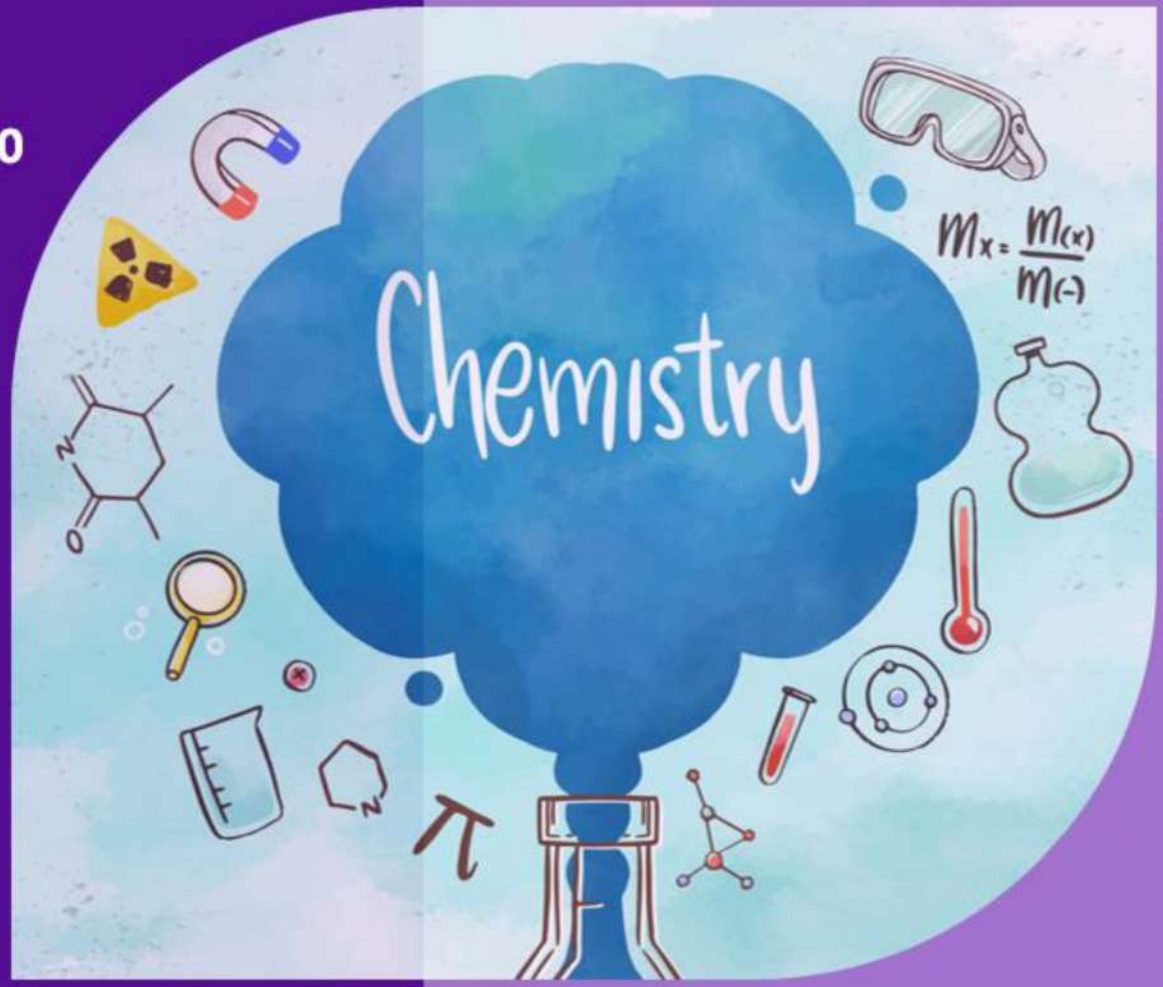
MEDICAL AND DENTAL ADMISSION PROGRAM 2020

CHEMISTRY

LECTURE : C-02

CHAPTER 03 : CHEMICAL BOND

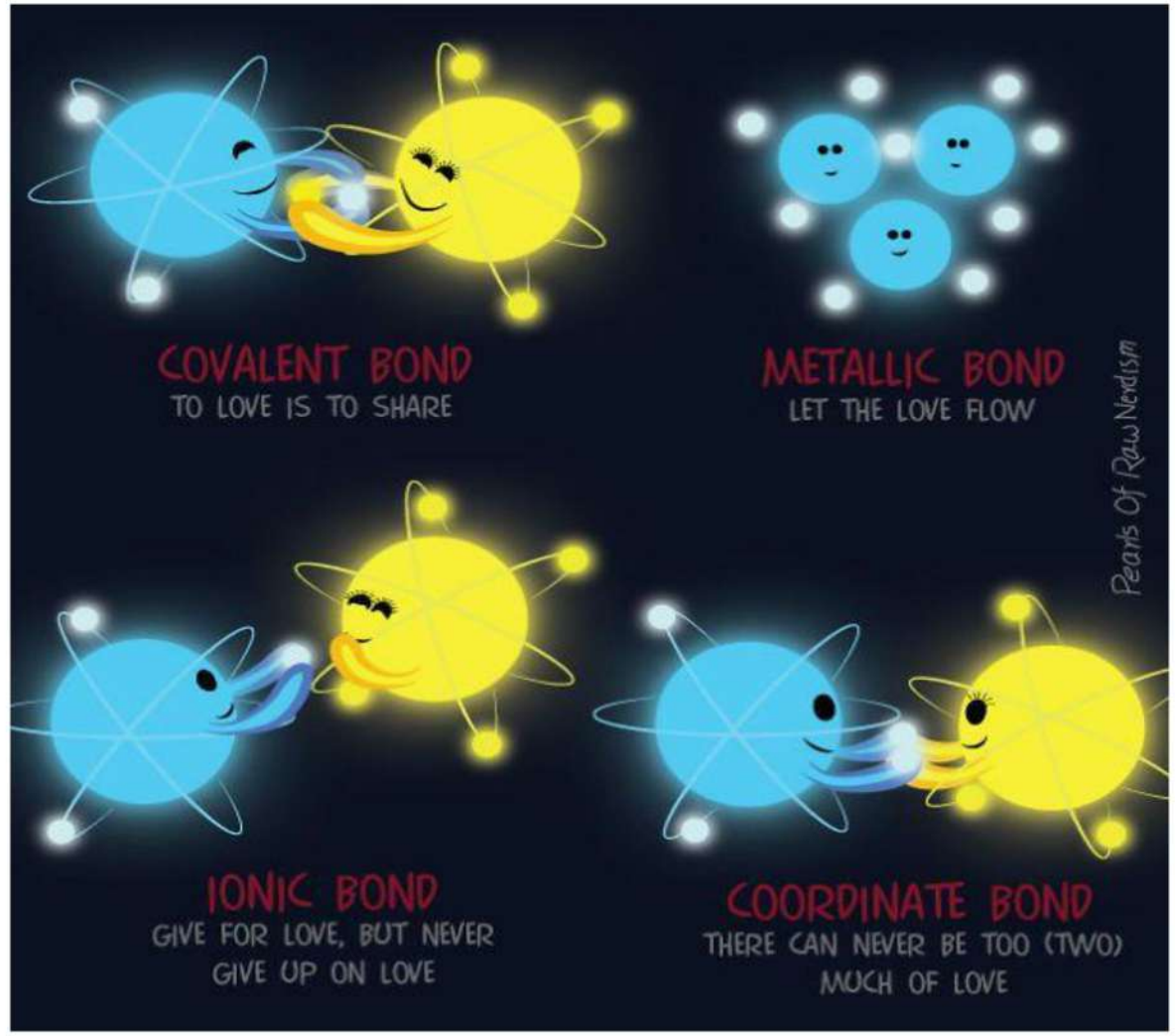


উন্মেষ
মেডিকেল এন্ড ডেন্টাল এডমিশন কেয়ার

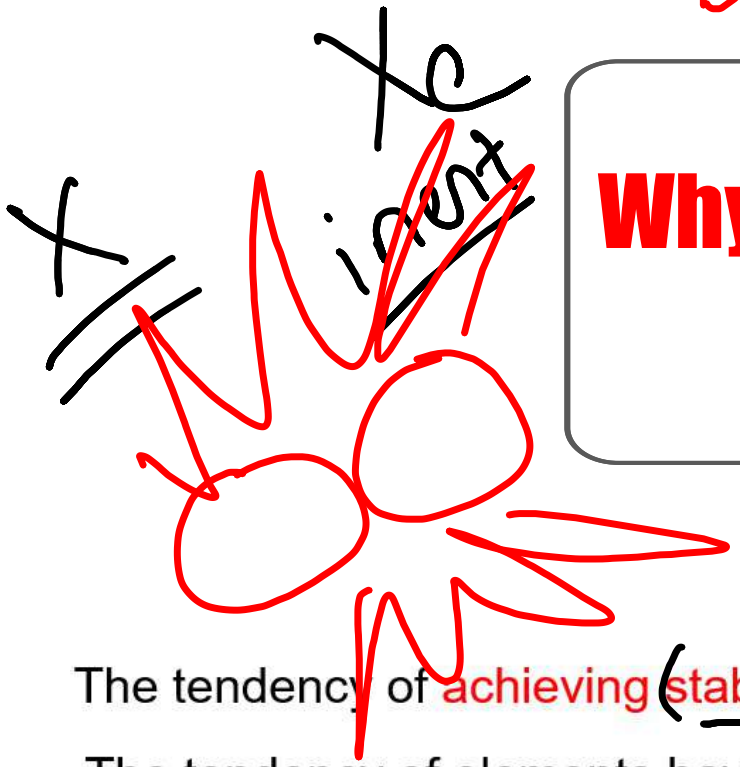
Important topic from this chapter for Medical and Dental admission test

Importance	Topic	Admission test years
✪✪✪	Chemical bonds	MAT: 19-20, 14-15, 13-14, 11-12, 09-10, 07-08, 06-07, 05-06, 04-05, 00-01; DAT: 19-20, 17-18, 10-11, 08-09, 03-04, 02-03, 00-01
✪✪	Hybridization of orbitals	MAT: 14-15, 02-03; DAT: 04-05, 02-03
✪	Polarity of covalent bonds and covalent characteristics of ionic compounds	MAT: 10-11; DAT: 01-02
✪✪	Nomenclature of inorganic compounds	MAT: 07-08, 05-06; DAT: 16-17, 07-08

Chemical Bond:



Bond formation — emission a / absorption b

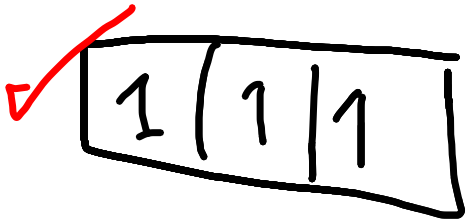


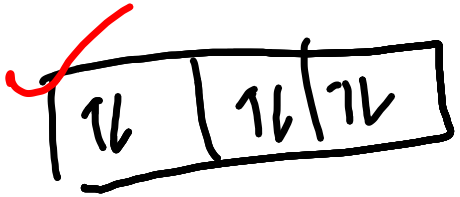
Why Bond is formed ???

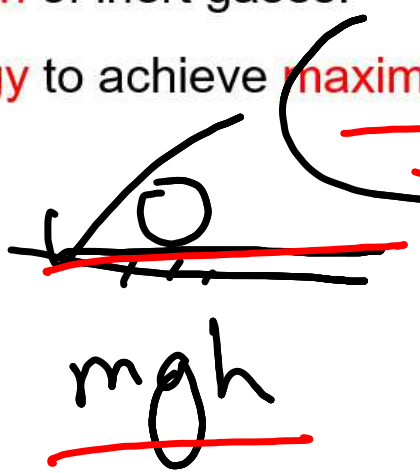
H → duplet / octet

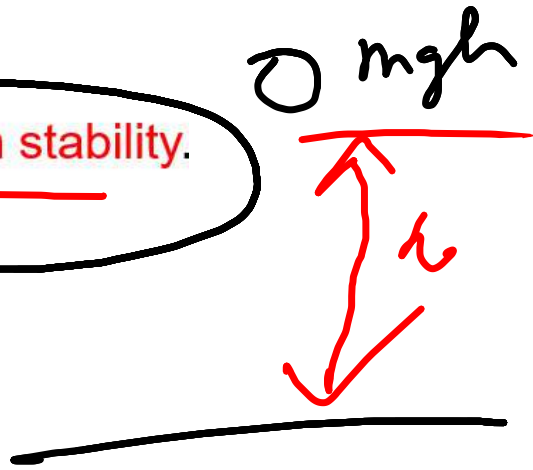
The tendency of achieving stable electronic configuration of inert gases.

The tendency of elements having minimum static energy to achieve maximum stability.





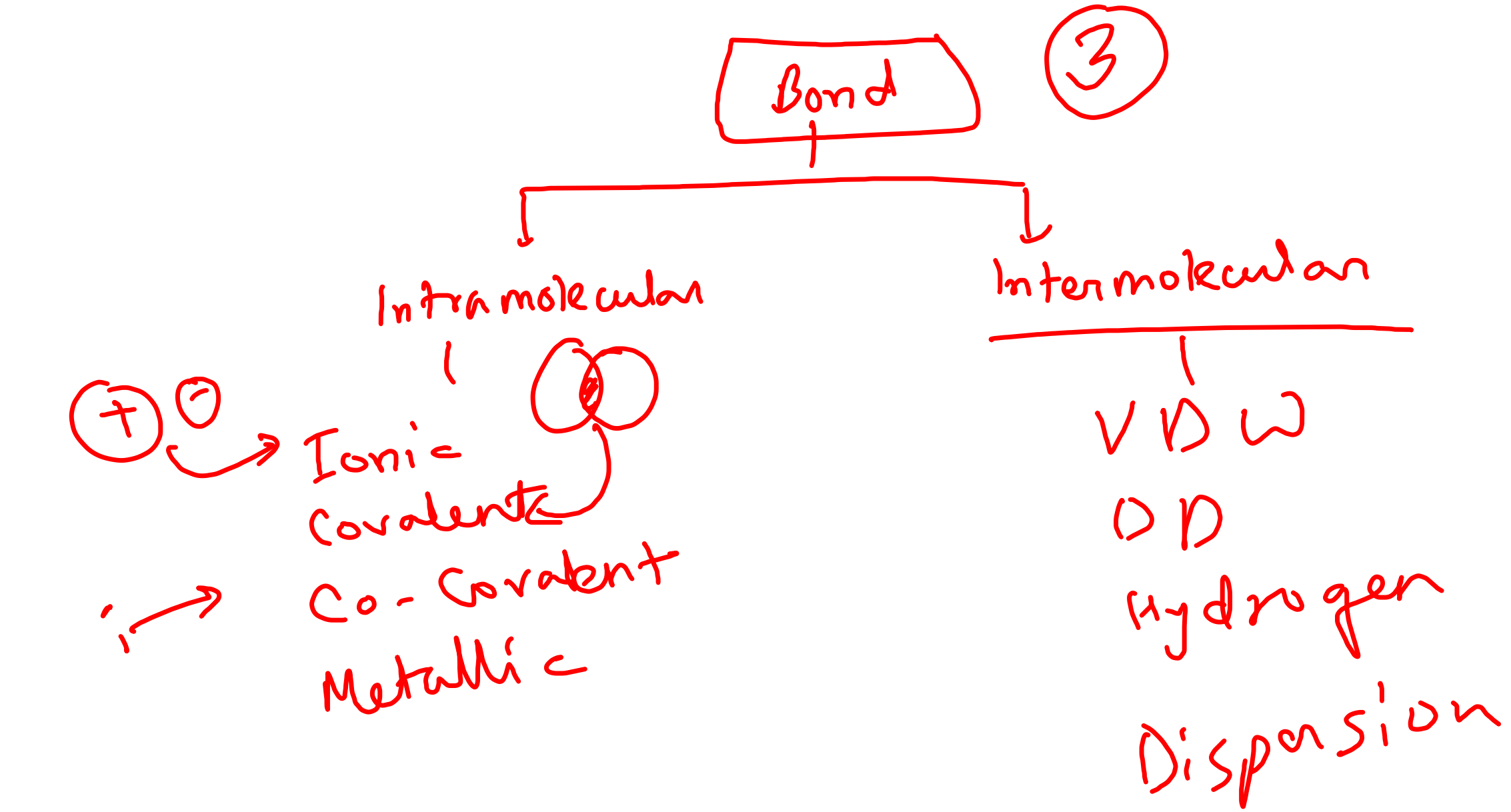




Chemical Bond:

Types: Different elements transfer or share or partially share electron of their outermost shell to form 3 types of bonds, they are-

- Ionic bond **(Metal + Non-metal)**
- Covalent bond **(Non-metal +Non-metal)**
- Co-ordinate bond


Bond
3
Intramolecular
Intermolecular
+
-
Ionic
Covalent
Co-Covalent
Metallic
VDW
DD
Hydrogen
Dispersion

Previous question

Which is not a type of chemical bond? [MAT: 13-14, 11-12, 06-07]

