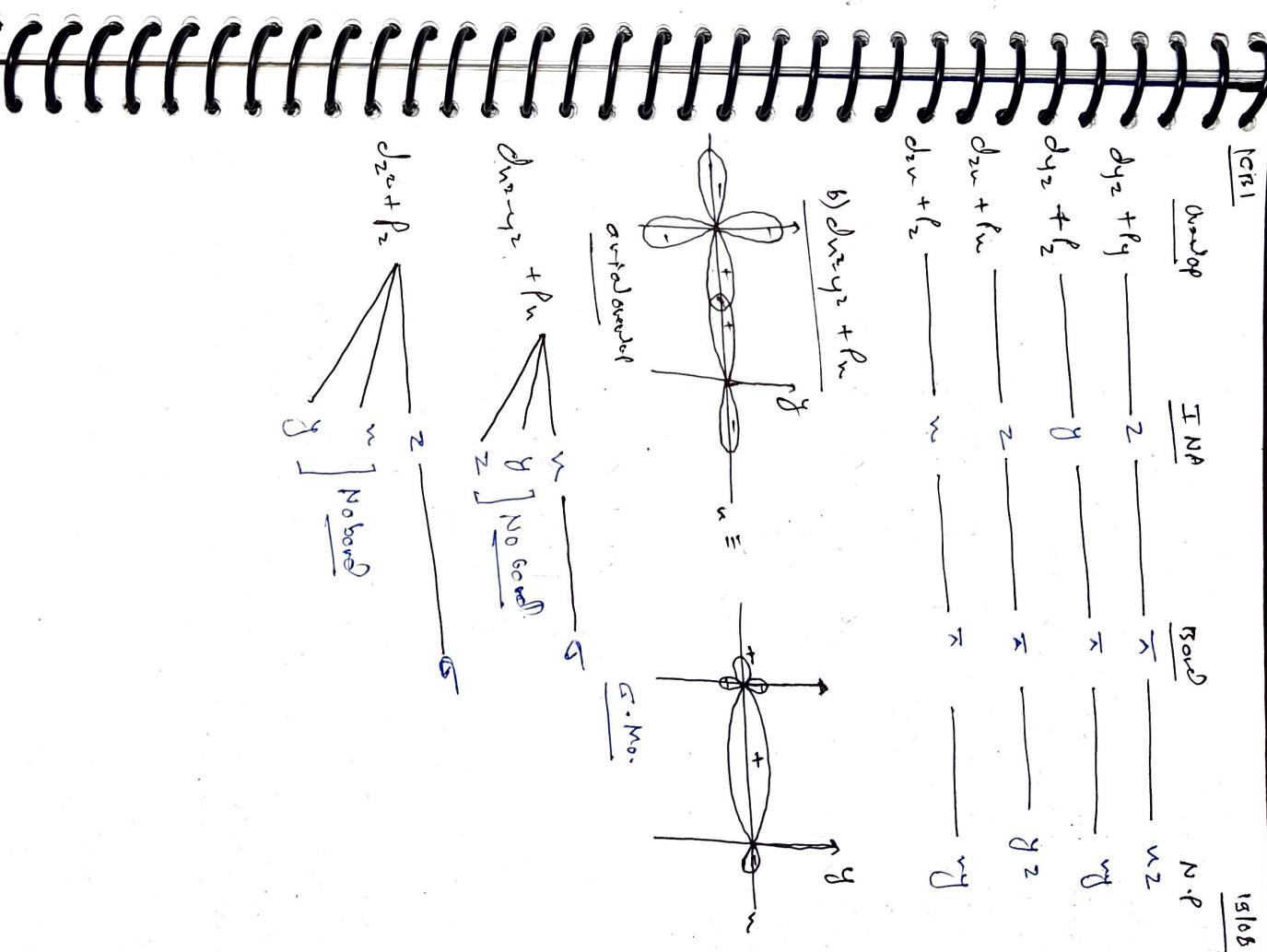
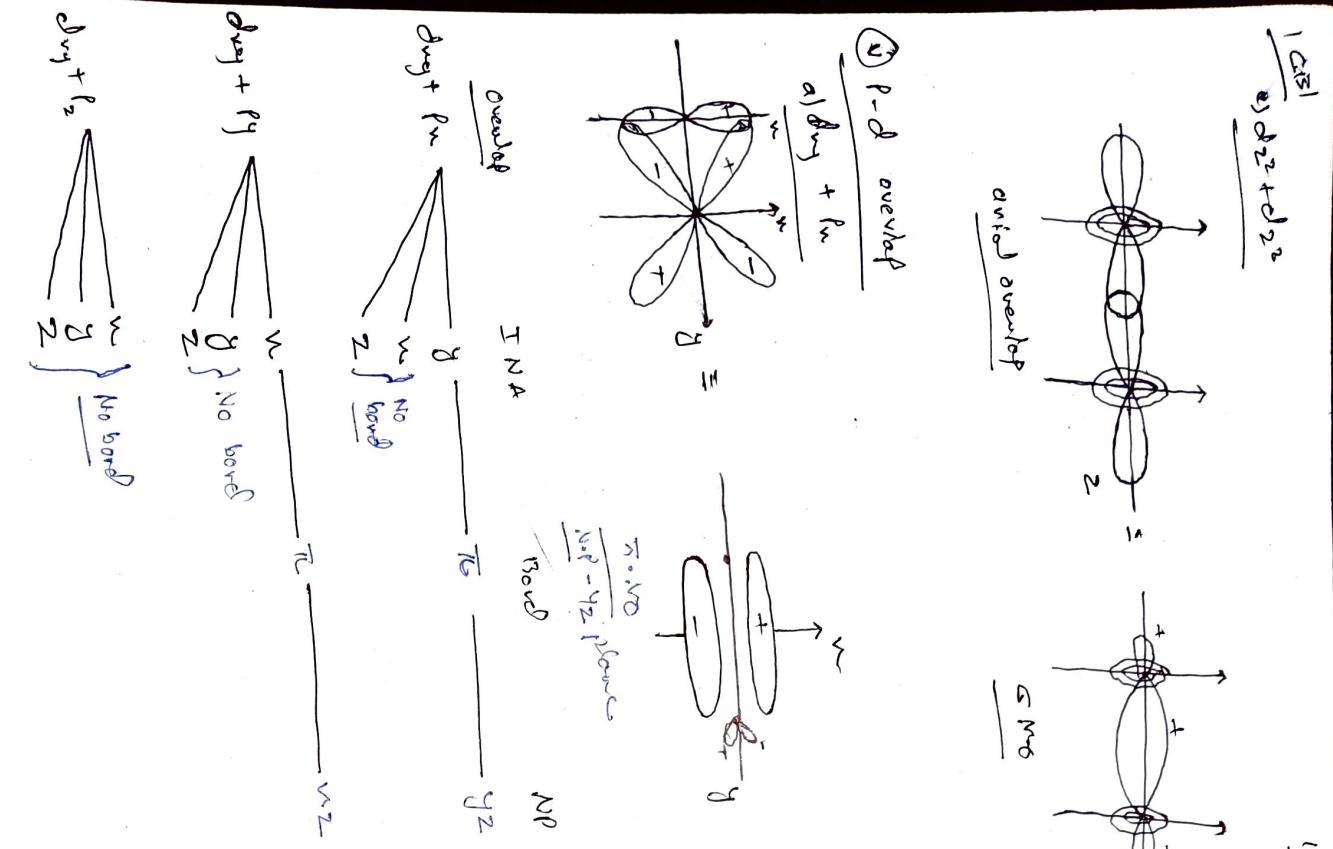
1308

