DATE: / /20

CHEMISTRY

ATOMIC STRUCTURE AND CHEMICAL BONDING.

Matter:-

Each and everything that occupy space and have mass.

÷ Purest form of element 'H' or 'Na'

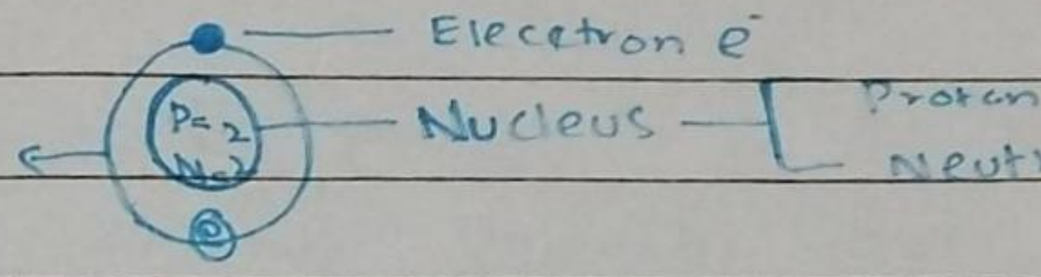
÷ Compound when 2 or more than 2 Che element identical molecules
↳ composed of many Id. molecules :- NaCl (Ch. bond)

÷ Mixture 2- or more diff chemical Subs. Impure.
2 or more elements or compands mixed mechanicaly.

ATOM:

According to John. Dalton (1803) atom is the Smallest particle of matter.

÷ Atom is the basic particle of elements.
Consisit of :- Nucleus = (Neutron, Proton) and Orbits/Shell (e^-).



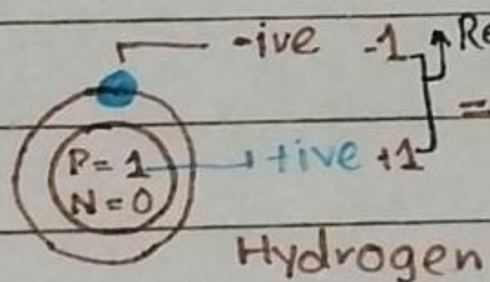
Structure of atom

(a) **Charge of atom:-**

1 Proton +ive 2 Neutron Nil 3 El -ive.

+ive charge of Proton and -ive charge of e^- Cancel each other and atom a is a Neutral Particle. Amount of charge on P(+ive &)& e^- (-) is equal

e.g:-



1.6×10^{-19} C → Charge of e^- & P^+

Hydrogen atom.

Mass of atom

(ii) Relative Mass:- P = 1 amu N = 1 amu.

(compare). e^- = 1/1836 a.mu

e^- 1836 times lighter than P & N

DATE: __/__/20__

(ii) Absolute / Actual Mass.

Proton (P) 1.6×10^{-27} Kg Neutron (N) 1.6×10^{-27} kg

Electron ($\bar{e}$) 9.1×10^{-31} kg.

Summary table

Sub. At. Particles	Amount of Charg	Relative Mass	Actual Mass.
Proton (P) +ive	1.6×10^{-19} C	1 amu.	1.6×10^{-27} kg
Neutron (N) Nil	Nil	1 amu	1.6×10^{-27} kg.
Electron ($\bar{e}$) -ive	1.6×10^{-19} C	1/1836 amu.	9.1×10^{-31} kg.
am of charge equal	(P charge) +ive E, $\bar{e}$ -ive	$\bar{e}$ 1836 times lighter than	

① Atomic Number:- / Proton number Identity of atom.

Can denote on the left side of symbol.

"The charge number of nucleus of a ch. element"

denoted by "Z"

Sodium uranium.

on left of symbol at base ← $^{11}_{11}Na$ (11P) $^{92}_{92}U$ (92P) Z = 92

P = Specific in numb

= number of N or $\bar{e}$ may differ but P never that's why we identify an atom with its P. number

② Mass of Number.