(a) Co-ordinate ionic bond

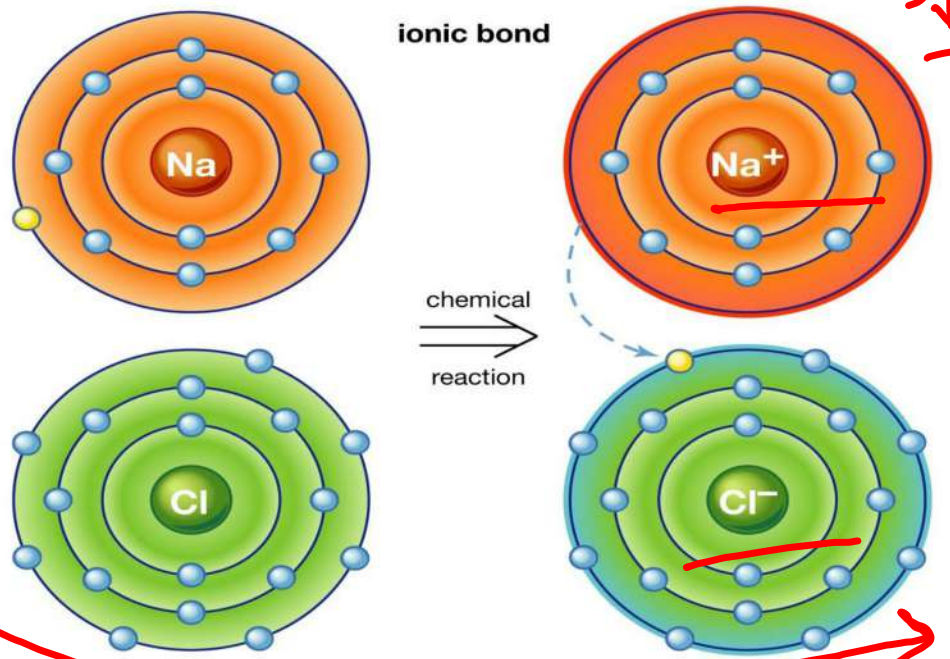
(b) Covalent bond

(c) Ionic bond

(d) Co-ordinate covalent bond

Ionic bond:

Formation of chemical bond among elements of atoms is the process of attaining more stable electronic configuration by those atoms similar to their nearest inert gas elements either by donation-acceptance of electrons



Metal

↓ I. Energy

$Na \rightarrow Na^+ + e^-$

Nometal

$Cl + e^- \rightarrow Cl^-$

↑ e Affinity

$NaCl \longrightarrow Na(g) + Cl(g)$

Na^+ Cl^-

ESF

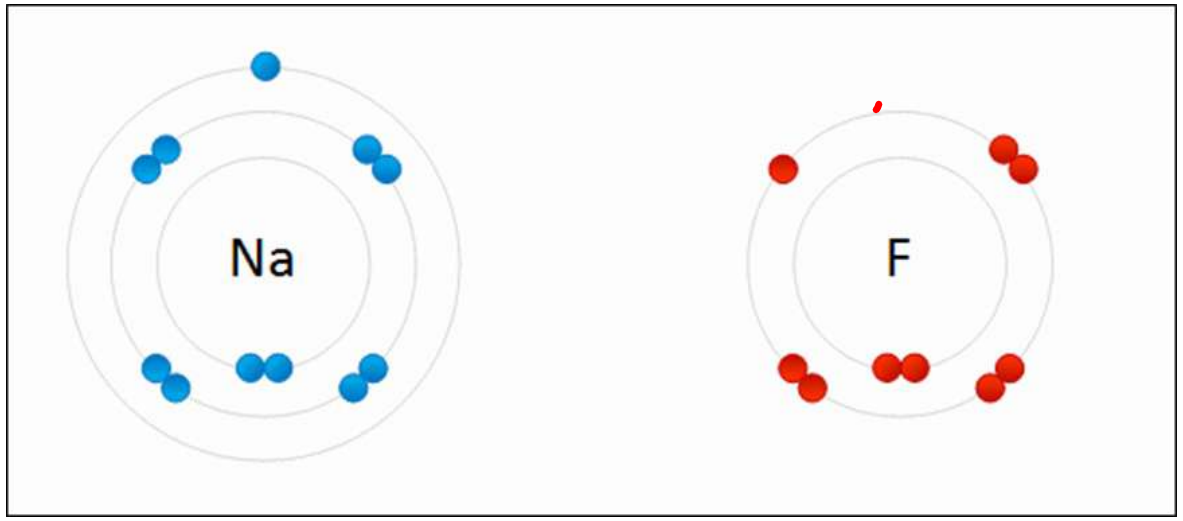
Conditions for formation of ionic bond:

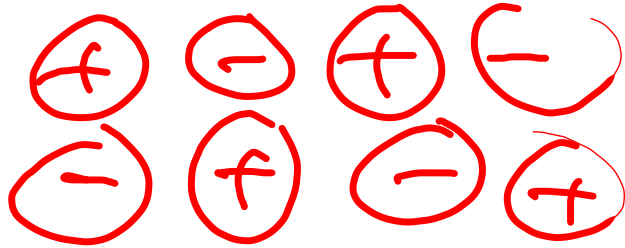
(i) metal atoms should have low ionization energy.

(ii) non-metal atoms should have high electron affinity.

(iii) The lattice energy of the crystals of ionic compounds must be high.

$LE \propto \frac{q_1 q_2}{\varepsilon r}$

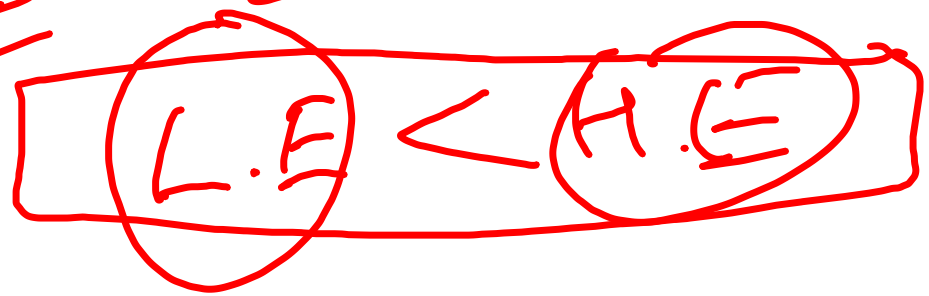




crystal lattice

Properties of ionic compounds:

- Polar in nature.
- Crystal. Example: NaCl takes the form of a side-centered cube.
- High melting & boiling points. Example: boling point of NaCl is $1470°C$ whereas boiling point of covalent chloride CCl_4 is
- Soluble in polar solvent. Example- NaCl dissolves in water, but not $77°C$ in.
- Conducts electricity.



Previous question

Which is not true regarding electric conductivity of ionic compounds? [MAT: 13-14]

(a) Can conduct electricity in solid state

(b) Conduct electricity in solution

(c) Conduct electricity at melted state

(d) Very high melting point

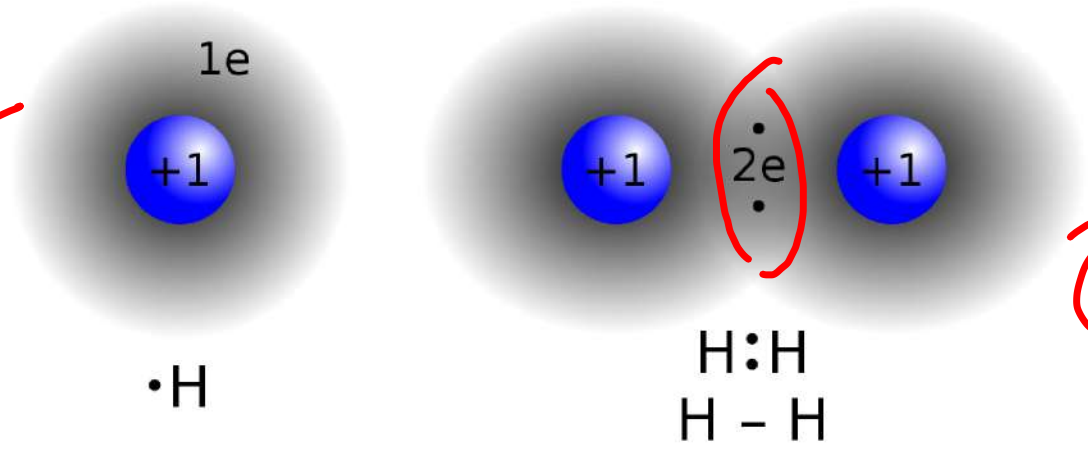
Covalent bond:

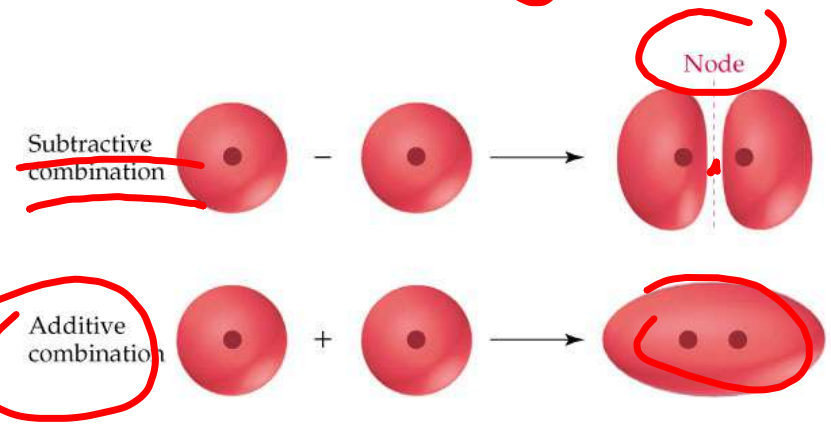
Proposer: Scientist GN Lewis.

Theories about formation:

There are two theories given based on modern wave mechanics on covalent bond structure. Such as-

- Valence bond theory,
- Molecular orbital theory.



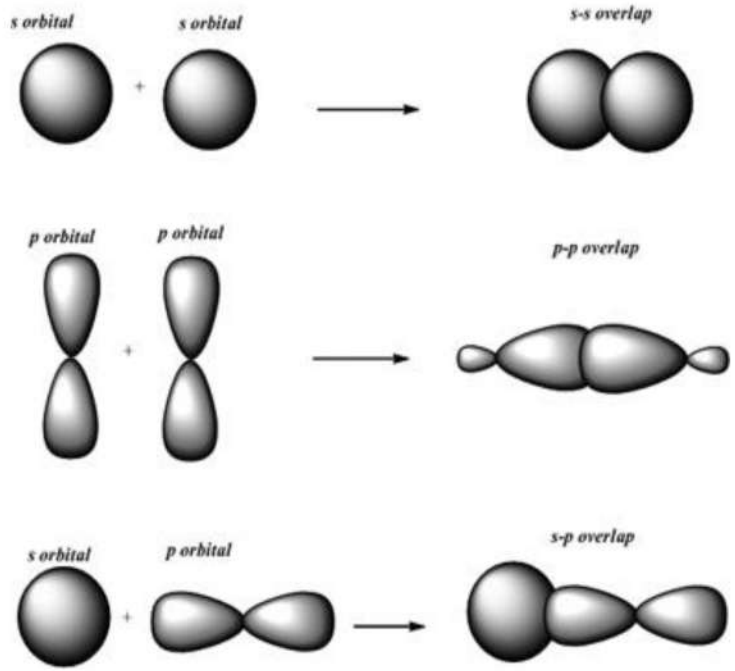


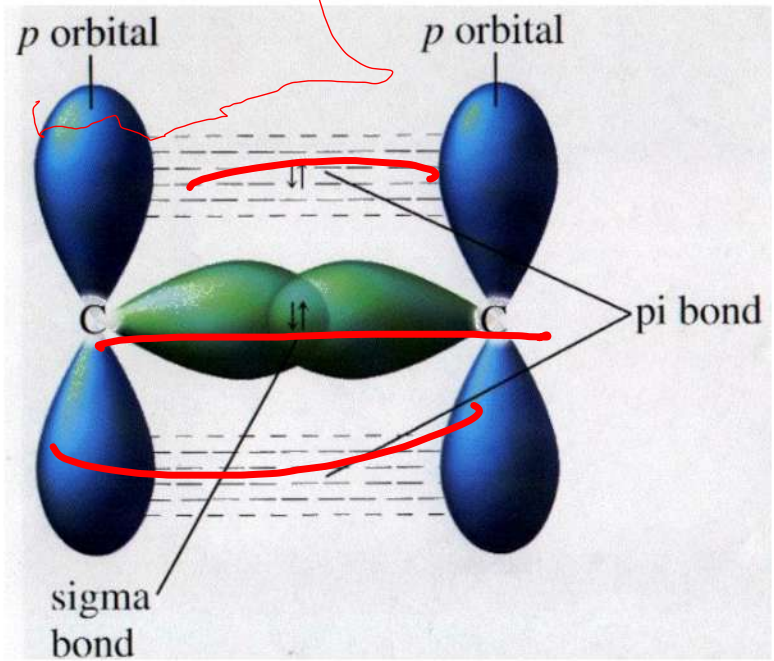
Classification of covalent bonds

According to overlapping of orbitals, covalent bonds are of two types. They are-

I. Sigma bond

II. Pi bond





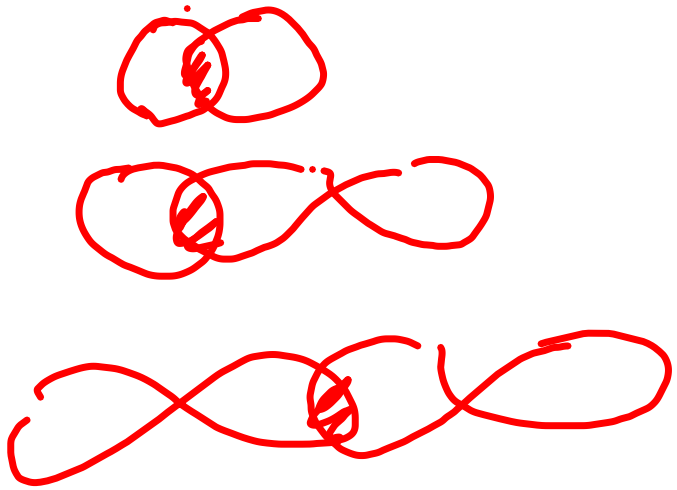
Poll Question-01

Overlapping of which element is most strong ?