1

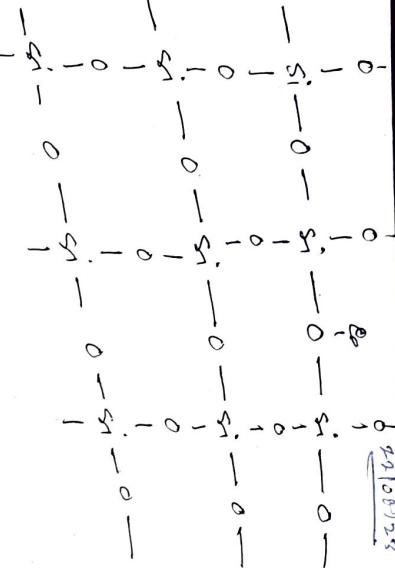
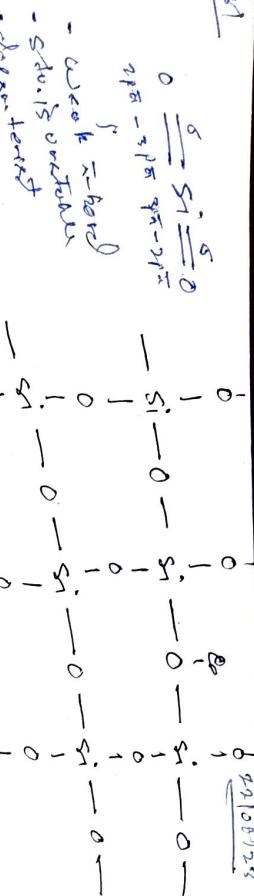
3

1510





(CR) 24/08/23



→ Down the group covalent property decreases because strength of σ -bond decreases.

Foung: $\text{C} > \text{Si} > \text{Ge} \approx \text{Sn}$

but, $\Rightarrow N < P$: catenation

$$\begin{array}{c} \therefore \text{N} \equiv \text{N} < \text{P} \equiv \text{P} \\ \text{N} \equiv \text{N} > \text{P} \equiv \text{P} \\ \text{N} \equiv \text{N} < \text{N} \equiv \text{N} \end{array} \quad \begin{array}{l} \text{Bond} \\ \text{Strength} \end{array}$$

$\Rightarrow \text{O} < \text{S} : \text{catenation}$

* Valence Shell Electron Pair Repulsion Theory

- Valence shell electron pairs present in the valence shell of individual atoms
- Electrons pairs repel each other.

$$0p - 0p > 0p - bp > bp - bp$$



- Identity effect pi-bond in
 - a) $\text{SO}_2 \quad \text{O} \equiv \text{S} \equiv \text{O}$
 - b) $\text{SC}_3 \quad \text{S} \equiv \text{C} \equiv \text{C} \equiv \text{C} \equiv \text{O}$
 - c) Cl_2O_2 (not shown)
- Non-pi bonding
 - $\text{O} \equiv \text{C} \equiv \text{O}$
 - $\text{O} \equiv \text{Si} \equiv \text{O}$
- Other
 - (a) O-hydrogen
 - H_2O
 - (b) C-hydrogen
 - CH_4
 - (c) O-hydrogen
 - H_2O

- Identity effect pi-bond in
 - a) $\text{SO}_2 \quad \text{O} \equiv \text{S} \equiv \text{O}$
 - b) $\text{SC}_3 \quad \text{S} \equiv \text{C} \equiv \text{C} \equiv \text{C} \equiv \text{O}$
 - c) Cl_2O_2 (not shown)
- Non-pi bonding
 - $\text{O} \equiv \text{C} \equiv \text{O}$
 - $\text{O} \equiv \text{Si} \equiv \text{O}$
- Other
 - (a) O-hydrogen
 - H_2O
 - (b) C-hydrogen
 - CH_4
 - (c) O-hydrogen
 - H_2O

Hybridization

Device bond formation, valency satisfied or central atom involving and produces new orbitals known as hybrid orbitals and this concept is called Hybridisation.

Rules and characteristics of hybridisation

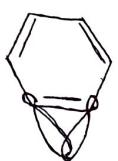
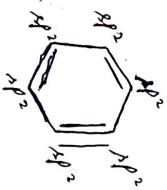
- Half filled or half-filled or vacant, all types of valency orbitals may participate in hybridization.
- 2s orbitals undergoing hybridization would not have large enough difference.
- ns-orbitals won't participate in hybridization.

Characteristics

- Total no. of hybrid orbitals is equal to total no. of pure atomic orbitals undergoing hybridization.
- All hybrid orbitals have same shape, non-nega and non-zero energy.
- Both their orientation are different.
- Hybrid orbitals either form sigma-bond or have lone-pair electrons.
- Hybrid orbitals either form sigma-bond or have unpaired electron, they don't form pi-bond and do not have unpaired electron.

Exception

- In benzene, one of pi-bond is formed by overlap of hybrid orbitals.

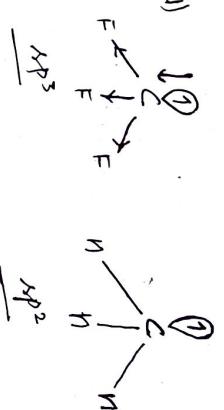
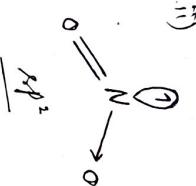


Orbital contraction

- Central atom in first period and terminal atoms are more electronegative; than central atom although its size is increased due to which size and energy of respective electrons strongly involved in hybridization.
- Orbital decreases, and it gets involved in hybridization.