Number of Proton + Num of Nutron

Neutron Sometime atom: have or some time not

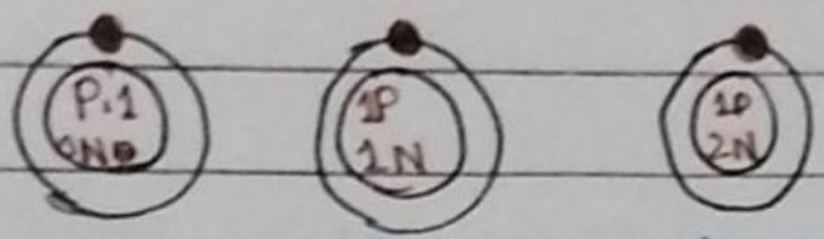
$^{1}_{1}H$ (1) → M.No P = 1, N = 0 P = 11, N = 12 $^{11}_{11}N$ (11) → M.No P = 92, N = ? $^{235}_{92}U$ (236, 237, 238)

↳ Much more than 92.

DATE: / /20

ISOTOPES:

Atoms of the same element having same (z) atomic number (Proton num) but different mass number. (in mass num, Num of Neutron Changes).



P 1+1N 1P+2N

$_1H^1$ $_1H^2$ $_1H^3$

Protium Duterium Tritium.

In case of 'H' we name them

Note: Normal water : protium + O $\Rightarrow H_2O$ (Most com. Most abund

at. mass: 18 $(2(H_2) + 16(O) = 18amu$

Heavy Water: Duetrium + O $\Rightarrow D_2O$ $(4(D_2) + 16(O)$ 20amu

Hard water: The water which contain Salts of Ca^{++} & Mg^{++}

(But Not NaCl water)

lay man def :

How to find No of Prolon & Neutron

e.g:- $_{92}U^{235}$ No of P & N.

A $\Rightarrow$ = Mass No = #P + N # $\Rightarrow$ M.No = 92 + N# = ?

235 = 92 + N:?

N# = 143 $\Leftarrow$ 235 - 92 = N. of Nut

Atom is Neutral until or unless it gain or loose at least 1 $\bar{e}$

ORBITS / SHELLS

Name of Orbits. Shell name → shell no → Max Cap of $\bar{e}$

K = 1 : $2\bar{e}$ L = 2 : $8\bar{e}$ M = 3 32

N = 4 .....

$2(3)^2 \Rightarrow 3\times3 = 9\times2 = 18$

Shell $\bar{e}$ cap: $2(n)^2$ $\Rightarrow$ shell number

$2(2)^2$ 2nd shell $2\times2 = 4\times2 = 8$

1st orbit have $2\bar{e}$ and rest have cap of (Cal by formula)

and need to fill 1st. and then move to 2nd.