(a) H_2

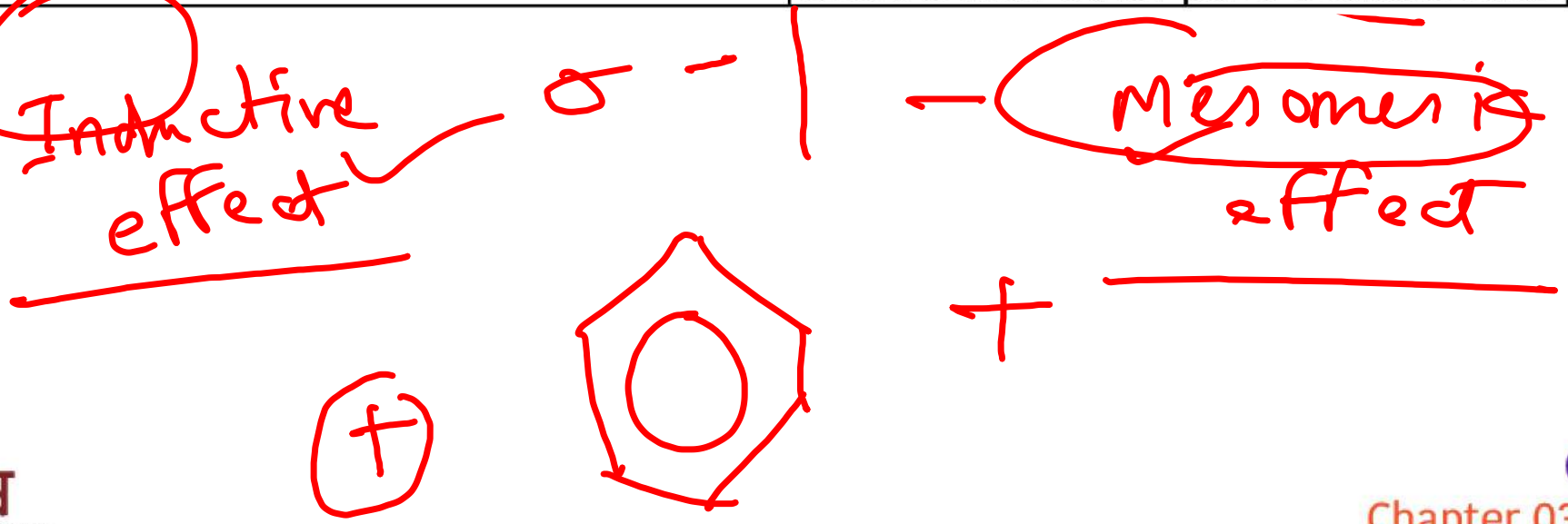
(b) HCl

(c) F_2



Differences between sigma bond & pi bond

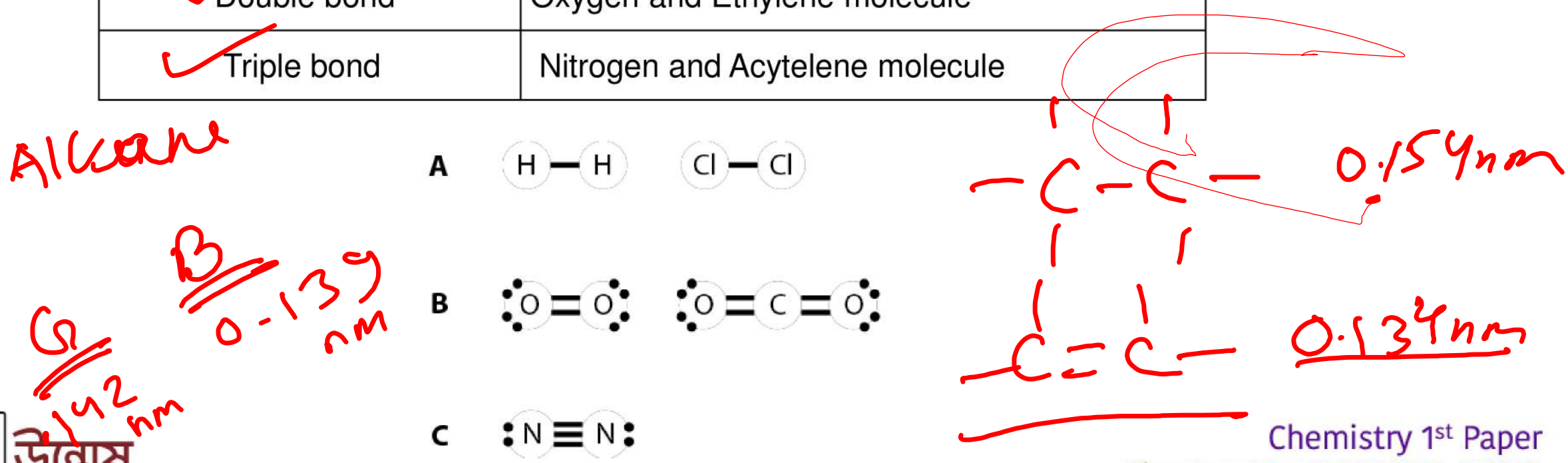
sigma bond	Pi-bond
This type of bond formed by direct overlapping of orbitals	This type of bond formed by partial side to side overlapping of orbitals
sigma bond is stronger than Pi-bond	Pi-bond is weaker than sigma bond.
Can occur in any orbital	Pi bond does not occur with hybrid orbitals but occurs with other pure orbitals except s-orbital.



Classification of covalent bonds

How many pairs of electrons needed to share between two atoms; depending on it covalent bond is of 3 types. These are-

Bond	Example
Single bond	Hydrogen and Ethane molecule
Double bond	Oxygen and Ethylene molecule
Triple bond	Nitrogen and Acytelene molecule



Previous question

By which bond two hydrogen atoms are connected? [MAT: 19-20]

(a) Ionic

(b) Hydrophilic

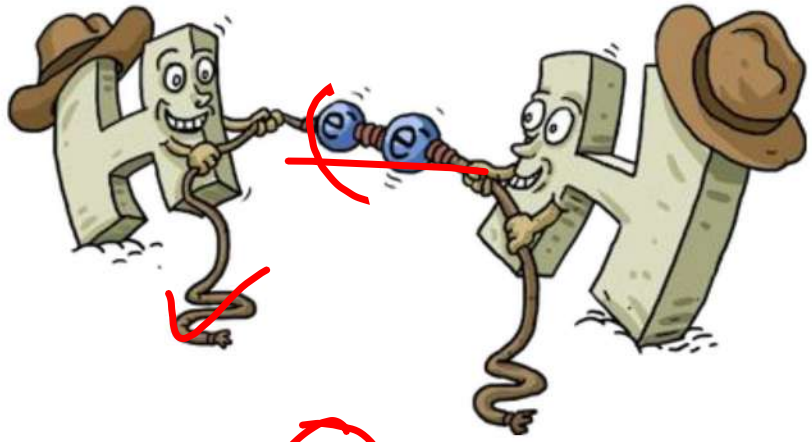
(c) Hydrophobic

(d) Covalent

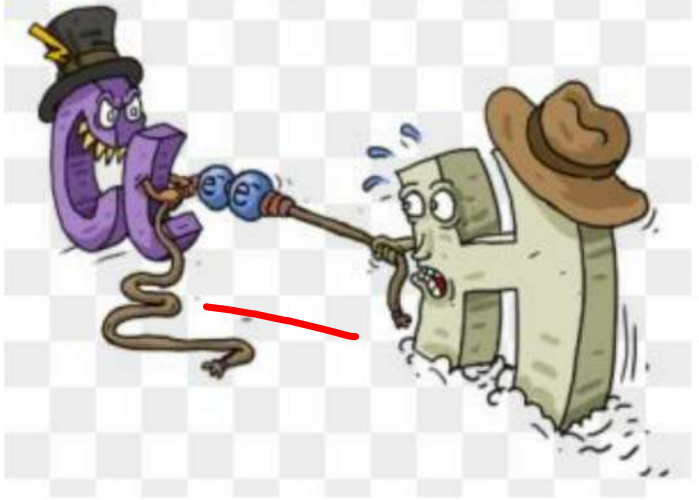
Polarity in covalent bond

- The formation of a dipole in a covalent compound is called polarity of the compound.
- HCl, HF, H_2O, HNO_3, etc. are polar compounds.

Non-Polar Covalent Bond



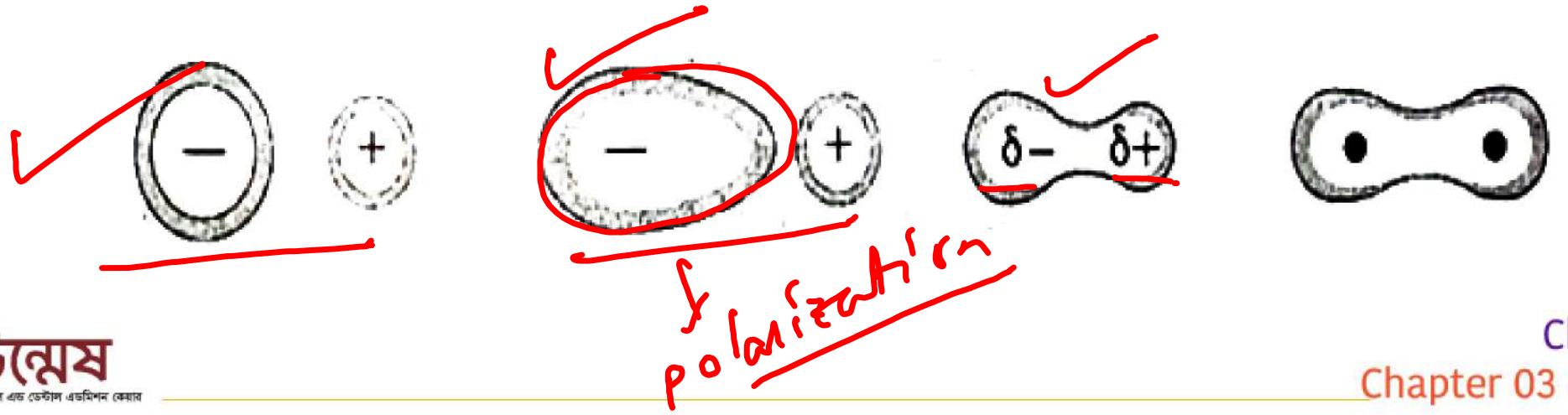
Polar Covalent Bond



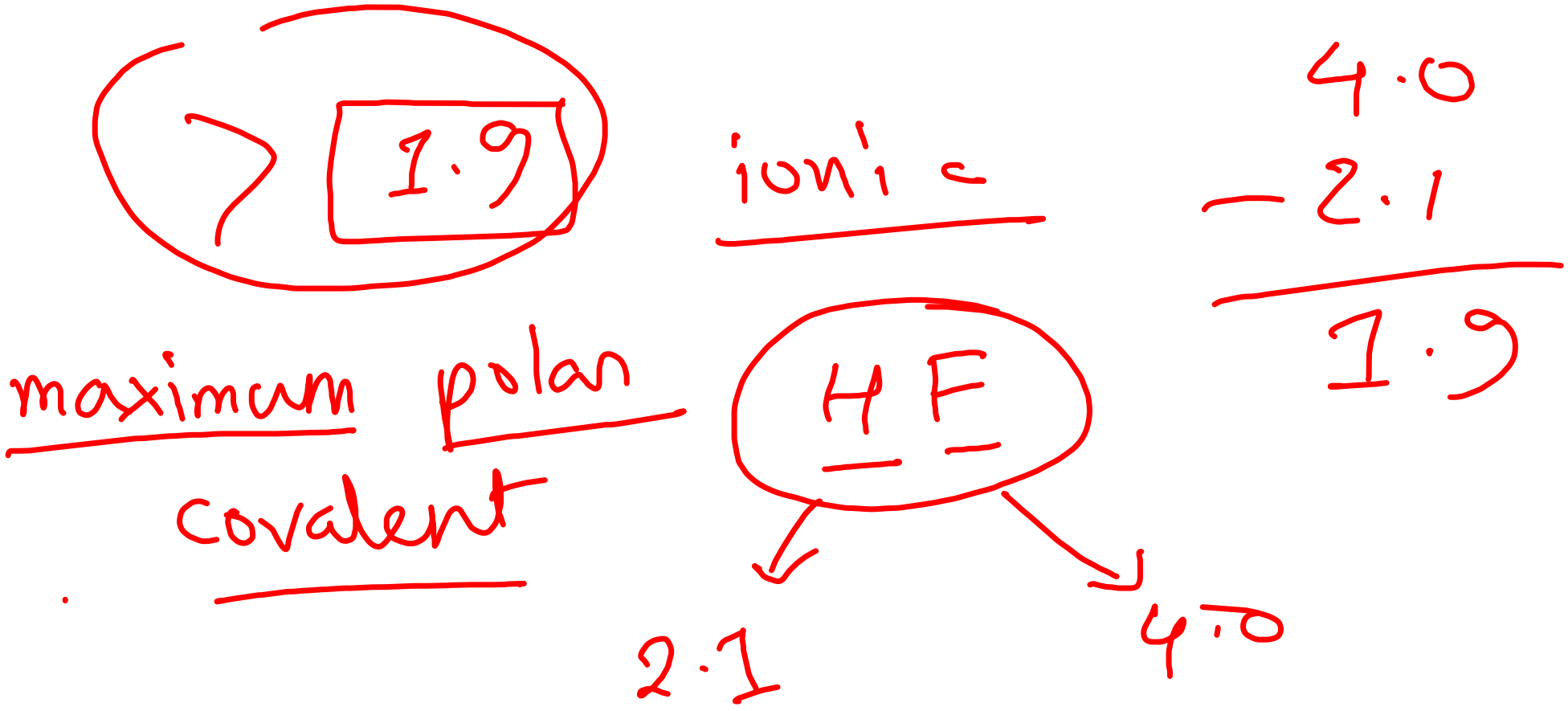
Polarity in covalent bond

↑ polarization ⟶ less polar compound.

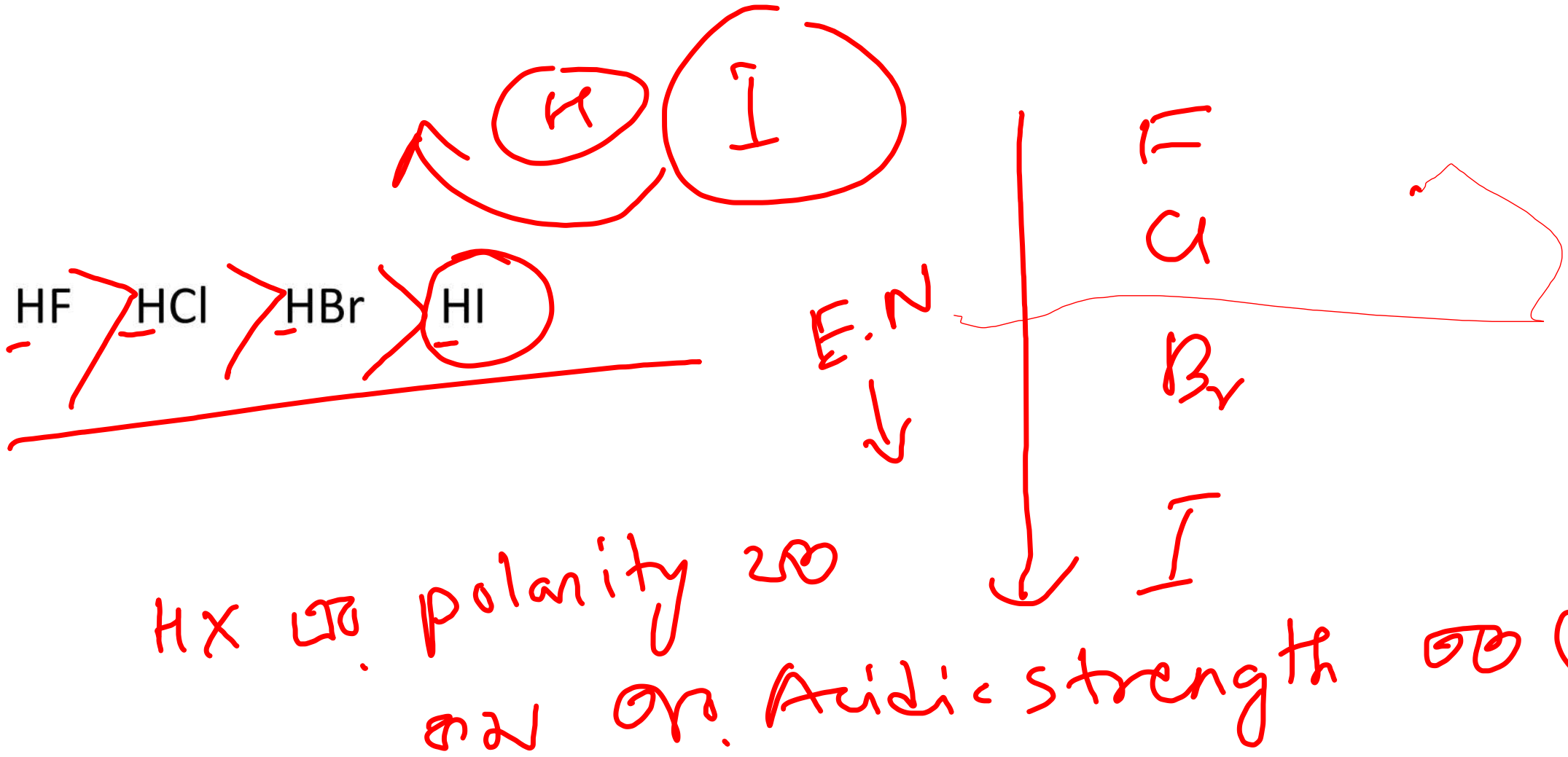
Differences in electro-negativity	Types of compound
0	Pure covalent
< 0.5	Non-polar covalent
0.5-1.9	Polar covalent
> 1.9	Ionic compound



Why molecules become ionic if difference of electronegativity is more than 1.9?



What is the order of polarity among hydrogen halide?



Poll question-02

Which one is polar?

[DAT: 17-18]

(a) CH_4

(b) CCl_4

(c) HCl

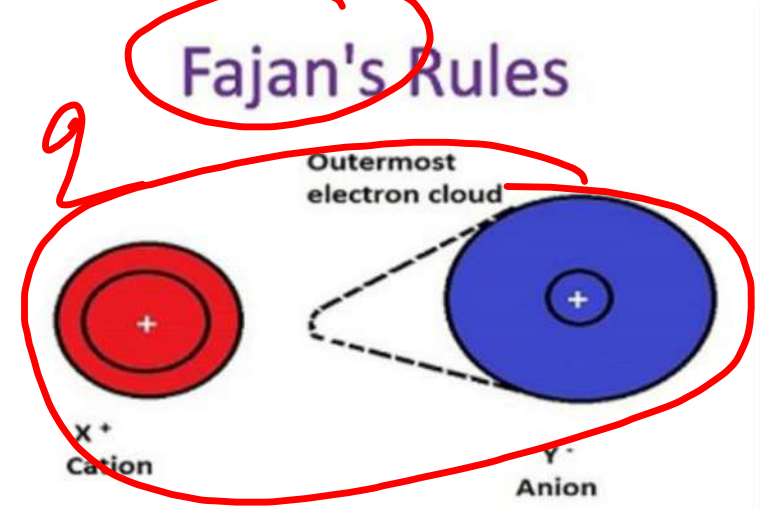
(d) N_2

0.5 - 1.9

Covalent characteristics in ionic compounds

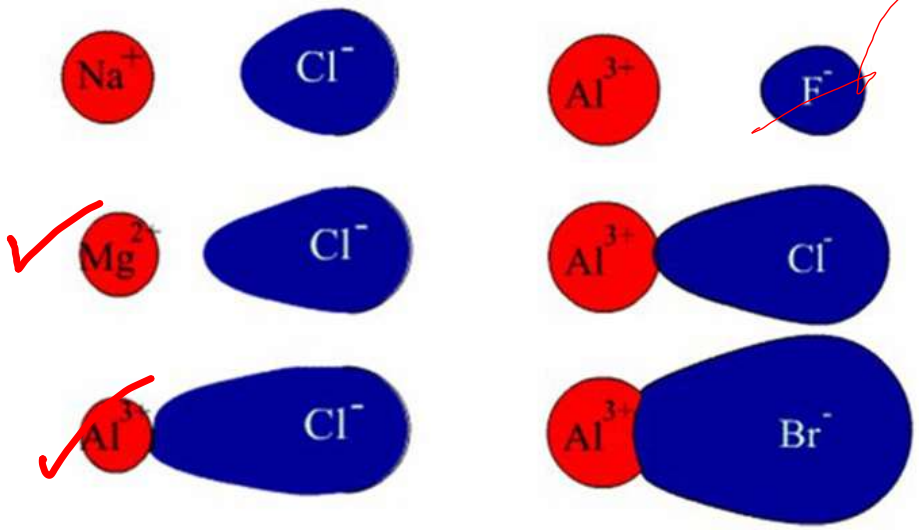
- In reality no compound is 100% ionic. Like that there is no 100% covalent compounds.
- NaCl has 80% ionic property.