Need of hybridization

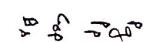
Hybridization is a hypothetical concept and it is used to explain molecular geometry, bond length, bond energy and bond angle.



$$\xrightarrow{\text{steric number}} n = \sigma + L.P$$

- Formation of CH4 is considered by overlap of pure atomic orbitals of carbon and hydrogen, then such correct statements will be correct.
- Some H-C-H bond angle should be 90° .
- Some H-C-H bond angle should be 109° .
- Some H-C-H bond angle should be 180° .
- Some H-C-H bond angle should be 0° .

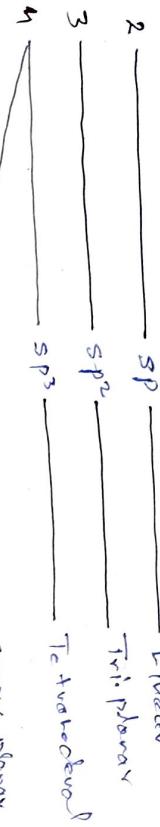
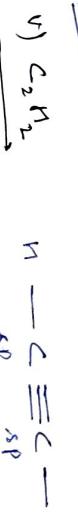
- Shape of CH4 should be tetrahedral geometry.
- CH4 will have definite tetrahedral geometry.
- CH4 is incorrect.



108

26/08/23

108



sp , linear
Bond angle

N-N bonds are identical.

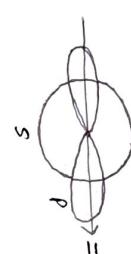
N-N bonds are non-identical.



① sp^2 -hybridization



E AB_2 type molecule

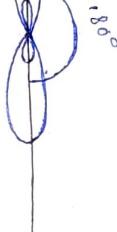


p



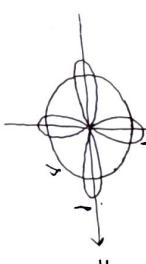
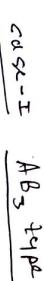
b. A: Linear

Linear structure



180°

② sp^2 -hybridization



Trigonal planar

c. sp^2 Tri. planar



Min. Δ bond angle

i) BF_3



$\{ \text{v} = \text{r} \rightarrow \text{I} \}$

ii) BO_2^-



bond angle

iii) CO_2



carbon dioxide



Carbon dioxide

a) BF_3



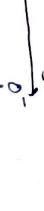
$\{ \text{v} = \text{r} \rightarrow \text{I} \}$

b) AlCl_3



$\{ \text{v} = \text{r}, \text{r}, \text{r} \}$

c) BO_3^-



$\{ \text{v} = \text{r} \}$

d) CO_3^-



$\{ \text{v} = \text{r} \}$

e) NO_3^-



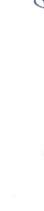
$\{ \text{v} = \text{r} \}$

f) SO_3



$\{ \text{v} = \text{r} \}$

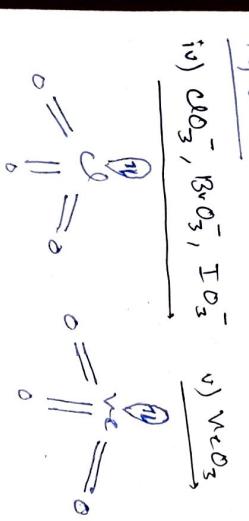
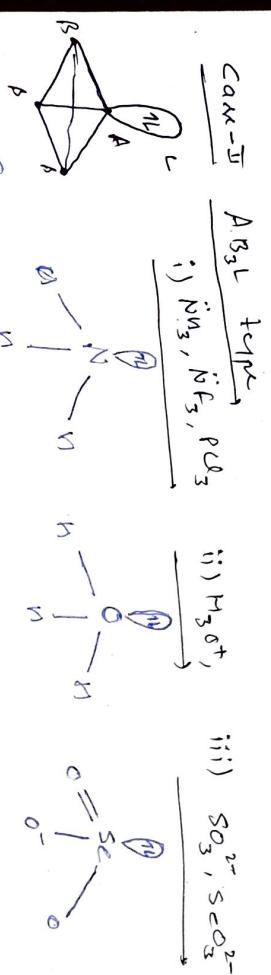
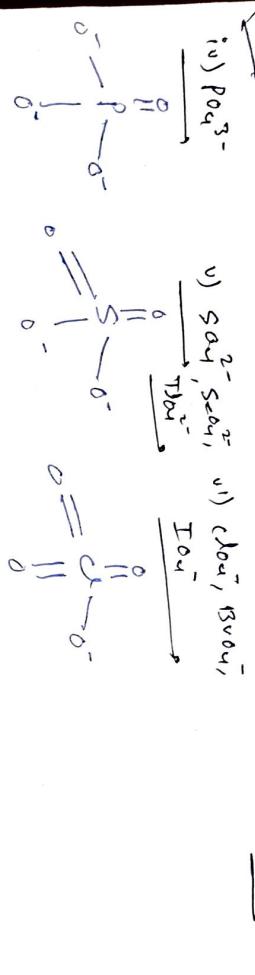
g) C_2O_4^-



$\{ \text{v} = \text{r} \}$

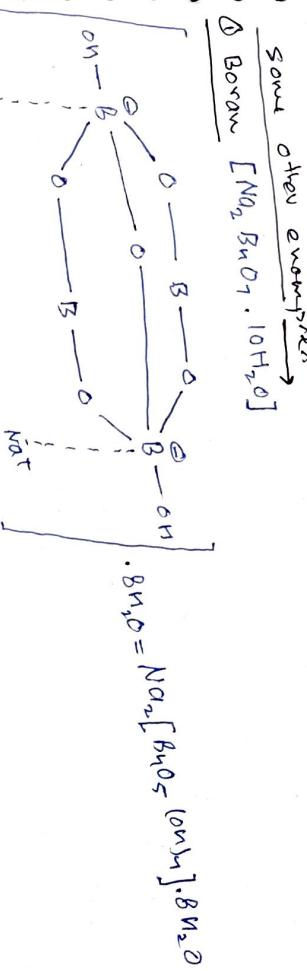
02/09/23

01/09/25



Some other examples →

→ Non-planar molecules
 \rightarrow Rotations around O-O-S-S-C=C carbon
 restricted due to lone pair lone pair repulsion.