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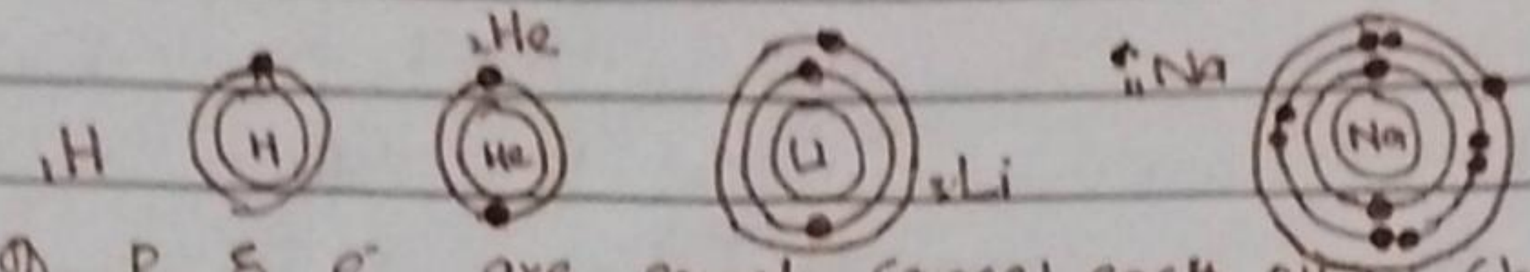
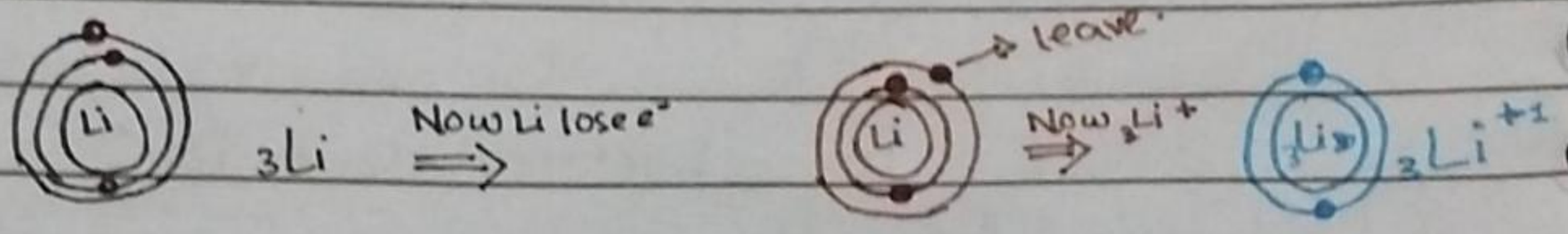
Topic: Orbits cont

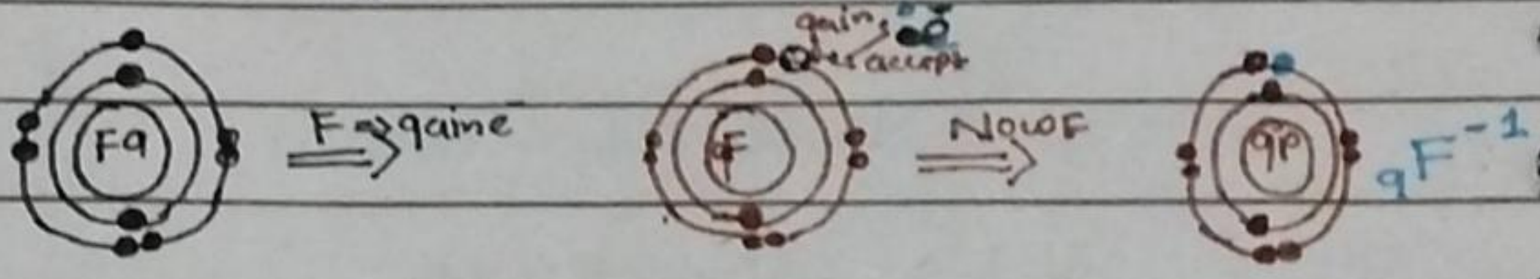


No of P & e⁻ are equal cancel each other Charge & atom

ION:- When an atom loose its e⁻ or gain e⁻ of another atom (any reason) (alter) Ion ↑ leave a charge on atom. it may be tive ion (If e⁻ lose) or -ive ion (If e⁻ gain). away e⁻ leaves atom (P never).



÷ Gain, loss start from outermost shell.



÷ It is easy to loose 1e⁻ from outer shell than accepting 07↑ (To comp. outer-most shell) => So such element with 1,2,3 e⁻ in last shell Lose their e⁻ and get charge respectively.

÷ It is easy to gain 1e⁻ in outer most shell (To complete O.M shell) than loosing 7↑ So such elements with 5,6,7 e⁻ in last shell gain e⁻ easily and get charged respectively

Lose e⁻:

1e⁻ = +1
2e⁻ = +2
3e⁻ = +3

ION

tive (lose e⁻)

-ive (gain e⁻)

Gain. e⁻

5e⁻ = -3
6e⁻ = -2
7e⁻ = -1.

DATE: / /20

CHEMICAL BONDING (Imp)

Chemical bond:

When 2 or more atoms join together (to form molecule/crystal/giant structure) permanently called Ch. bond. (H_2O ⇒) we can't separate with physical means.