Electronegativity difference, ΔEN:	0.1	0.2	0.6	0.9	1.1	1.7	2.0	2.1	3.0
Average partial ionic character :	0.5	1.0	10	19	25	50	75	80	90



Fajan's polarization rules

- With the increase of charges on cations and anions,
- With decrease of sizes of cations and increase of sizes of anions,
- Cations with electronic configuration $ns^2\ np^6\ nd^{1-10}$



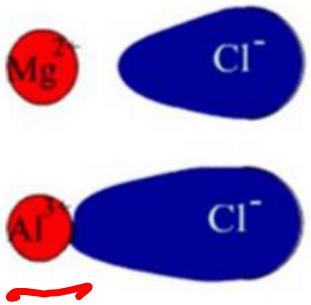
ionic potential ↑ ⇊ polarization ↑

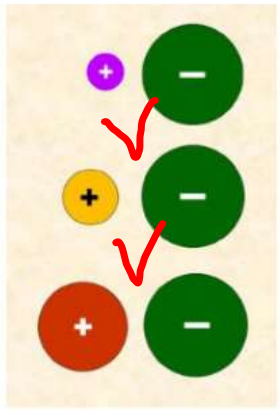
$\phi = \frac{\text{charge}}{\text{radius}}$

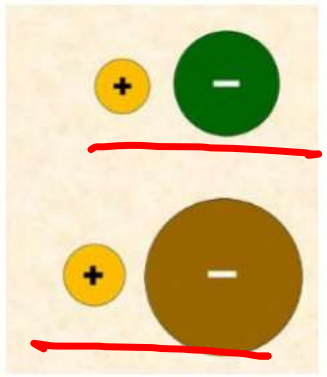
Application of fajans rule

1st rule

2nd rule







$ns^2\ np^6\ nd^{1-10}$

- a CaF_2
- b CaO

- $BaCl_2$ a
- $MgCl_2$ b
- $BeCl_2$ c
- $SrCl_2$ d

- $CaCl_2$ a
- CaI_2 b
- CaF_2 c
- $CaBr_2$ d

- NaCl a
- CuCl b

0.095 nm
0.096 nm

Poll Question-03

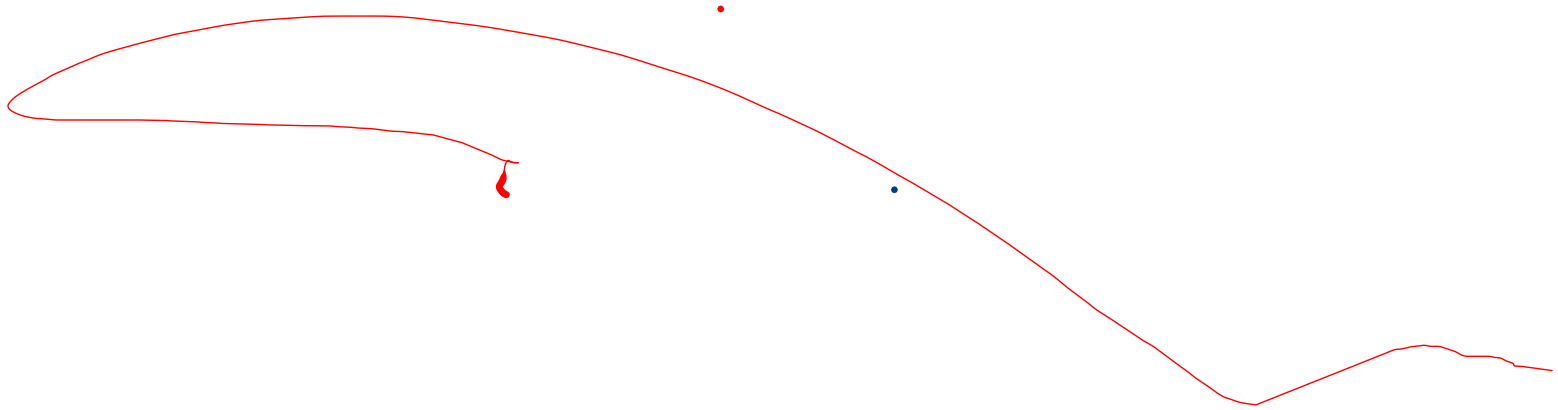
Which one is most covalent?

(a) CaF_2

(b) $CaCl_2$

(c) $CaBr_2$

(d) CaI_2



Ionic potential

Ionic potential of cation: Ø = ~~radius~~ of cation /radius of cation

With the increase in Ø of cation-

- Melting and boiling points of ionic salts gradually decrease,
- Decrease of solubility in water,
- Coloration of compounds,
- Dissociation of metallic carbonates in low heat etc. properties are expressed.

Why AgF is water soluble?

Decrease of solubility of salts in water : Among AgF, AgCl, AgBr and AgI, polarization of anion occurs the least in AgF So, AgF is soluble in water.

$$\phi = \frac{\text{charge}}{\text{radius}}$$

which metallic carbonate has more Thermal stability ?

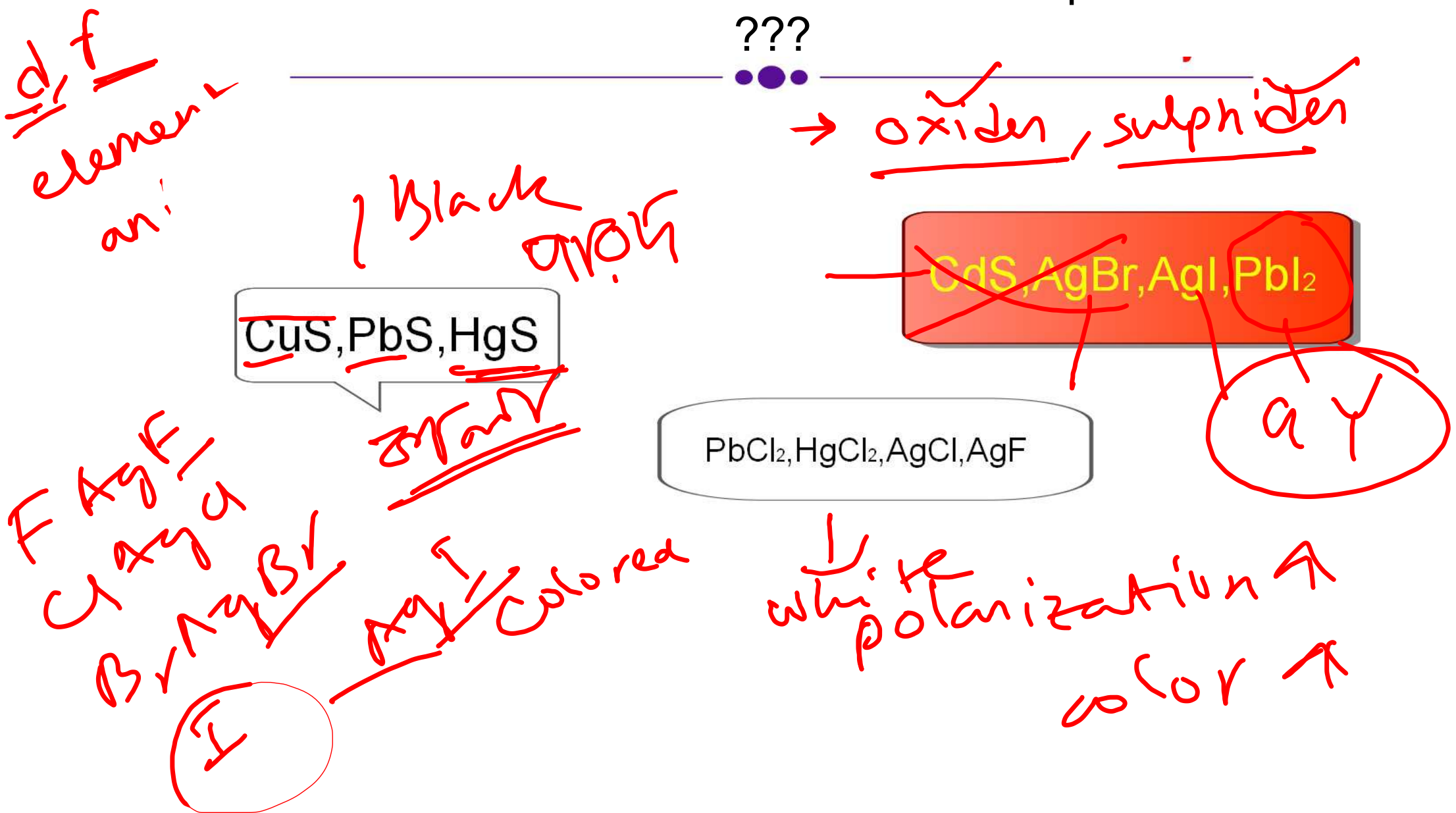
16 -17

Be Mg Ca Sr Ba CO_3

CO_3 CO_3 CO_3 CO_3

ঢাঃ Bell ৫ ৭৮

What will be the color of these compounds ???



Poll Question-04

Which salt is least stable? or heat

(a) $BeCO_3$

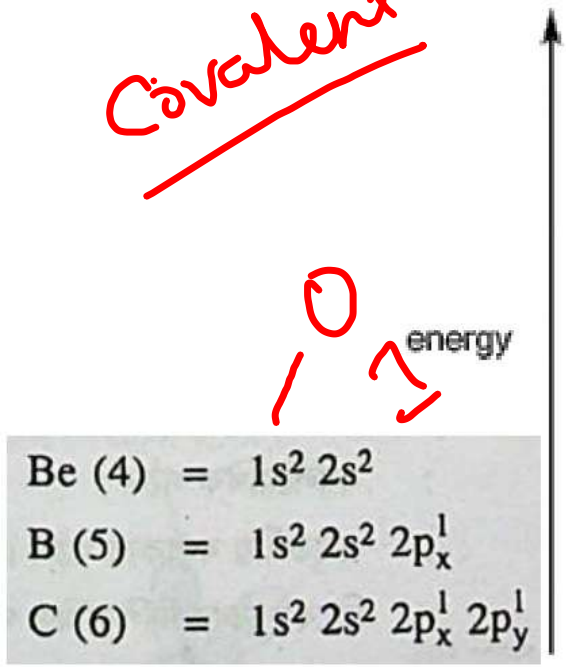
(b) $MgCO_3$

(c) $CaCO_3$

(d) $BaCO_3$

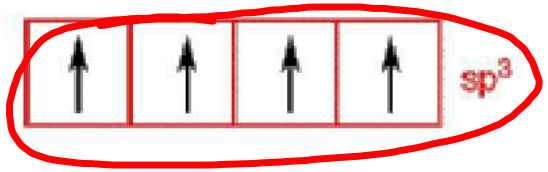
Hybridization of orbitals

Proposed by: Scientist Linus Pauling.



Be (4)	=	$1s^2\ 2s^2$
B (5)	=	$1s^2\ 2s^2\ 2p_x^1$
C (6)	=	$1s^2\ 2s^2\ 2p_x^1\ 2p_y^1$

hybridization



Be* (4)	=	$1s^2\ 2s^1\ 2p_x^1$
B* (5)	=	$1s^2\ 2s^1\ 2p_x^1\ 2p_y^1$
C* (6)	=	$1s^2\ 2s^1\ 2p_x^1\ 2p_y^1\ 2p_z^1$

$1s^2, 2\psi_1^1, 2\psi_2^1$

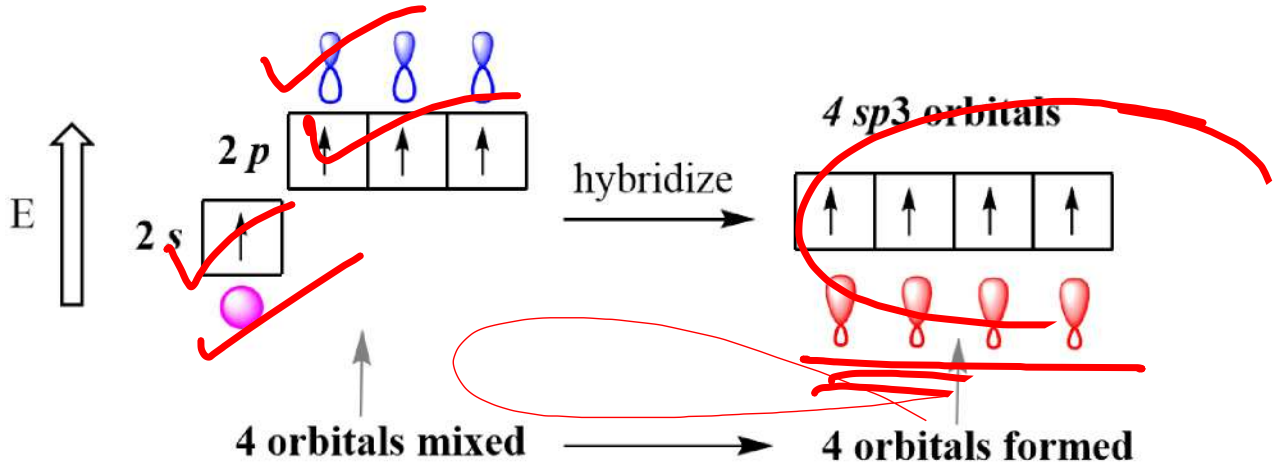
$1s^2, 2\psi_1^1, 2\psi_2^1, 2\psi_3^1$

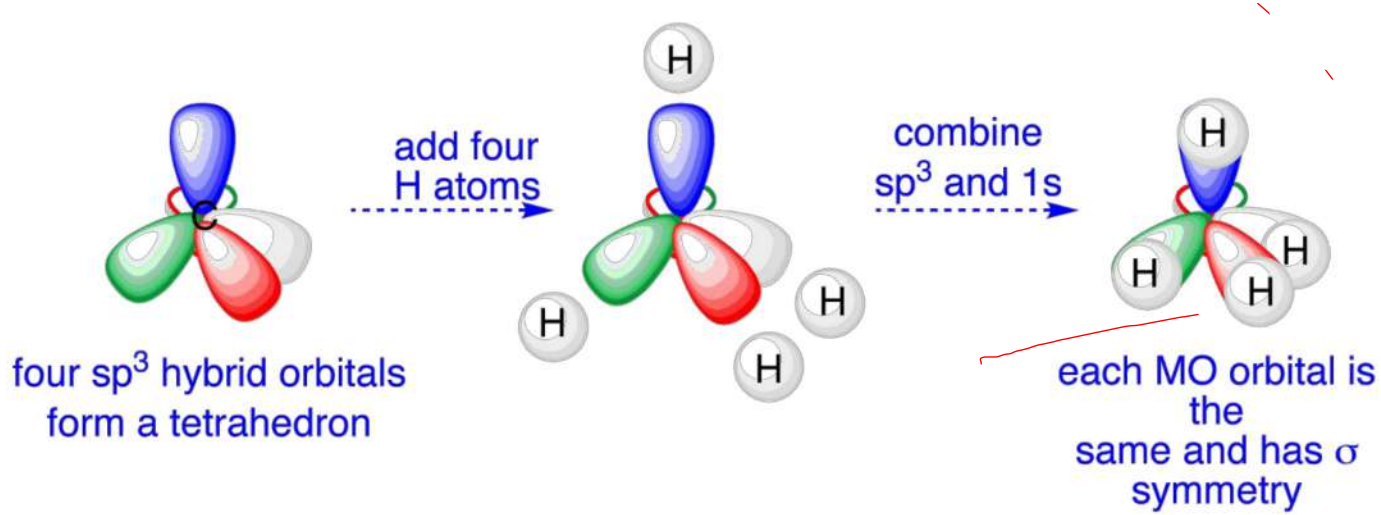
$1s^2, 2\psi_1^1, 2\psi_2^1, 2\psi_3^1, 2\psi_4^1$

Properties of hybridization

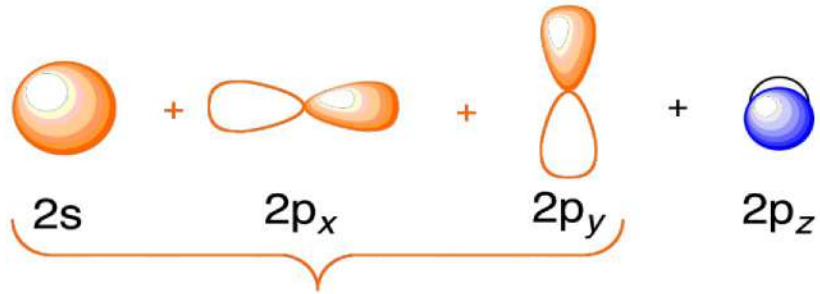
- Orbital hybridization occurs in a separated atom only.
- Generally orbitals of different subshells in a same energy level undergo hybridization.
- The number of orbitals that take part in hybridization indicates the number of hybrid orbitals of equal energy that are formed.
- As orbitals formed from hybridization are of equal energy, they create an equal angular distance by repelling themselves.
- The shapes and bond angles of molecules can be assumed from type of hybridization.
- Each hybrid orbital accommodate maximum two electrons like pure atomic orbital.
- The bonds formed by hybrid orbitals become stronger.