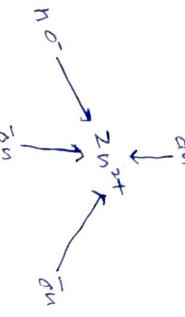


Nat

⑩ Blue vitriol [cuso₄. 5H₂O] solubility

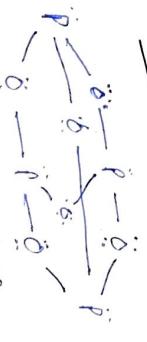
(10) $\text{Na}_2\text{ZnO}_2 \cdot 2\text{H}_2\text{O}$

on | 09/23



⑩ Oxidized Phosphorus < P^{+6}

a) $\text{P}(\text{OH})_3$



Total O-P bond = 6
Total O-O-P bond = 6
Total lone pairs = 16

b) $\text{P}(\text{OH})_4$

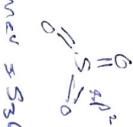


Total lone pairs = 26

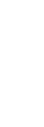
⑪ $\text{P}(\text{O})_3$



SO_3 = monosulfuric =



$\text{SO}_3(\text{H})_2$ = bisulfuric =



$\text{SO}_3(\text{H})_3$ = trisulfuric =



$\text{SO}_3(\text{H})_4$ = tetrakisulfuric =



$\text{SO}_3(\text{H})_5$ = pentakisulfuric =



$\text{SO}_3(\text{H})_6$ = hexakisulfuric =



$\text{SO}_3(\text{H})_7$ = heptakisulfuric =



$\text{SO}_3(\text{H})_8$ = octakisulfuric =

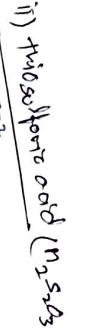


$\text{SO}_3(\text{H})_9$ = nonakisulfuric =



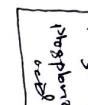
⑫ Oxidized Sulfur

i) Sulfuric acid series



H₂SO₄ → SO₃

ii) Thiosulfuric acid (H₂S₂O₃)



H₂S₂O₃ → H₂S₂O₄

iii) Pyrosulfuric acid (H₂S₂O₅)



H₂S₂O₅ → H₂S₂O₆

iv) Pyromolybdate (H₂S₂O₇)

H₂S₂O₇ → H₂S₂O₈

v) Pyromolybdate (H₂S₂O₉)

H₂S₂O₉ → H₂S₂O₁₀

vi) Pyromolybdate (H₂S₂O₁₁)

H₂S₂O₁₁ → H₂S₂O₁₂

vi) Pyromolybdate (H₂S₂O₁₃)

H₂S₂O₁₃ → H₂S₂O₁₄

vi) Pyromolybdate (H₂S₂O₁₅)

H₂S₂O₁₅ → H₂S₂O₁₆

vi) Pyromolybdate (H₂S₂O₁₇)

H₂S₂O₁₇ → H₂S₂O₁₈

vi) Pyromolybdate (H₂S₂O₁₉)

H₂S₂O₁₉ → H₂S₂O₂₀

vi) Pyromolybdate (H₂S₂O₂₁)

H₂S₂O₂₁ → H₂S₂O₂₂

vi) Pyromolybdate (H₂S₂O₂₃)

H₂S₂O₂₃ → H₂S₂O₂₄

vi) Pyromolybdate (H₂S₂O₂₅)

H₂S₂O₂₅ → H₂S₂O₂₆

vi) Pyromolybdate (H₂S₂O₂₇)

H₂S₂O₂₇ → H₂S₂O₂₈

vi) Pyromolybdate (H₂S₂O₂₉)

H₂S₂O₂₉ → H₂S₂O₃₀

vi) Pyromolybdate (H₂S₂O₃₁)

H₂S₂O₃₁ → H₂S₂O₃₂

vi) Pyromolybdate (H₂S₂O₃₃)

H₂S₂O₃₃ → H₂S₂O₃₄

vi) Pyromolybdate (H₂S₂O₃₅)

H₂S₂O₃₅ → H₂S₂O₃₆

vi) Pyromolybdate (H₂S₂O₃₇)

H₂S₂O₃₇ → H₂S₂O₃₈

vi) Pyromolybdate (H₂S₂O₃₉)

H₂S₂O₃₉ → H₂S₂O₄₀

vi) Pyromolybdate (H₂S₂O₄₁)

H₂S₂O₄₁ → H₂S₂O₄₂

vi) Pyromolybdate (H₂S₂O₄₃)

H₂S₂O₄₃ → H₂S₂O₄₄

vi) Pyromolybdate (H₂S₂O₄₅)

H₂S₂O₄₅ → H₂S₂O₄₆

vi) Pyromolybdate (H₂S₂O₄₇)

H₂S₂O₄₇ → H₂S₂O₄₈

vi) Pyromolybdate (H₂S₂O₄₉)

H₂S₂O₄₉ → H₂S₂O₅₀

vi) Pyromolybdate (H₂S₂O₅₁)

H₂S₂O₅₁ → H₂S₂O₅₂

vi) Pyromolybdate (H₂S₂O₅₃)

H₂S₂O₅₃ → H₂S₂O₅₄

vi) Pyromolybdate (H₂S₂O₅₅)

H₂S₂O₅₅ → H₂S₂O₅₆

vi) Pyromolybdate (H₂S₂O₅₇)

H₂S₂O₅₇ → H₂S₂O₅₈

vi) Pyromolybdate (H₂S₂O₅₉)

H₂S₂O₅₉ → H₂S₂O₆₀

vi) Pyromolybdate (H₂S₂O₆₁)

H₂S₂O₆₁ → H₂S₂O₆₂

vi) Pyromolybdate (H₂S₂O₆₃)

H₂S₂O₆₃ → H₂S₂O₆₄

vi) Pyromolybdate (H₂S₂O₆₅)

H₂S₂O₆₅ → H₂S₂O₆₆

vi) Pyromolybdate (H₂S₂O₆₇)

H₂S₂O₆₇ → H₂S₂O₆₈

vi) Pyromolybdate (H₂S₂O₆₉)

H₂S₂O₆₉ → H₂S₂O₇₀

vi) Pyromolybdate (H₂S₂O₇₁)

H₂S₂O₇₁ → H₂S₂O₇₂

vi) Pyromolybdate (H₂S₂O₇₃)

H₂S₂O₇₃ → H₂S₂O₇₄

vi) Pyromolybdate (H₂S₂O₇₅)

H₂S₂O₇₅ → H₂S₂O₇₆

vi) Pyromolybdate (H₂S₂O₇₇)

H₂S₂O₇₇ → H₂S₂O₇₈

vi) Pyromolybdate (H₂S₂O₇₉)

H₂S₂O₇₉ → H₂S₂O₈₀

vi) Pyromolybdate (H₂S₂O₈₁)

H₂S₂O₈₁ → H₂S₂O₈₂

vi) Pyromolybdate (H₂S₂O₈₃)

H₂S₂O₈₃ → H₂S₂O₈₄

vi) Pyromolybdate (H₂S₂O₈₅)

H₂S₂O₈₅ → H₂S₂O₈₆

vi) Pyromolybdate (H₂S₂O₈₇)

H₂S₂O₈₇ → H₂S₂O₈₈

vi) Pyromolybdate (H₂S₂O₈₉)

H₂S₂O₈₉ → H₂S₂O₉₀

vi) Pyromolybdate (H₂S₂O₉₁)