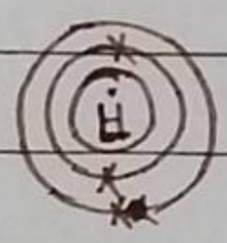
why form ch. bond: To acheive stability. (stability ∝ complete outer most shell.) with (max. Cap)

(8) Octate Rule / Law. ⇒ 8 in outer most shell.

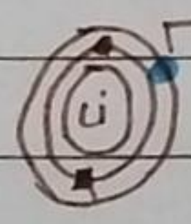
atom try to complete outermost shell e⁻

e.g

01 Li



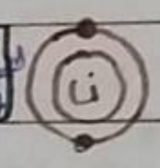
Want to complete outermost shell.



→ Leave

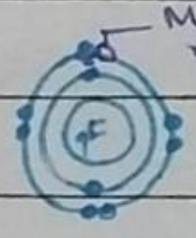
It will lose 1e⁻ from outer most shell to acheive stability.

[1 e⁻ lose easy instead of gaining 7]



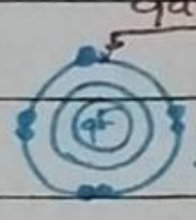
Now outermost shell completed & stable.

02 ~~:9F~~



Missing e⁻ making it unstable.

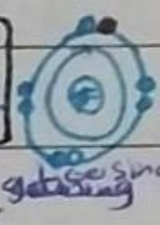
Wants to acheive / comp outer shell



Gain

It will gain 1e to comp O.M shell

[For F it is easy to gain 1 e⁻ then getting 7 e⁻ / losing]



Now O.M shell comp and get stabled

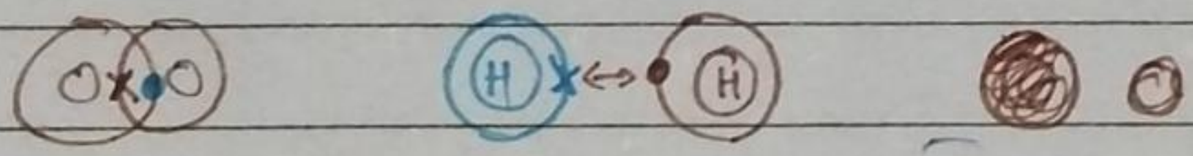
Types of Chemical Bond.

- 1 Covalent bond
- Ionic bond
- Coordinated Cov. bond
- Metallic bond.

Covalent BOND

Dot : Cross Model

a Covalent Bond is Ch. bond that involves the "Sharing of e⁻ to form e⁻ pairs" b/w atoms.



e⁻ revolves around both and both get stable.

H — H

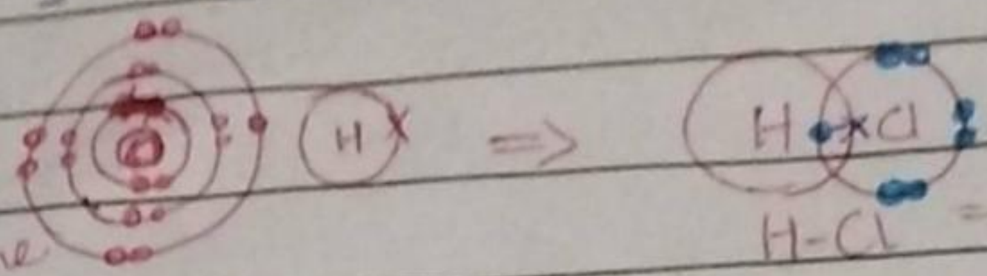
↳ Covalent bond

DATE: / /20

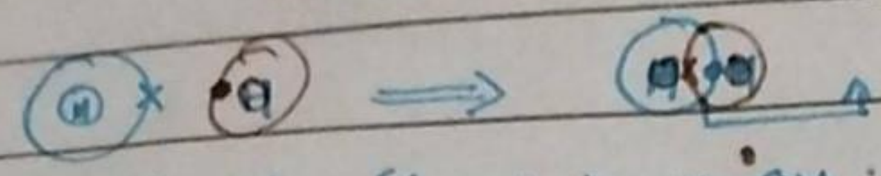
Types of Covalent bonds.