SP^3 HYBRIDIZATION



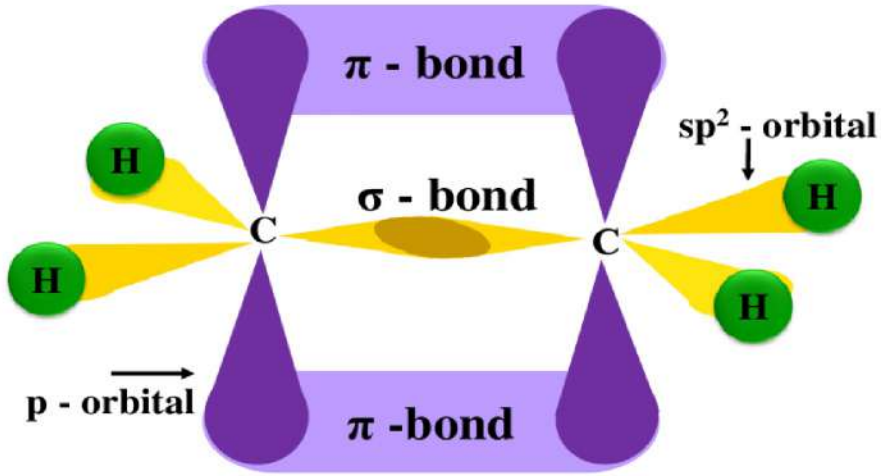


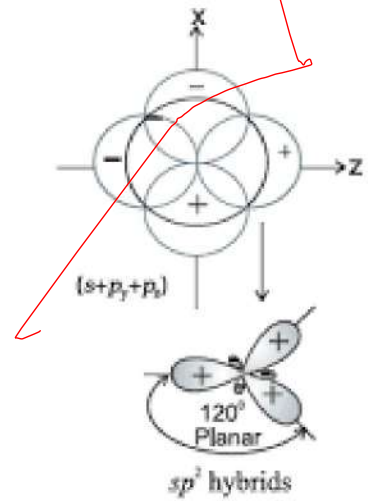
SP^2 HYBRIDIZATION

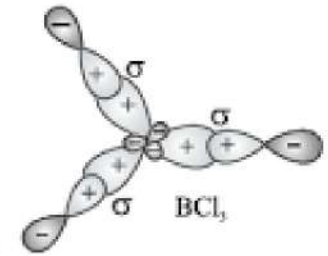


3 × sp^2 AOs in the plane

unchanged 2p$_z$







Determination of hybridization

$\frac{2}{2} = 4$

No of Hybrid orbital

Things to Consider

- no of sigma bond
- no of lone pair electron
- no of Co-ordinate bond

Structural formula

H_2SO_4

Determination of hybridization of central atom of compound and number of lone pair electron

Hybridization of central atom:

$$H = \frac{1}{2}(V + X - C + A)$$

Here,

V = number of electron in valence shell

X = number of univalent atoms

C = number of charge on cations

A = number of charge on anions

Number of lone pair electron in hybrid orbital :

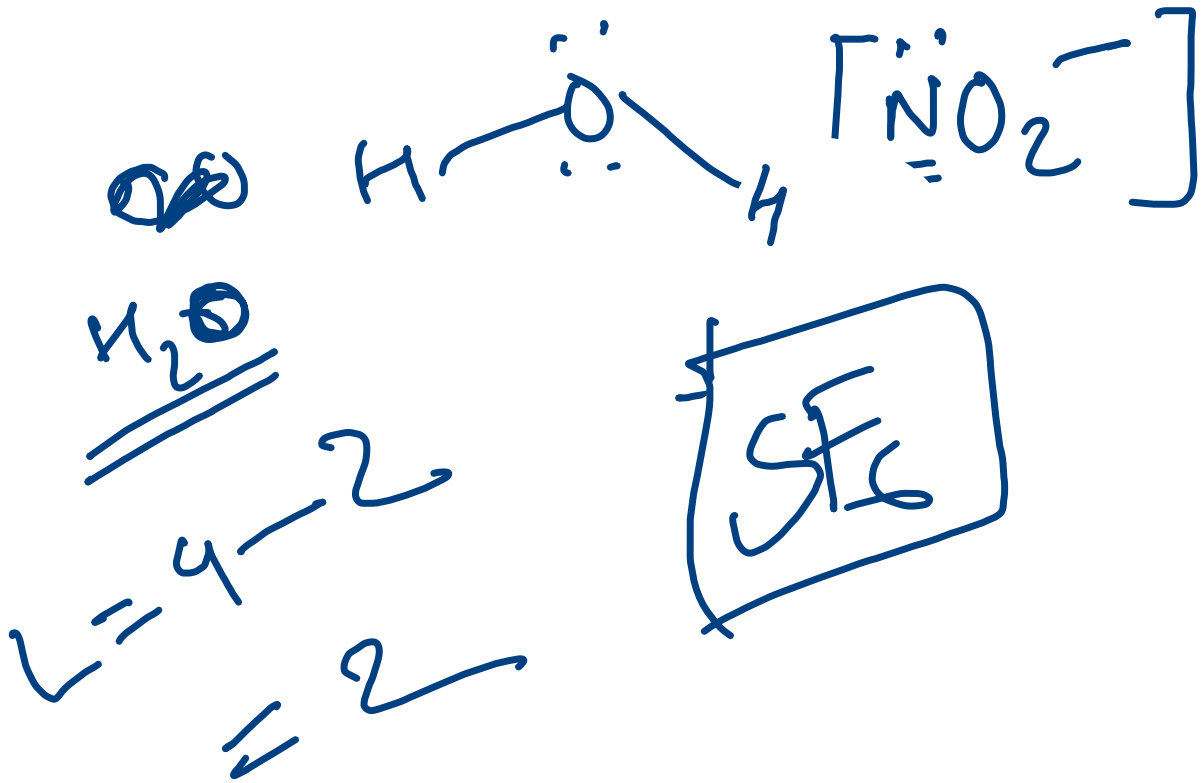
$$L = H - X - D$$

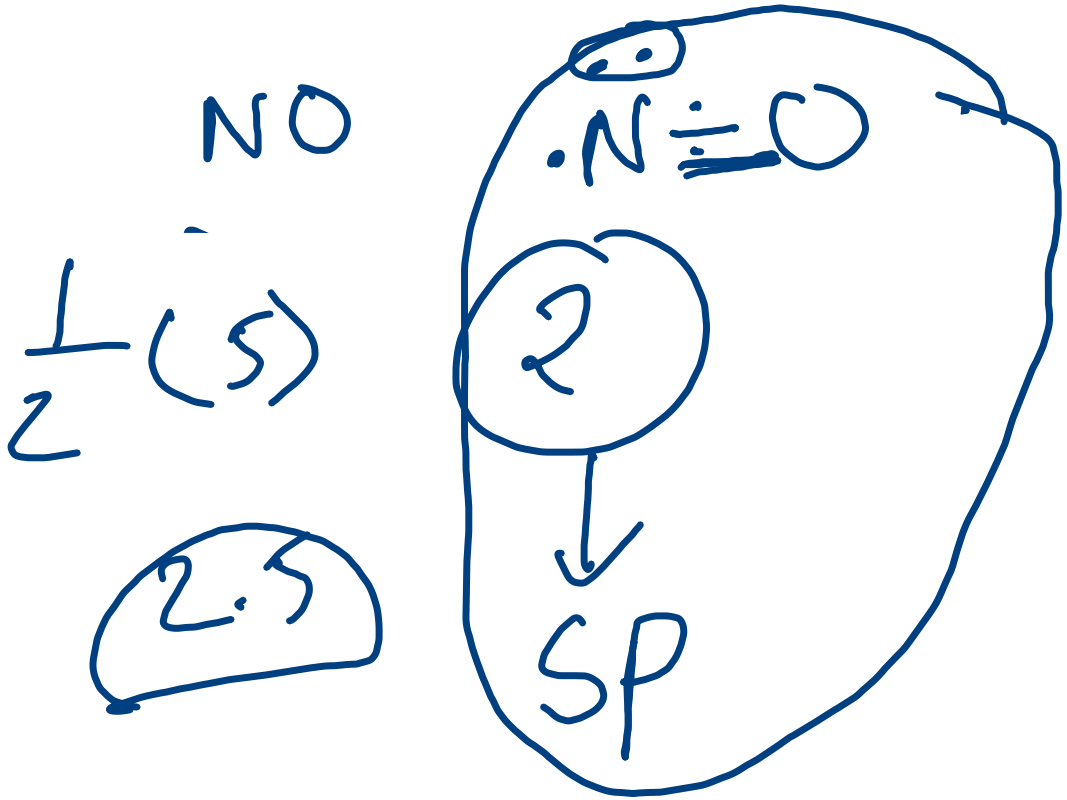
(Here, D is the number of divalent atoms)

Practice Problems

$$H = \frac{1}{2}(V + X - C + A)$$

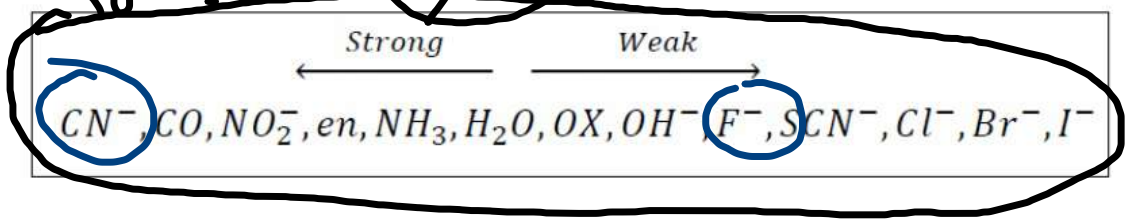
$$L = H - X - D$$



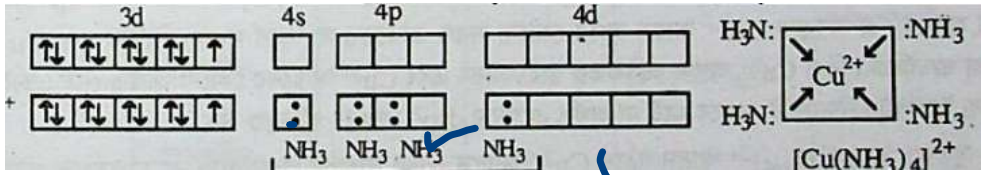


Hybridization of Complex ions

2	sp	linear	Ag^+	NH_3	$[Ag(NH_3)_2]^+$
2	sp	linear	Cu^+	Cl^-	$[CuCl_2]^-$
4	sp^3	tetrahedral	Co^{2+}	Cl^-	$[CoCl_4]^{2-}$
4	dsp^2 or, sp^2d $(d_{x^2-y^2})$	square coplaner	Ni^{2+} dsp^2	CN^-	$[Ni(CN)_4]^{2-}$
4	sp^2d	square coplaner	Cu^{2+} spd^2	NH_3	$[Cu(NH_3)_4]^{2+}$
6	d^2sp^3	octahedral	Fe^{2+}	CN^-	$[Fe(CN)_6]^{4-}$
6	d^2sp^3	octahedral	Fe^{3+}	CN^-	$[Fe(CN)_6]^{3-}$
6	sp^3d^2	octahedral	Fe^{3+}	F^-	$[FeF_6]^{3-}$



CN = LN = HON



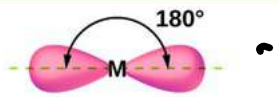
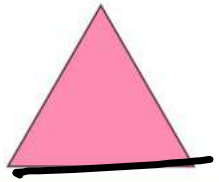
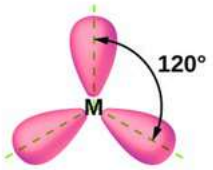
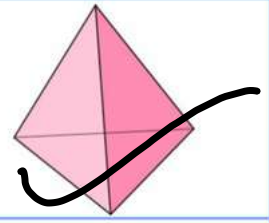
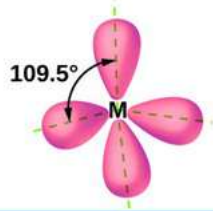
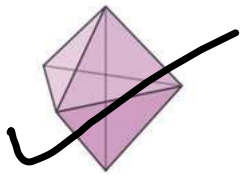
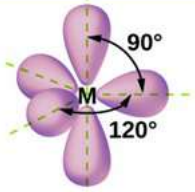
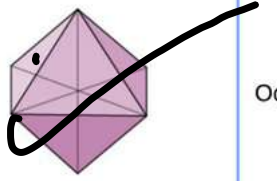
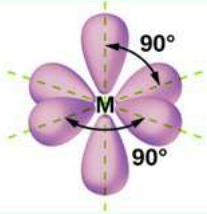
- co-ordination no
- Hybridization
- color
- shape

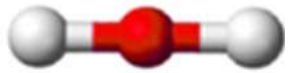
"John Teller Effect"

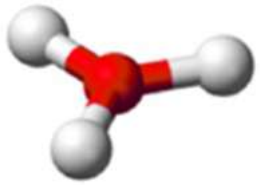
"X ray diffraction analysis"

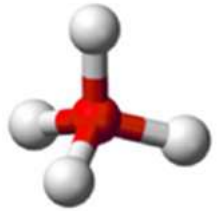
Shape of hybride orbitals

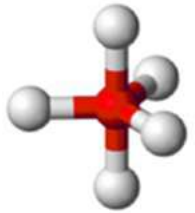
Hybridized orbital number	Hybridization	Shape of molecule	Bond angle	Example
Two	sp	Coplanar straight linear	180°	$BeCl_2$, C_2H_2
Three	sp^2	Coplanar triangular	120°	BCl_3
Four	sp^3	Tetrahedral	109.5°	CH_4 , NH_3
Four	sp^2d	Coplanar square	90°	$[Cu(NH_3)_3]^{2+}$
Five	sp^3d	Trigonal bipyramid	90° & 120°	PCl_5
Six	sp^3d^2	Octahedral	90°	SF_6
Seven	sp^3d^3	Pentagonal pyramid	90° & 72°	IF_7

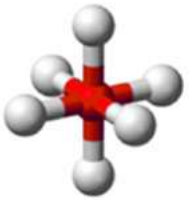
Regions of Electron Density	Arrangement		Hybridization	
2		Linear	*sp*	
3		Trigonal planar	sp^2	
4		Tetrahedral	sp^3	
5		Trigonal bipyramidal	sp^3d	
6		Octahedral	sp^3d^2	





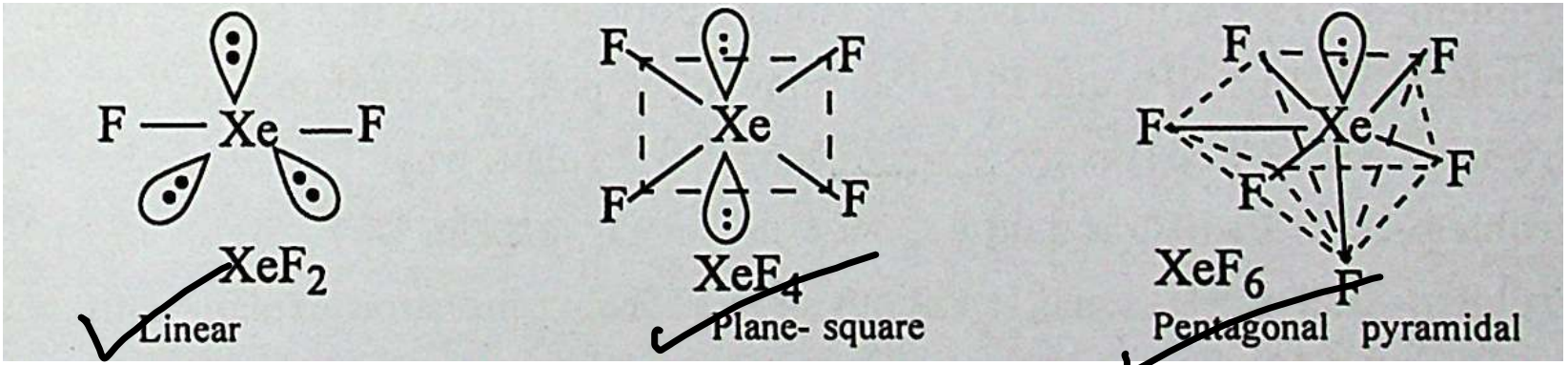






VSEPR

Exception of Shape



Previous question

sp^2

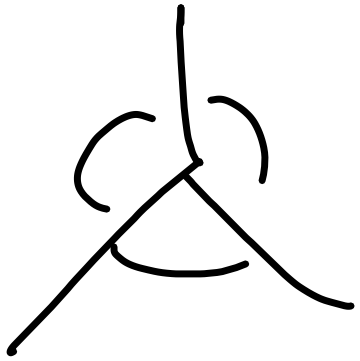
Bond angle in hybridized orbital is- [MAT: 02-03, DAT: 04-05, 02-03]

a) 180°

b) 109°

c) 120°

d) 170°



Poll Question-05

What is the hybridization of central atom of HSO_4^- ?