H₂S₂O₉₁ → H₂S₂O₉₂

vi) Pyromolybdate (H₂S₂O₉₃)

H₂S₂O₉₃ →

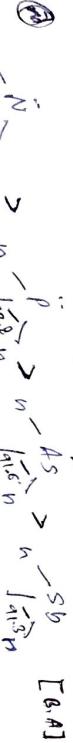
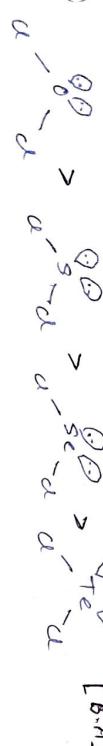
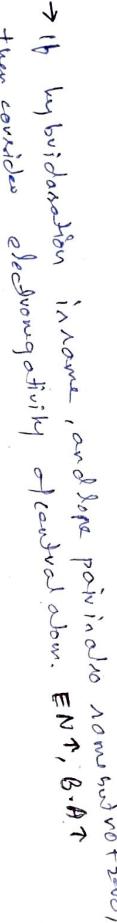
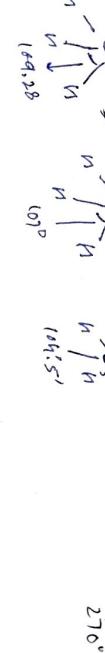
1921

25/09/2023

25109123

If hybridization is none, then consider lone-pairs on central atom.

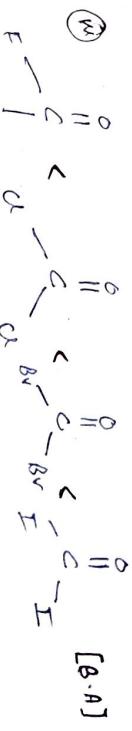
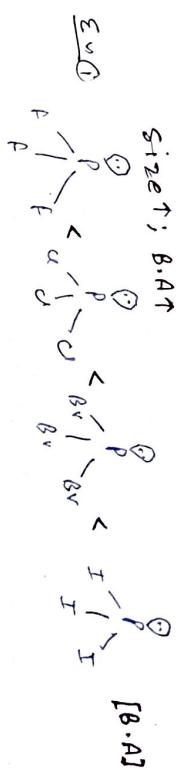
J.P.↑, B.A.↑



Afcanulotone belongs to 3rd or higher period, it has one pair over terminal atom due by hydrogen or less electronegative element, than central atom do not undergo hybridization rather their power p-orbitals form bonds as the since p-orbitals are necessarily perpendicular, hence bond angle is obviously 90° .

$C.A \rightarrow \text{Name}$
 $\text{only } \beta.p \rightarrow \text{Name but not zero condition}$
 $\beta.p \rightarrow \text{or else T.A one not name}$

Hider E. Novak and T. A.



The diagram shows the periodic table with the transition metals highlighted in blue. The blue-shaded area covers the d-block elements from scandium to copper, including the lanthanides (Ce to Lu) which are placed below the main body of the table. The d-block is labeled with the letter 'd' above it.

→ Effect of double bond or bond angle
Double bond creates higher evaporation, but
increases viscosity.

$$\theta_1 > \theta_2 > \theta_3$$

(C.F.) Dipole moment and polarized molecules

30/09/23

(1) CH₄ followed molecular non-polar
2) NH₃ (3) NF₃ (4) HCl

$$\mu = q_1 \vec{r}_1 + q_2 \vec{r}_2$$

Units

i) S.I. unit \rightarrow C.m

ii) Debye unit

$$1.D = 3.3 \times 10^{-30} \text{ C.m}$$

\rightarrow In a molecule, dipole arises due to electronegativity difference between bonded atoms.

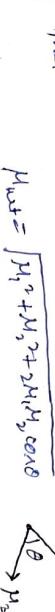
\rightarrow If molecule have only one dipole, then it must be polar.



Ex. H — Cl

\rightarrow If molecule have two or more dipoles, then net dipole moment is obtained by their vectorial addition.

$$\mu_{\text{net}} = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2 \cos\theta}$$



If $\mu_1 > \mu_2$; μ_{net}

If $\mu_1 = \mu_2$; Non-polar

If molecular geometry is irregular, then $\mu_{\text{net}} = 0$.

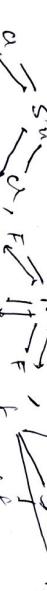
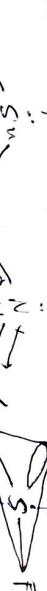
$\left. \begin{array}{l} \text{H}_2 = 0, \\ \text{N}_2 = 0, \\ \text{Cl}_2 = 0 \end{array} \right\} \text{Non-polar}$

$$\mu_{\text{net}} = \sqrt{\mu_1^2 + \mu_2^2 + 2\mu_1\mu_2 \cos\theta}$$



If molecular geometry is regular, then $\mu_{\text{net}} \neq 0$ may or may not be zero.

$\left. \begin{array}{l} \text{H}_2 = 0, \\ \text{F}_2 = 0, \\ \text{Cl}_2 = 0 \end{array} \right\} \text{Polar}$



* Order of polarity
 $\text{N} = \text{F} > \text{N} = \text{Cl} > \text{N} = \text{Br} > \text{N} = \text{I}$
 $\mu = \text{S} \times \text{dipole}$
 polarity

v) $\text{CH}_4 > \text{C}_2\text{H}_6 > \text{C}_2\text{H}_5\text{Br} > \text{C}_2\text{H}_5\text{I}$

a-n bond dipole over S-character

III) $\text{C}_2\text{H}_5\text{Cl} > \text{C}_2\text{H}_5\text{Br} > \text{C}_2\text{H}_5\text{I} > \text{C}_2\text{H}_4$

IV) $\text{N} = \text{F} > \text{N} = \text{Cl} > \text{N} = \text{Br} > \text{N} = \text{I}$

$\mu_{\text{net}} = \mu$

5

63

(CB)
0-0 combination

05/10/23
NP

leads in more acidic environment

$F \rightarrow$
 $C \rightarrow$
 $n \rightarrow$
 $f \rightarrow$
 $R = f + n \rightarrow$
 Contact force
 Friction force
 Normal force
 Reaction force

Aktenzeichen 109.
Bromberg → chem. Wiss.

p-p combination

The diagram illustrates the formation of molecular orbitals from two atomic p-orbitals ($2p_x$ and $2p_z$). The atomic p-orbitals are shown as three lobes along the x and z axes. The resulting molecular orbitals are:

- Sigma (σ) bonding orbital:** Formed by the head-on overlap of the $2p_z$ orbitals. It has a single lobe along the z-axis.
- Sigma (σ) antibonding orbital:** Formed by the head-on overlap of the $2p_z$ orbitals with opposite phases. It has a single lobe along the z-axis.
- Pi (π) bonding orbital:** Formed by the side-on overlap of the $2p_x$ orbitals. It has two lobes, one above and one below the xy-plane.
- Pi (π) antibonding orbital:** Formed by the side-on overlap of the $2p_x$ orbitals with opposite phases. It has two lobes, one above and one below the xy-plane.
- Pi (π) bonding orbital:** Formed by the side-on overlap of the $2p_z$ orbitals. It has two lobes, one above and one below the xy-plane.
- Pi (π) antibonding orbital:** Formed by the side-on overlap of the $2p_z$ orbitals with opposite phases. It has two lobes, one above and one below the xy-plane.