Single = 01 e share ∴ Double = 2e share

Triple - 3 e share.



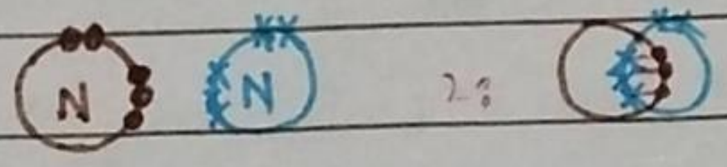
Single



outermost shell show kryn'gy.

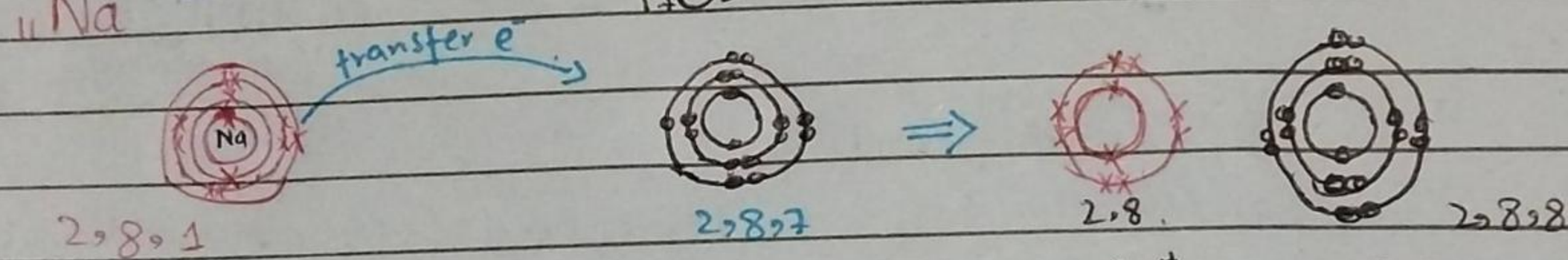
Covalent Bond = Double

Triple bond :-

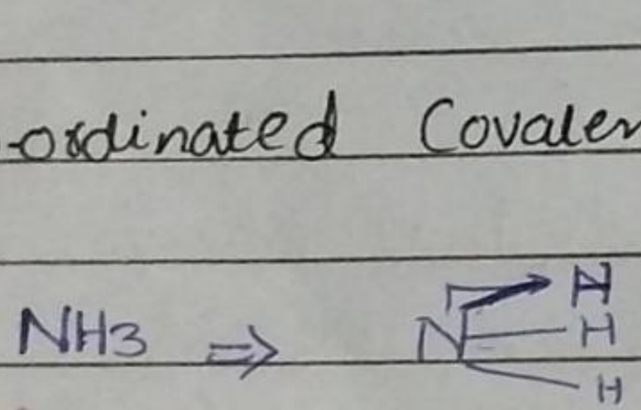


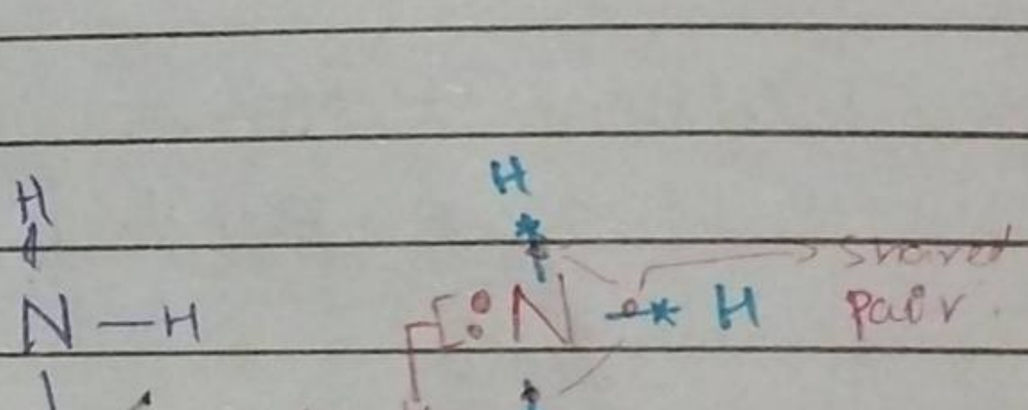
2 IONIC BOND.