(a) sp^2

(b) sp^3

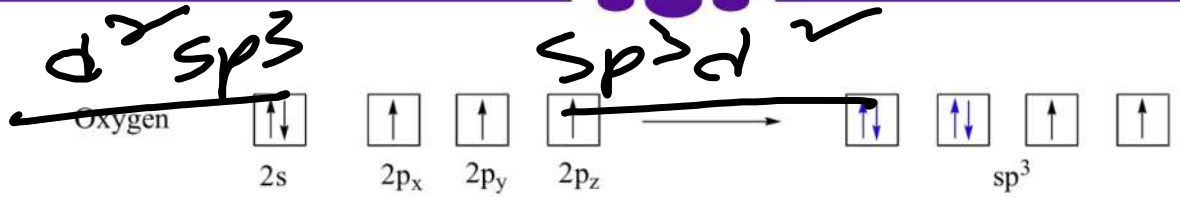
(c) dsp^3

(d) d^2sp^2

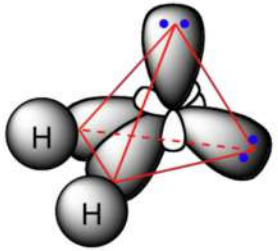
$\frac{1}{2}(6+1-0+1)$

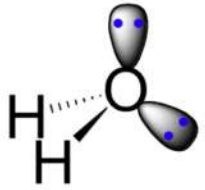
4

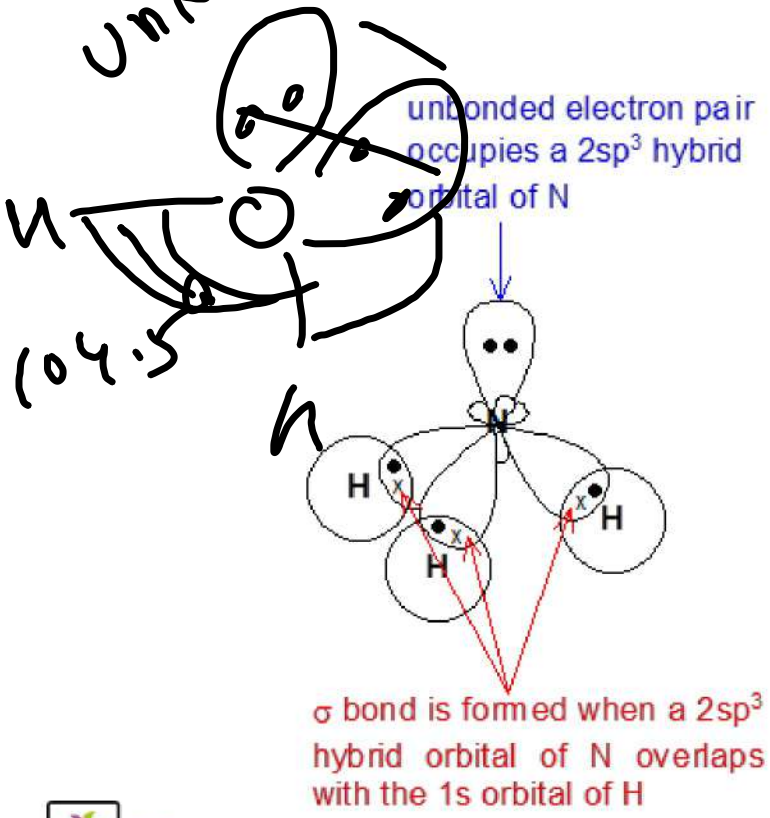
Effect of lone pair electron in shape of orbital

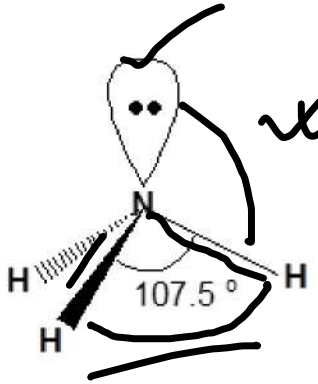


Valence shell electron pair repulsion theory.









lp-lp> lp-bp> bp-bp

Special information

Molecule	Hybridization	Lone pair electron	Bond angle	Shape of molecule
NH_3	sp^3	1	107°	Trigonal pyramid
NF_3	sp^3	1	102.5°	Trigonal pyramid
PH_3	sp^3	1	94°	Trigonal pyramid
H_2O	sp^3	2	104.5°	V shaped
H_2S	sp^3	2	92°	V shaped

$[NH_4^+]$ Distorted tetrahedral

Poll Question-06

Bond angle in ammonia molecule is? [MAT: 14-15]

a) 180°

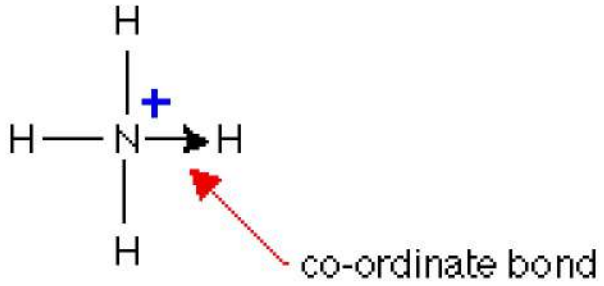
b) 107°

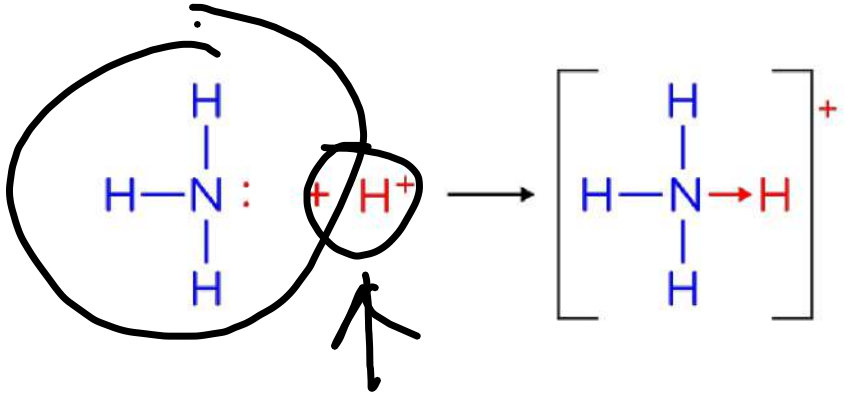
c) 120°

d) 170°

Co-ordinate covalent bond

Definition: In the formation of a covalent bond between two atoms, each atom supplies one electron to form an electron pair which is shared by the related two atoms equally





Nucleophile electrophile

Exmple :

NH_4^+

complex metallic ion

Determination of co-ordinate number:

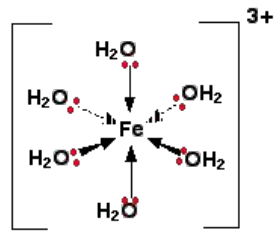
6

6

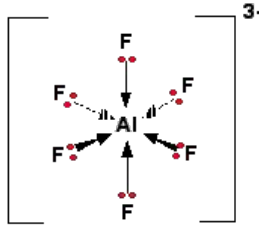
6

6

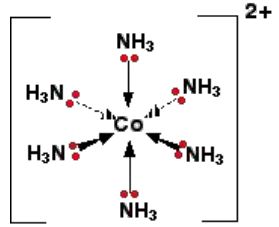
sp^3d^2



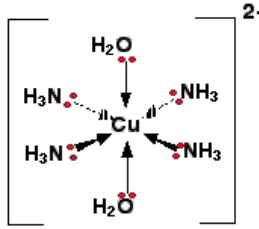
[$Fe(H_2O)_6$]$^{3+}$



[AlF_6]$^{3-}$



[$Co(NH_3)_6$]$^{2+}$



[$Cu(NH_3)_4(H_2O)_2$]$^{2+}$

Determination of oxidation number in complex molecule:

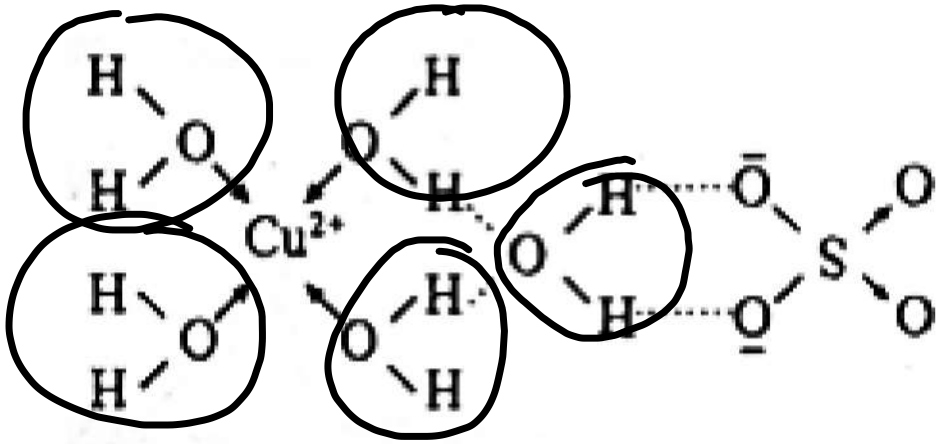
F^{-1}

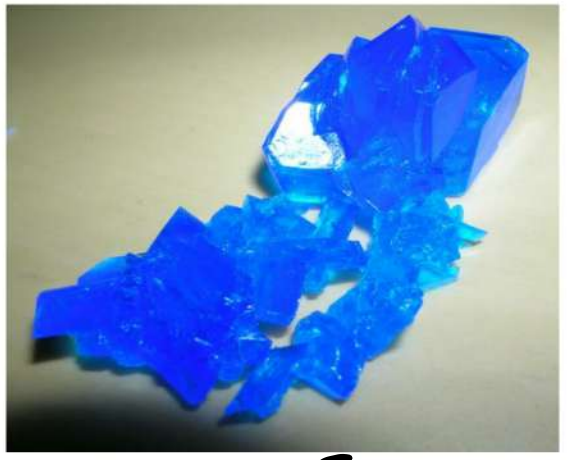
$x + (-1 \times 6) = -3$

$\therefore x = 6 - 3$

$\therefore x = +3$

Effect of temparature in blue vitriol





$$CuSO_4.5H_2O \xrightarrow[-2H_2O]{63^\circ C} CuSO_4.3H_2O \xrightarrow[-2H_2O]{109^\circ C} CuSO_4.H_2O \xrightarrow[-H_2O]{200^\circ C} CuSO_4 \xrightarrow{650^\circ C} CuO\ (s) + SO_3(g)$$

Dark blue crystal — Blue crystal — Bluish white crystal — White powder — Black

Different types of bonds in same compound

Compound	~~Number~~ of bonds	Name of bonds
NH_4Cl	Three	• Covalent, Co-ordinate, Ionic bond
$K_4[Fe(CN)_6]$	Three	• Covalent, Co-ordinate, Ionic bond
$[Co(NH_3)_6]Cl_3$	Three	• Covalent, Co-ordinate, Ionic bond
$(CuSO_4.5H_2O)$	Four	• Covalent, Co-ordinate, Ionic bond and Hydrogen bond
KOH	Two	• Ionic bond and covalent bond
$H_3N \rightarrow BF_3$	Two	• Covalent, Co-ordinate bond
H_3PO_4	Two	• Covalent, Co-ordinate bond
H_2SO_4	Two	• Covalent, Co-ordinate bond
$(H_2O)_n$	Two	• Covalent and Hydrogen bond

Poll Question-07

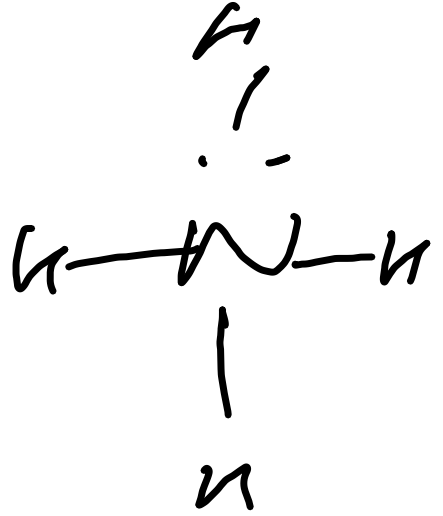
Which bond is not present in NH_4Cl molecule?

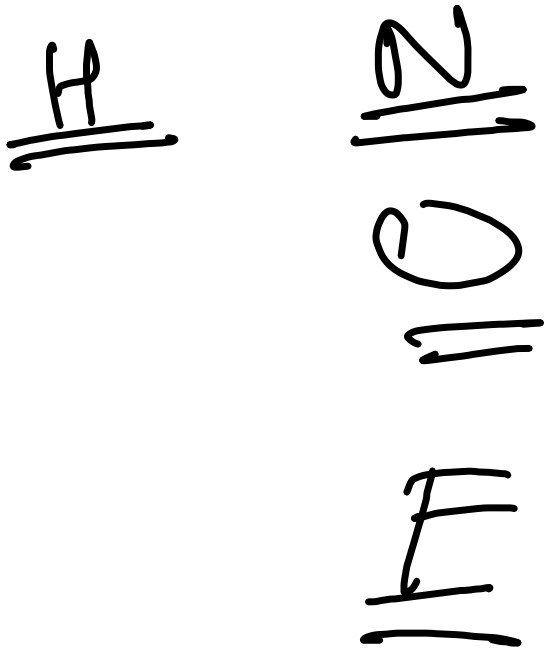
(a) Covalent bond

(b) Hydrogen bond

(c) Ionic bond

(d) Co-ordinate bond





Metallic Bond:

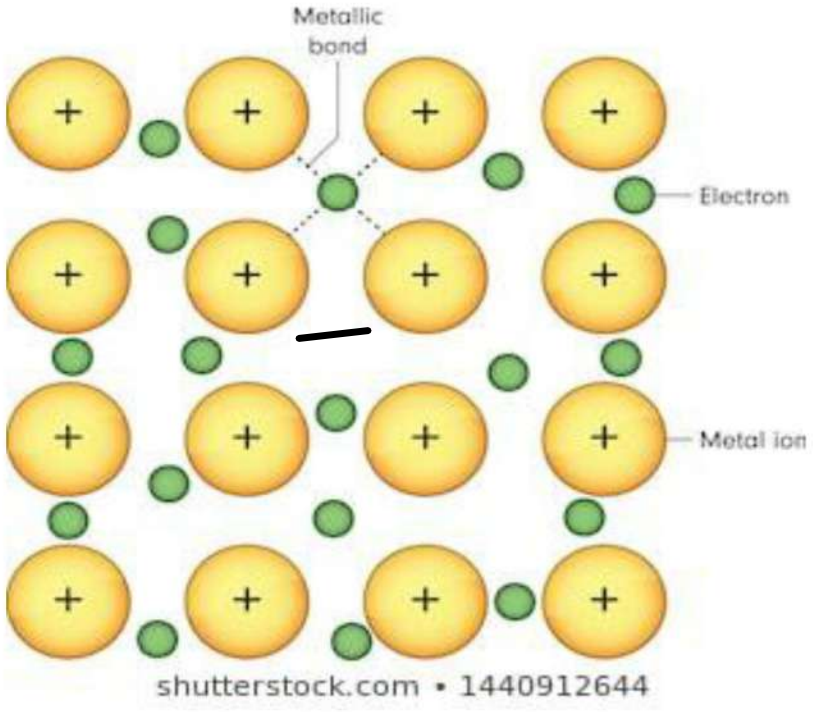
a covalent radius
b metallic radius

Defination: In metallic bond, shared electrons are mobile

Metallic bond is weaker than covalent bond.

Special properties:

- Metals are crystalline in structure.
- Metals are very good conductors of electricity.
- Metals have special luster.
- Metals are malleable and soft.