Below the diagrams, the following labels are present:

- $2p_x + 2p_z$
- $2p_z - 2p_z$
- $\pi \sigma_{\text{bond}}$
- $\pi \sigma_{\text{antibond}}$
- $\pi \sigma_{\text{bond}}$
- $\pi \sigma_{\text{antibond}}$
- $\pi \sigma_{\text{bond}}$
- $\pi \sigma_{\text{antibond}}$

~~Molecular Orbital Theory (cont)~~

① In a molecular electron ^{anti}-conjugate, linear combinations of atomic orbitals originate one from each atom.

(iv) For LCAO, or hybrid wave function, LCAO means interferences of overlap of energy differences. In short of electrons in respective atomic orbitals.

④ Are to some extent associated with certain types of independent word - it consisting usually of some name, or

a) constructive intervention → can structure and re-
shape behaviour with the help of
bonding mechanisms or criteria (BMO)

b) Destructive Interference - If conflicting waves are opposed "out-of-phase" then interference will be destructive and lead to lower Amplitude.

$$\text{Anti-bowing molecular vibration} = \text{Rigid spring} - \text{Hooke's law}$$

Pictorial representation of LCM
G.S. - Combination

Bond order (Bo)
$\text{Bond order} = \frac{\text{Nb} - \text{Na}}{2}$
<ul style="list-style-type: none"> Value of Bond orders may be decimal but bond order in reality doesn't exist. Such negative don't exist or such bond orders may be zero.
<ul style="list-style-type: none"> Bond length $\propto \frac{1}{\text{bond order}}$ B. Energy stability \propto Bondorder
E.g. 1) $H_2 : 0.152, 0.150$
$n - n = 2 - 0$

(A) For M_2 and M_{2e}

overformation
• Economic configuration in
no longer over time follows
'soft-growth rule', more in
paving principle

bond order = $\frac{N_b - N_a}{2}$
 value of bond order may be positive, negative, zero, integer, fraction
 if calculated bond order can never be negative
 also negative don't exist
 bond order may be zero or

- Bond length $\propto \frac{1}{\text{bondorder}}$
- B. E. and rigidity \propto Bondorder

$$\text{Ex. 1) } H_2 : \overset{\circ}{S} \overset{\circ}{S^2}, \overset{\circ}{S} \overset{\circ}{S^0}$$

$n - n$: Natural existence

1031
Species

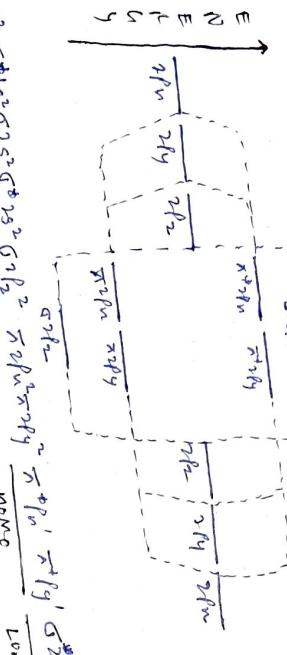
	B.O.	M
N_2	3	0
N_2^+	1.5	$\sqrt{3}$
N_2^{2+}	2	$\sqrt{3}$
N_2^-	2.5	$\sqrt{3}$
N_2^{\ddagger}	2	$\sqrt{8}$

	B.O.	M
O_2	2	$\sqrt{3}$
O_2^+	2.5	0
O_2^-	3	$\sqrt{3}$
O_2^{\ddagger}	1.5	$\sqrt{3}$
$O_2^{\ddagger\ddagger}$	0	$\sqrt{3}$

$N-N$ B.L. : $N_2 < N_2^+ < N_2^- < N_2^{2+} < N_2^{\ddagger}$

B.E. Enthalpy : $N_2^{\ddagger} > N_2^- > N_2 > N_2^+ > N_2$

Energy level diagram for excitation energies of O_2 and F_2 .
 Oxygen and Fluorine have large energy difference between their 2S and 2P orbitals. Hence, B.E. mixing doesn't occur and hence energy of 2P remains lower than 2P.



$B.O. = 0 \frac{\sigma}{\pi} 0$ (no bond)

O_2 : $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_1^2 \pi 2p_1^2 \pi^* 2p_1^2 \pi 2p_2^2 \pi^* 2p_2^2$
 $n=2, \mu=\sqrt{8},$ parvalence $\frac{1}{2}$ but according to VBT, O_2 should be diamagnetic. It is polarized VBT
 as O_2 is nonpolar.

1031
Species

	B.O.	M
O_2	2	$\sqrt{3}$
O_2^+	2.5	0
O_2^-	3	$\sqrt{3}$
O_2^{\ddagger}	1.5	$\sqrt{3}$
$O_2^{\ddagger\ddagger}$	0	$\sqrt{3}$

$O-O$ B.L. : $O_2^+ < O_2^- < O_2 < O_2^+ < O_2^{\ddagger}$

B.E. enthalpy : $O_2^{\ddagger\ddagger} > O_2^- > O_2 > O_2^+ > O_2$

(d) F_2 : $\sigma 1s^2 \sigma^* 1s^2 \sigma 2s^2 \sigma^* 2s^2 \sigma 2p_1^2 \pi 2p_1^2 \pi^* 2p_1^2 \pi 2p_2^2 \pi^* 2p_2^2$ norm

$B.O. = 1$ F — F, (no bond)

$n=0, \mu=0$, diamagnetic
 all halogens are diamagnetic but colourless. They are colourless because they absorb visible light for HOMO(π^*) to LUMO(σ^*) electron transition.

Halogen color
 F2 — yellow-green
 Cl2 — light brown
 Br2 — violet
 I2 — reddish brown

Complementary colour



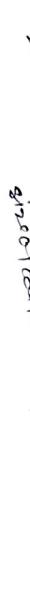
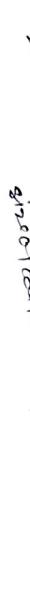
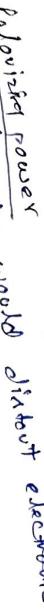
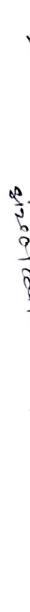
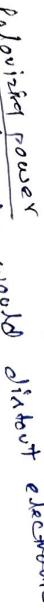
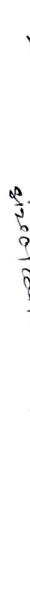
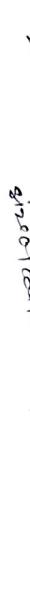
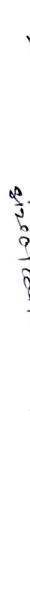
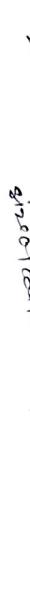
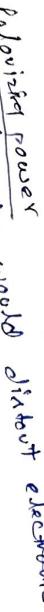
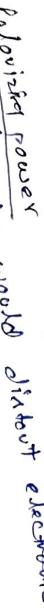
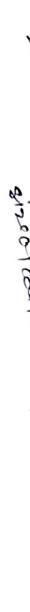
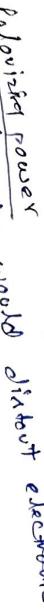
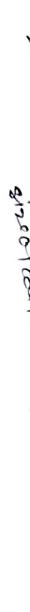
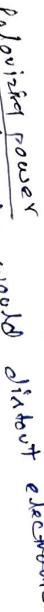
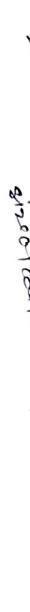
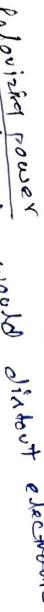
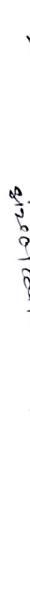
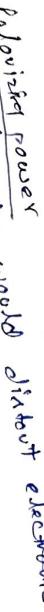
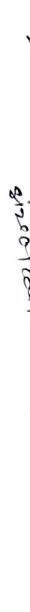
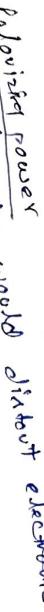
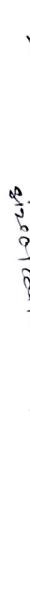
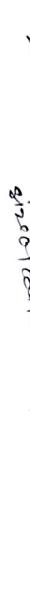
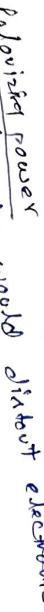
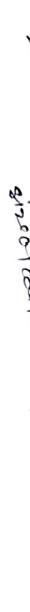
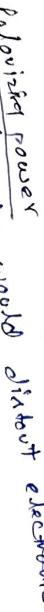
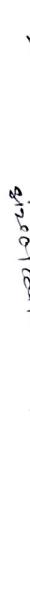
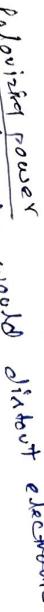
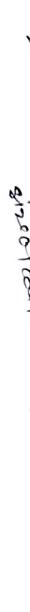
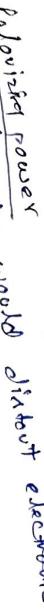
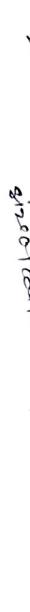
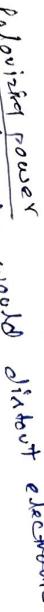
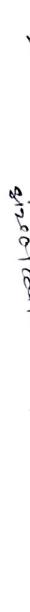
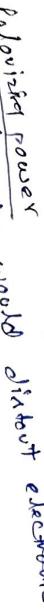
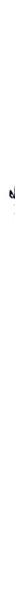
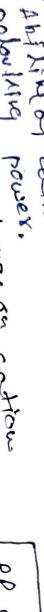
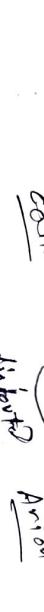
Properties of Ionic compound. Never, ionic compounds do not have ionic bond in non-directional. Never, ionic compounds have specific geometry and don't have melting point and are hard and brittle. They are bad conductor of electricity in solid state but conduct electricity in molten form or in aqueous solution. They are soluble only in polar solvents.

* Faraday's Rule
No any bond neither 100% ionic nor than each bond has both character.

* If $IC > SC$: Bond is ionic

If $IC < SC$: Bond is covalent

In covalent bond, ionic character depends on due to polar bonds.





(ii) Removal of decomposition of ammonium salts

- If anions of ammonium salts are strong oxidizing agent like $\text{Cr}_2\text{O}_7^{2-}$, ClO_4^- , NO_3^- etc., then on heating, they produce N_2 gas.



* NH_4NO_3 over not strong oxidizing agent like $\text{Cr}_2\text{O}_7^{2-}$, ClO_4^- etc., then on heating, they produce ammonia gas.



(iii) Hydration of ions



Hydration forces. Positional accommodation hydration

These may be due to weak hydration shells.

Weak in called hydrated radius. Hydration in the process reduced in the hydration shell.

The energy released in hydration is known as hydration energy.

Hydration energy = ΔH°

Hydration & ionization

SV.	Li^+	Na^+	K^+	Rb^+ (Cs^+)	Reason
Bent	Na^{+}	Ca^{2+}	Sr^{2+}	Ba^{2+}	Near \uparrow , hydration \downarrow , H_2O mol. \downarrow , Rb^+ , Cs^+
Linear	Li^-	Cl^-	Br^-	I^-	
Not	Mg^{2+}	Al^{3+}			
Not	Mg^{2+}	Al^{3+}			

Size of the following compound more highest hydrophilicity.

Size which of following ions have lower higher volat.

$\text{Li}^{+}(\text{aq})$ $\text{Na}^{+}(\text{aq})$ $\text{K}^{+}(\text{aq})$ $\text{Cs}^{+}(\text{aq})$

Ions mobility (κ) & Ions conductivity (K) \rightarrow Ions mobility.