Comparison of degree of energy between bonding and non-bonding forces

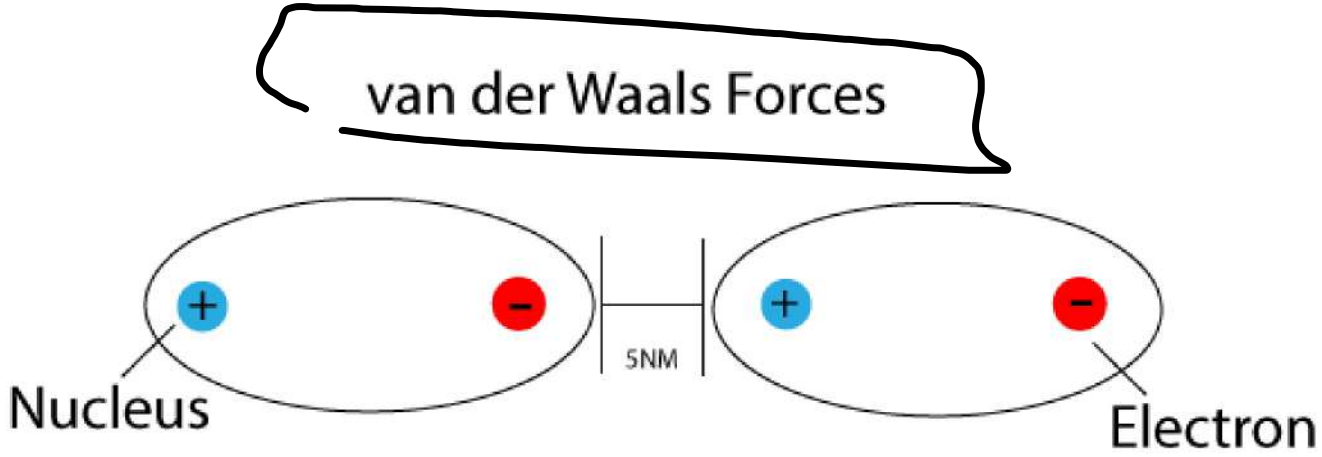
Effective attraction force	Base of bonding	Degree of energy (kj/mol)	Example
(a) In case of bonding:			
Ionic bond	Cation and anaion	400 – 4000	Crystal of NaCl
Covalent bond	Nucleus and shared electrons	150 - 1100	H_2 molecule
Metallic bond	Cation and polarized valence electron	75 - 1000	metals
(b) In case of non-bonding:			
Ion-dipole attraction:	Ion charge and dipole charge	10 – 50	Na^+ & H_2O
H-bond (Polar molecule) [N,O,F-compounds]	Polar bond and H-dipole charged	10 – 40	H_2O
Dipole-dipole	Dipole charges	3 - 4	HCl – HCl
Ion-induced dipole	Ion's charges and polarized e^- cloud	3 – 15	Fe^{2+} & O_2
Dipole-induced dipole	Dipole charge and polarized e^- cloud	2 – 10	HCl & Cl_2
London force or dispersion force	Polarizable e^- cloud	1 – 10	F_2

Vander Waals force

Intermolecular force among non-polar covalent compound is called Vander Walls force.

On the basis of sources, Vander Waals forces are of two types; such as:

- Permanent dipole and induced dipole attraction,
- Dispersion force or London force.



Dipole and dipole moment

Dipole: The different charges or poles developed on two ends of a covalent compound containing highly electronegative elements are called dipole.

Types of dipole: Two types. They are- permanent dipole and temporary dipole.

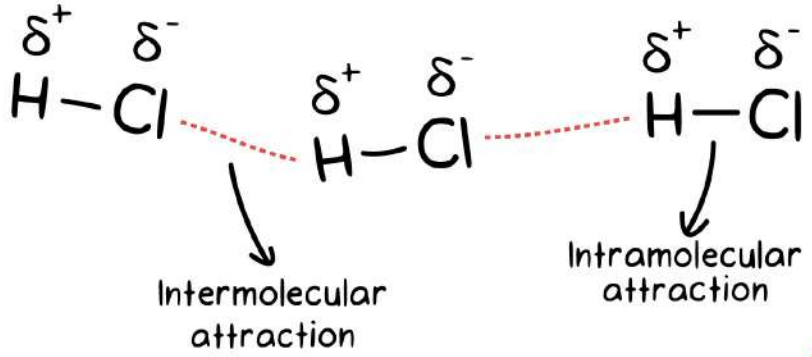
Permanent dipole: H_2O, NH_3, HCl

Dipole moment: $\mu = Q \times r$

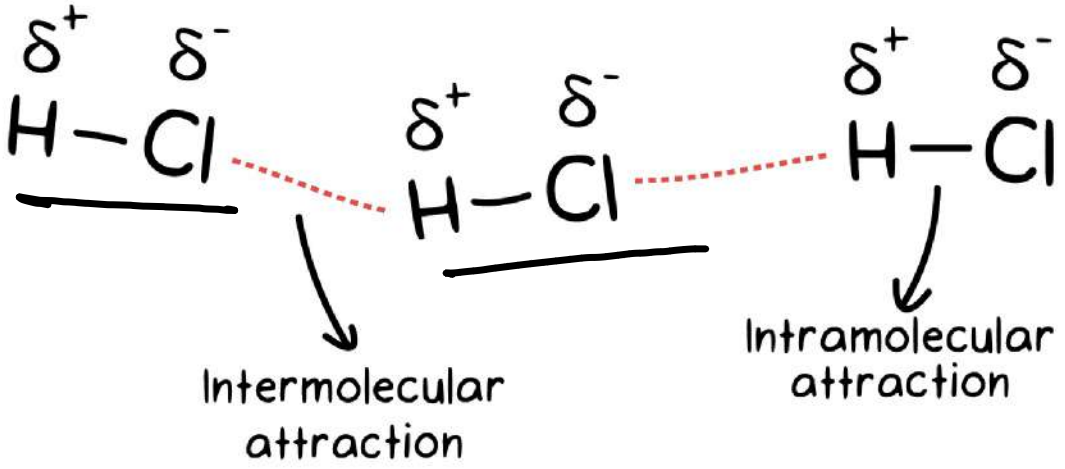
D – debye

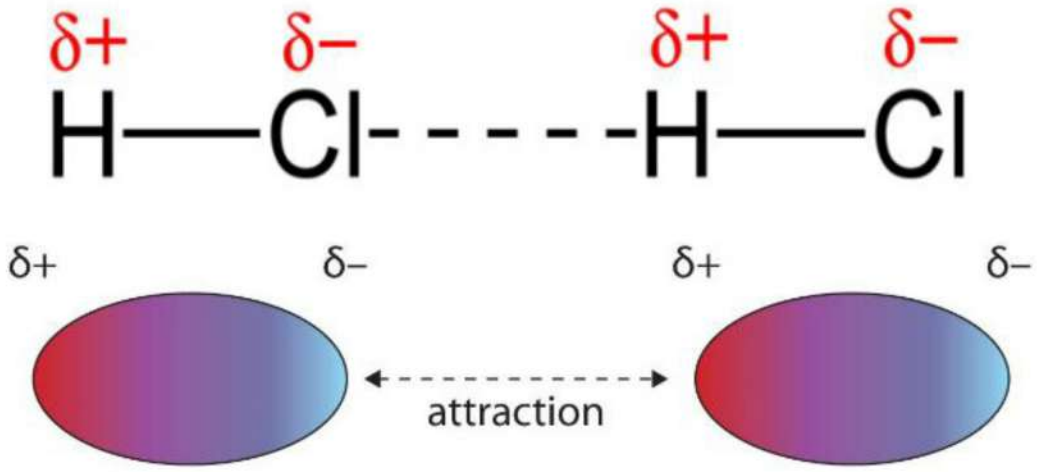
Unit of dipole moment is debye (D)

1D= 3.336×10^{-30} coulomb meters ().

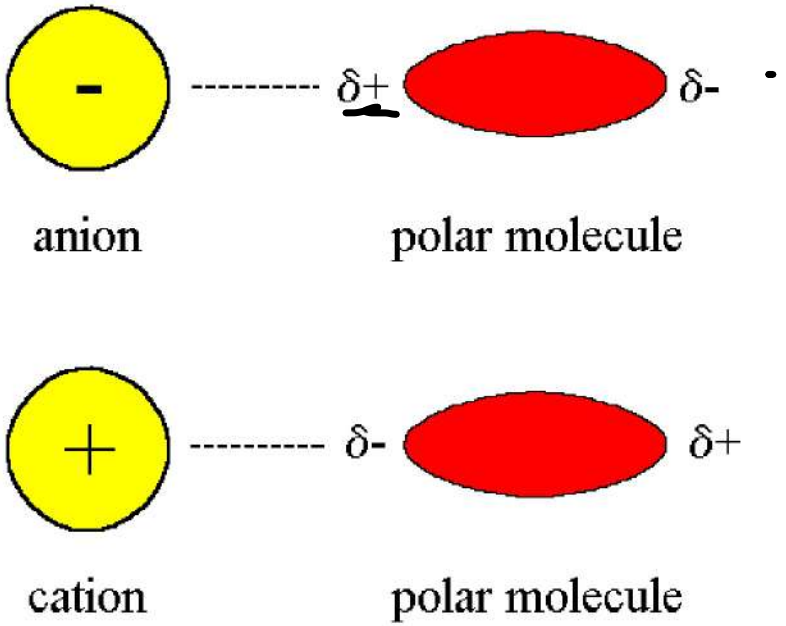


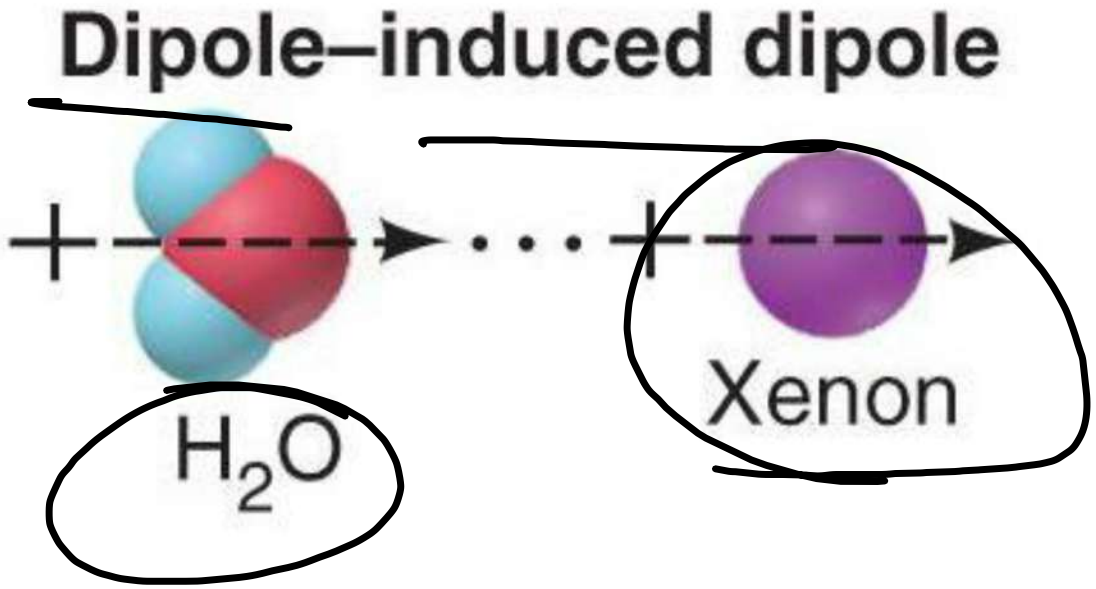
Dipole-dipole interaction





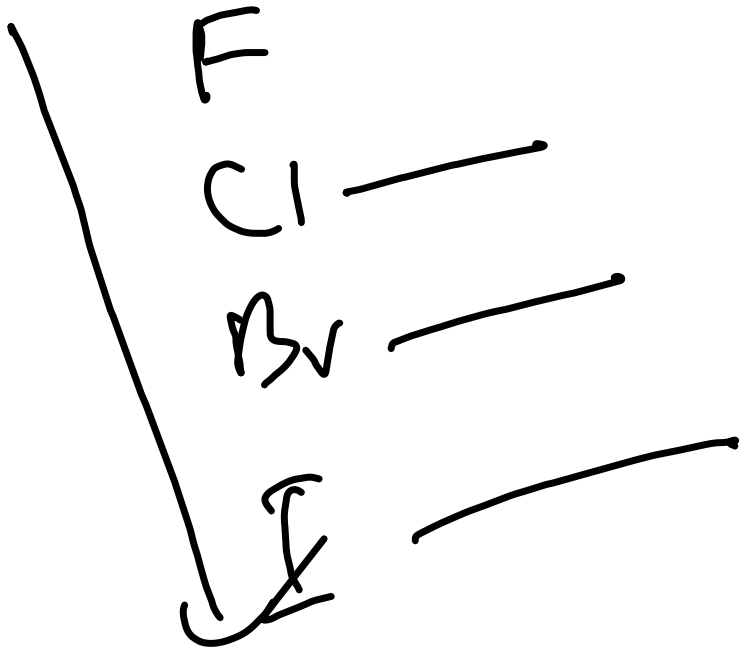
Various types of non-bonding force

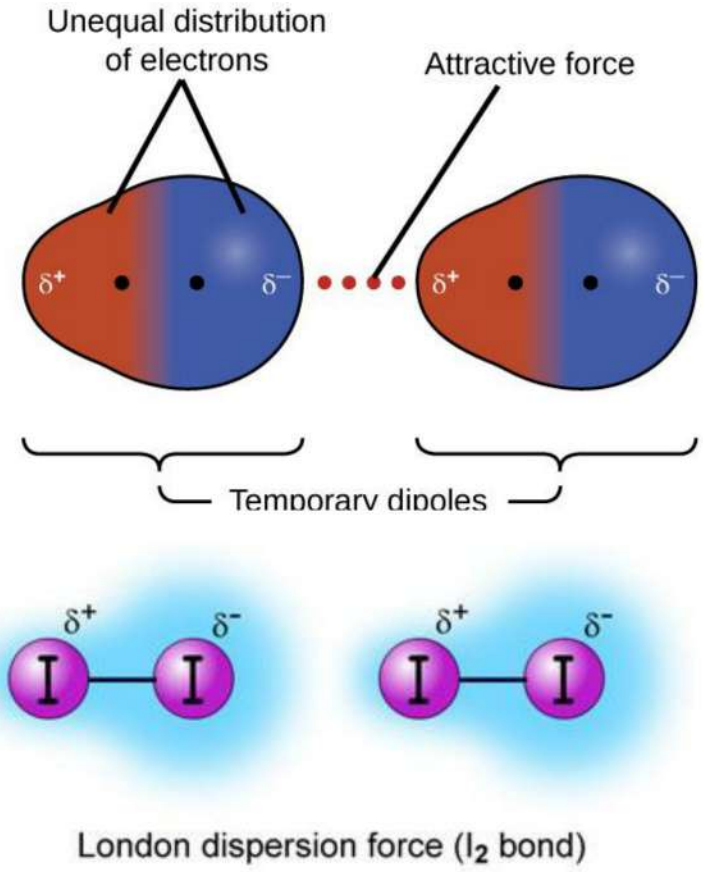




Dispersion force or London force

Other name: Dispersion force is also called dipole-induced dipole attraction





London force

Effectiveness: It is effective for all kinds of non-polar atoms and molecules.

Nomenclature : Named after Fritz London.

Dependence: The more the electron in an atom or molecule and the lower the nuclear attraction on its outer electrons, the greater this force becomes.

Effect:

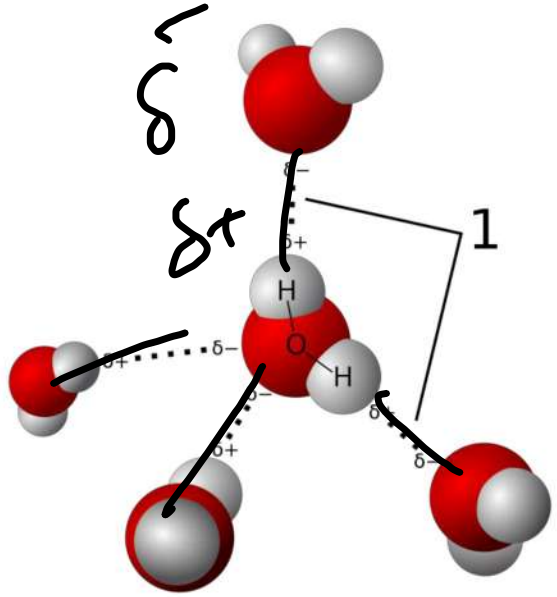
- Physical states of halogen as gas, liquid and solid are affected by dispersion force.
- Nano scale particle can make suspension due to dispersion force, example- gold suspension.

Hydrogen bond

Hydrogen bonding forms for two reasons:

- More polarization occurs between H atom with small but more electronegative N, O, F atoms etc.
- Lone pair electrons of N, O, F etc. attract H to form weak H-bond.