Velocity of ions per unit potential gradient in acid

$\bullet \mu \propto k \propto \text{charge of ion}$

$\alpha \frac{1}{\text{molecular}}$

Order of μ and k in pure state

$\text{Li}^+ > \text{Na}^+ > \text{K}^+ > \text{Rb}^+ > \text{Cs}^+$ $\text{Na}^+, \text{K}^+ \downarrow$

$\text{Rb}^+ > \text{Mg}^{2+} > \text{Ca}^{2+} > \text{Sr}^{2+} > \text{Ba}^{2+}$ $\text{Rb}^+ \uparrow, \text{Mg}^{2+} \uparrow$

$\text{Na}^+ < \text{Mg}^{2+} < \text{Ca}^{2+} < \text{Sr}^{2+} < \text{Ba}^{2+}$

Order of μ and k in aqueous

$\text{Li}^+ < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

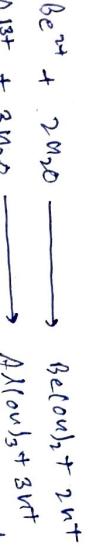
$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$

$\text{Li}^{+(<)} < \text{Na}^{+(<)} < \text{K}^{+(<)} < \text{Cs}^{+(<)} \quad \text{in aqueous}$



But + 3 π , $\frac{1}{2}$, etc. help their power & value.

incipient compounds to a great number which have been isolated.

$$\text{Ba}(\text{Cl}_2 \cdot 2\text{H}_2\text{O}) \rightarrow \text{Ba}(\text{Cl}_2 \cdot 2\text{H}_2\text{O}) + \text{H}_2\text{O}$$

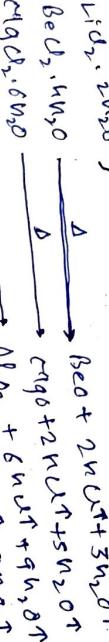
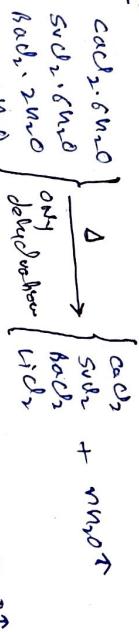
↓ Hygroscopicity

KER, which overcomes our next important question concerning common and rare disease in not hereditary but commonest condition among us, and can also serve as a hereditary improvement. This is because we have only now understood onto what will be the result of our studies.

BeCl_2 MgCl_2 AlCl_3 } condensate formed
 $\text{BeCl}_2 \cdot \text{H}_2\text{O}$ Tonit compound becomes extremely viscous
 $\text{MgCl}_2 \cdot \text{H}_2\text{O}$ hydration makes it more viscous.
 $\text{AlCl}_3 \cdot \text{H}_2\text{O}$

$$\begin{array}{c}
 \text{HgCl}_2 \cdot \text{C}_2\text{H}_5\text{OH} \\
 \text{cat}, \text{Cu}^{+2} \\
 \text{Bc} \text{Cl}_2 \cdot \text{nH}_2\text{O} = \\
 \text{Bc} \text{Cl}_2 + \text{nH}_2\text{O} \\
 \downarrow \text{H}_2\text{O} \\
 \text{Bc}^{+2} + \text{Cl}^- = [\text{Bc}(\text{H}_2\text{O})_n] \text{Cl}_2
 \end{array}$$

143



$\text{Fe}_2\text{O}_3 + \text{6Mn} \rightleftharpoons \text{2Mn}_3\text{O}_4$ dehydrogenation.

$2\text{Fe}_3\text{O}_4 \cdot 8\text{MnO}$ due to higher oxidation, they undergo hydrosulfite reduction instead of anhydrous metal chlorination.

When more reduced metal chalcide is obtained, but when the reduced metal chalcide is obtained of halogen, then only two

Probability → disorders like "lipid disorders" in polar solvent
"protein disorders" in non-polar solvent

do where I do most of my work
- Being surrounded by dirt and
mud makes me sick

so far as possible to be
done by the same
method.

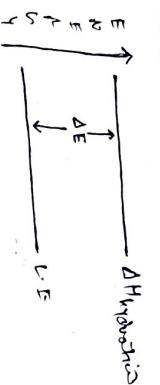
in which 100% were found, no significant difference was observed between the two groups ($P = 0.8$).

(v) solvent A
 (vi) solvent B ($K = n_1 \cdot 0$)
 (vii) solvent C ($K = n_1 \cdot 0$)
 (viii) solvent D ($K = 3.25$)

69/11/23

1681
Solubility of binary compounds in water

(1) Hydrogen enthalpy of ionic compound in aqueous form is positive
exothermic, then it will be soluble in water.



Solubility $\propto \Delta E$

less soluble in water while more soluble in protic solvents

(2) $\Delta H_{\text{sol}} > \Delta H_{\text{hydration}}$

(3) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(4) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(5) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(6) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(7) $\Delta H_{\text{sol}} > \Delta H_{\text{hydration}}$

(8) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(9) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(10) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(11) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(12) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(13) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(14) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(15) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(16) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(17) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

(18) $\Delta H_{\text{sol}} = \Delta H_{\text{hydration}}$

(19) $\Delta H_{\text{sol}} < \Delta H_{\text{hydration}}$

1681
Soluble and Insoluble

(1) All metal nitrides are insoluble (except Pb_3N_2 , Ba_3N_2 , Al_3N_2)

(2) Many metal sulfides are insoluble but carbonates are soluble

(3) Many metal carbonates are insoluble but carbonate are soluble

(4) Many oxides are insoluble but only Li_2O , Na_2O , K_2O , Rb_2O , Cs_2O are soluble

(5) Oxide and hydroxide only Li_2O , Na_2O , K_2O , Rb_2O , Cs_2O are soluble due to polarisation

(6) Sulphides of only s-block metals are soluble. Some insoluble metal halides are also insoluble. Halides are soluble. Some insoluble metal halides are

(7) Many metal halides are soluble. LiCl , CaCl_2 , SrCl_2 , BaCl_2 , AgCl , AlCl_3 , FeCl_3 , PbCl_2 , PbBr_2 , PbI_2 , Pb_3Cl_2 , Pb_3Br_2 , Pb_3I_2 are insoluble in normal water but soluble in

(8) Note: PbCl_2 , PbBr_2 , PbI_2 are insoluble in boiling water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in hot water, PbCl_2 dissolves in cold water.

1681
Soluble and Insoluble

(1) All metal nitrides are insoluble (except Pb_3N_2 , Ba_3N_2 , Al_3N_2)

(2) Many metal sulfides are insoluble but carbonates are soluble

(3) Many metal carbonates are insoluble but carbonate are soluble

(4) Many oxides are insoluble but only Li_2O , Na_2O , K_2O , Rb_2O , Cs_2O are soluble

(5) Oxide and hydroxide only Li_2O , Na_2O , K_2O , Rb_2O , Cs_2O are soluble due to polarisation

(6) Sulphides of only s-block metals are soluble. Some insoluble metal halides are

(7) Many metal halides are soluble. Some insoluble metal halides are

(8) Note: PbCl_2 , PbBr_2 , PbI_2 are insoluble in normal water but soluble in

(9) Note: PbCl_2 , PbBr_2 , PbI_2 are insoluble in boiling water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in hot water, PbCl_2 dissolves in cold water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.

Note: PbCl_2 , PbBr_2 , PbI_2 dissolves in cold water, PbCl_2 dissolves in hot water.