Example: H_2O,HF,NH_3



Water

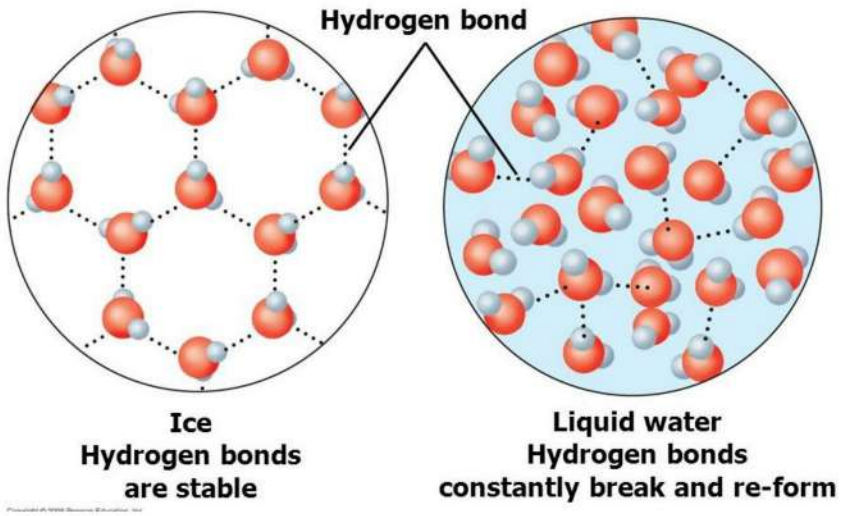
4

Effects of Hydrogen bond on compounds

- As effective H-bond is present in H_2O, HF, NH_3 molecules, they have higher boiling and melting points than any other hydrides.
- H_2S is non polar covalent molecule; but H_2O is polar.a

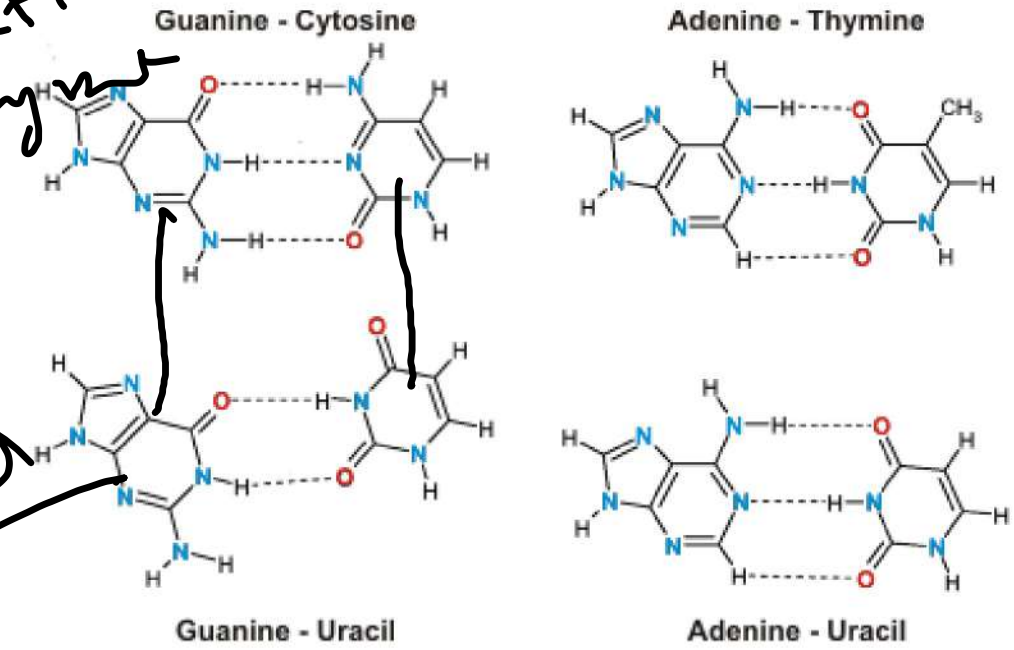
H_2S — gas

H_2O — liquid



Importance of hydrogen bond

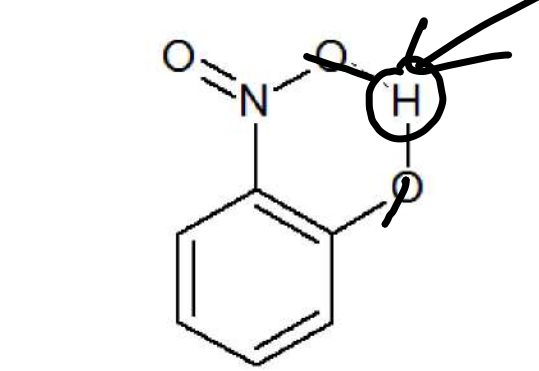
- water
- secondary and tertiary proteins chains.
- Ice floats on water
- Double-helix or two chains of nucleic acids



Types of hydrogen bond

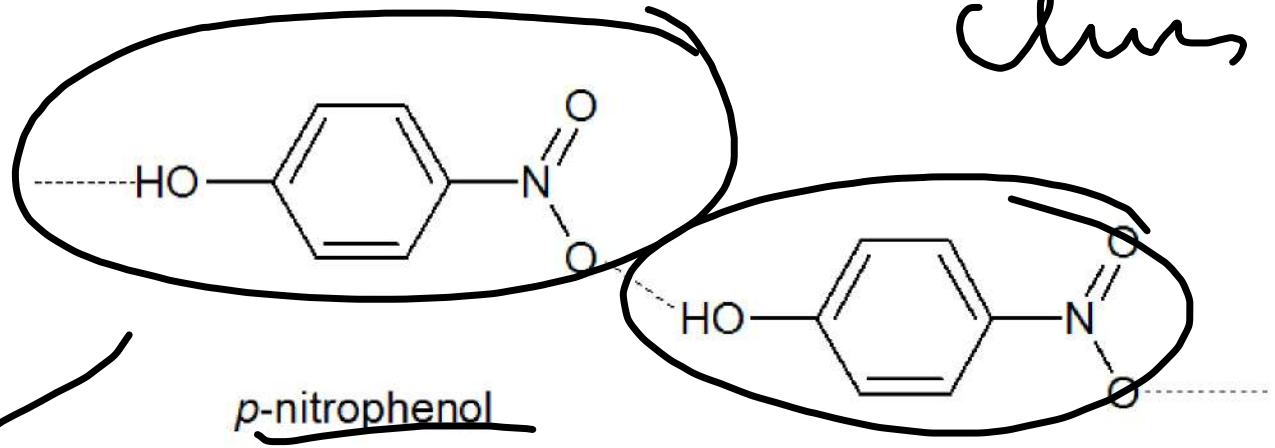
2 types. Eg :

- intermolecular H-bond
- Intramolecular H-bond



o-nitrophenol

(intramolecular hydrogen bonding)



p-nitrophenol

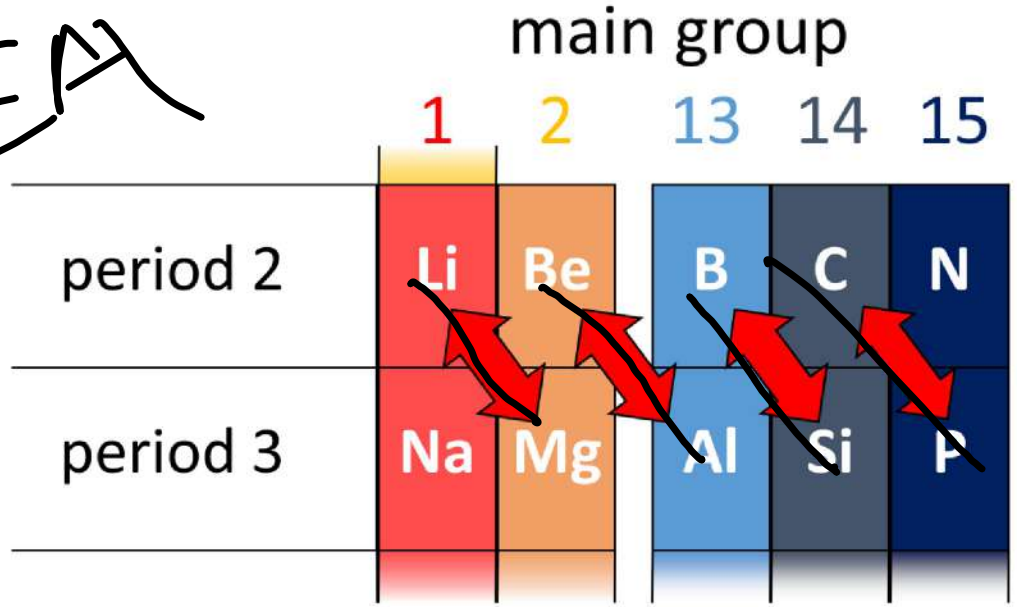
(intermolecular hydrogen bonding)

Diagonal relations of elements

Similarity in :

- Ionic radius
- Ionization energy
- Electronegativity
- Polarization power
- Charge density

EA



Nomenclature of inorganic compounds

Some common polyatomic ions:

Name of ion	Formula	Charge	Name of ion	Formula	Charge
Ammonium	NH_4^+	+1	Permanganate	MnO_4^-	-1
Nitrite	NO_2^-	-1	Acetate	$CH_3CO_2^-$	
Nitrate	NO_3^-		Carbonate	CO_3^{2-}	-2
Hydroxide	OH^-		Sulfite	SO_3^{2-}	
Cyanide	CN^-		Sulfate	SO_4^{2-}	
Hydrogen carbonate	HCO_3^-		Thiosulfate	$S_2O_3^{2-}$	
Hydrogen sulfate	HSO_4^-		Hydrogen phosphate	HPO_4^{2-}	
Di-hydrogen phosphate	$H_2PO_4^-$		Chromate	CrO_4^{2-}	
Hypo chlorite	ClO^-		Di-chromate	$Cr_2O_7^{2-}$	
Chlorite	ClO_2^-		Peroxide	O_2^{2-}	
Chlorate	ClO_3^-		Phosphate	PO_4^{3-}	-3
Perchlorate	ClO_4^-				

Nomenclature of oxo-acids

In case of nomenclature of multiple oxo-acids of same elements, the oxidation number of the central atom is considered as the basis.

(1) The oxo-acid in which the oxidation number of the third non-metal element is the lowest, in case of its nomenclature ('hypo' + third element + 'us' acid) this rule is followed.

Name	Formula	Oxidation Number of central atom
Hypo chlorous acid	HClO	Oxidation number of Cl +1
Hypo bromous acid	HBrO	Oxidation number of Br +1
Hypo iodous acid	HIO	Oxidation number of I +1
Hypo nitrous acid	$H_2N_2O_2$	Oxidation number of N +1

(2) The oxo-acid in which the oxidation number of the third element is higher than the hypo-acid, in this case (third element + 'us' acid) this rule is followed.

Name	Formula	Oxidation Number of central atom
Chlorous acid	$HClO_2$	+3
Bromous acid	$HBrO_2$	+3
Iodous acid	HIO_2	+3
Sulphurous acid	H_2SO_3	+4

(2) The oxo-acid in which the oxidation number of the third element is higher than the us-acid, in this case (third element + 'ic' acid) this rule is followed.

Name	Formula	Oxidation Number of central atom
Chloric acid	$HClO_3$	+5
Bromic acid	$HBrO_3$	+5
Iodic acid	HIO_3	+5
Sulphuric acid	H_2SO_4	+6

(4) The oxo-acid in which the oxidation number of the third element is higher than the ic-acid, in this case ('per' + third element + 'ic' acid) this rule is followed.

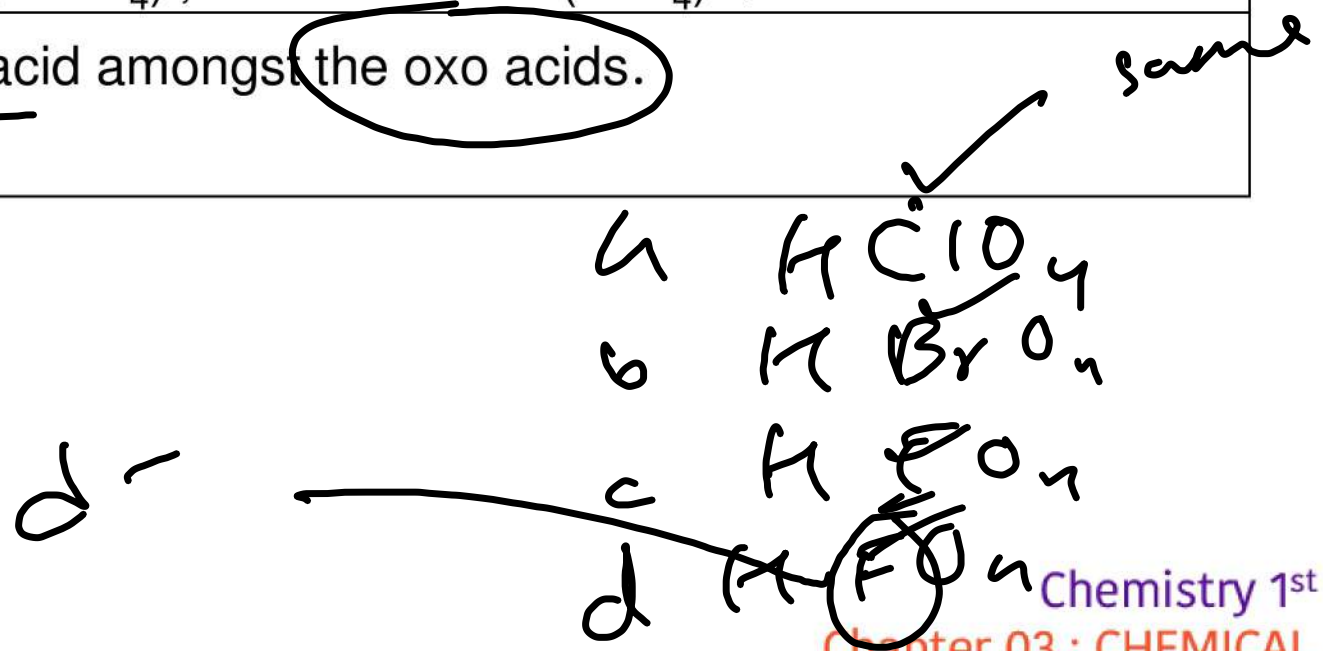
Name	Formula	Oxidation Number of central atom
Perchloric acid	$HClO_4$	+7
Persulphuric acid	$H_2S_2O_8$	+7

(5) P_2O_5 is an acidic oxide. The nomenclature of acids produced by addition of different numbers of molecules with is given below-

Water	Name of the acid	Formula
3 H_2O	Ortho-phosphoric acid	$2H_3PO_4$
$2H_2O$	Pyro-phosphoric acid	$H_4P_2O_7$
H_2O	Meta-phosphoric acid	$2HPO_3$

Oxo-acid of halogens

Hypohalous acid	Hypo chlorous acid (HOCl), Hypo bromous acid (HOBr), Hypo iodous acid (HOCl)
Halous acid	Chlorous acid ($HClO_2$), Bromous acid ($HBrO_2$), Iodous acid (HIO_2)
Halic acid	Chloric acid ($HClO_3$), Bromic acid ($HBrO_3$), Iodic acid (HIO_3)
Per halic acid	Perchloric acid ($HClO_4$) , Per iodic acid (HIO_4) I
• Perchloric acid is the strongest acid amongst the oxo acids. • There is no oxo-acid of F.I	



Nomenclature of hydrate compounds

Name	Formula
Copper sulfate penta-hydrate (Blue vitriole)	$CUSO_4.5H_2O$
Iron sulfate penta-hydrate (Green vitriole)	$FeSO_4.7H_2O$
Magnesium sulfate hepta-hydrate	$MgSO_4.7H_2O$
Zinc fluoride tetra-hydrate	$ZnF_2.4H_2O$
Sodium sulfate deca-hydrate	$Na_2SO_4.10\ H_2O$
Zinc sulfate hepta-hydrate	$ZnSO_4.7H_2O$
Calcium sulphate dihydrate (Gypsum)	$CaSO_4.2H_2O$

Epsom salt

Glauber salt

white vitriol

plaster of Paris $\longrightarrow (CaSO_4)_2.H_2O$

Previous Question

Which one is ‘pyro’ acid? [DAT: 16-17]

(a) $HClO_4$

(b) H_3PO_3

(c) H_2SO_4

(d) $H_2S_2O_7$

Previous Question

Chemical formula of Gypsum- [DAT: 16-17]

(a) $ZnSO_4.7H_2O$

(b) $CaSO_4.5H_2O$

(c) $CaSO_4.2H_2O$

(d) $ZnSO_4.2H_2O$

Poll Question-08

Which is not correct formula of oxo-acid? [MAT: 07-08]

(a) Meta phosphoric acid-HPO_2

(b) Phosphinic acid- H_3PO_2

(c) Phosphonic acid-H_3PO_3

(d) Ortho-phosphoric acid-H_3PO_4

লেগে থাকো সৎ ভাবে,
স্বপ্ন জয় তোমারই হবে।