Complete transfer of e⁻ (and 'get charged) and attract each other to form ionic bond.

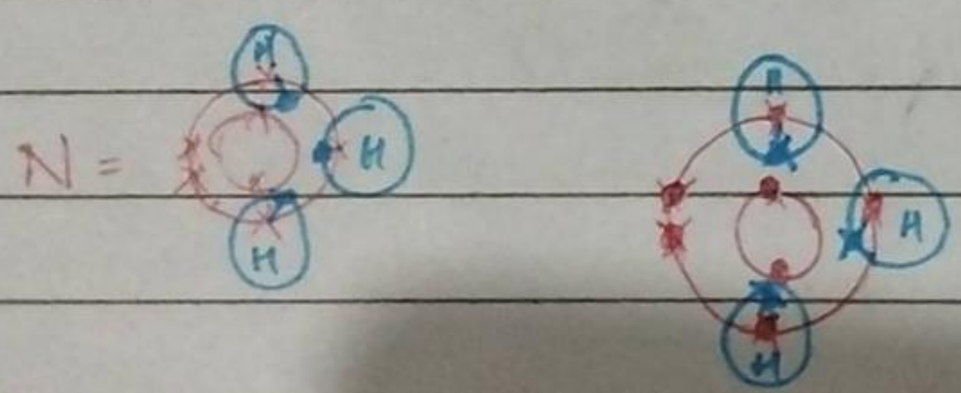


3 Co-ordinated Covalent Bond





Step 01



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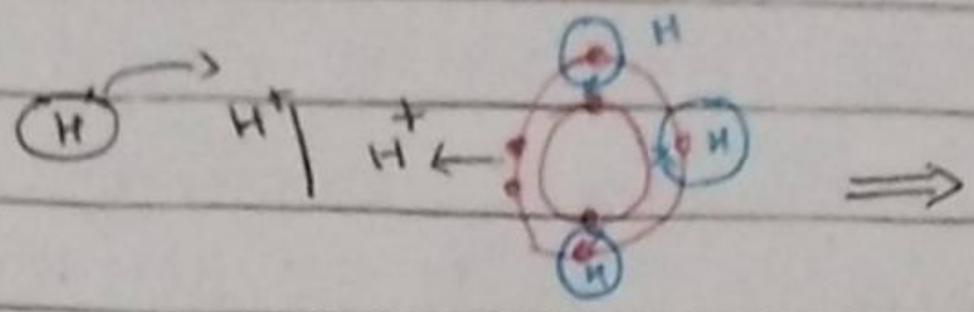
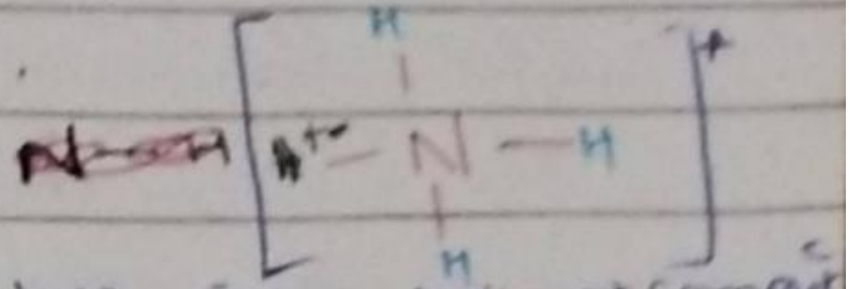
Step 02:-



Ammonium Ion NH_4^+

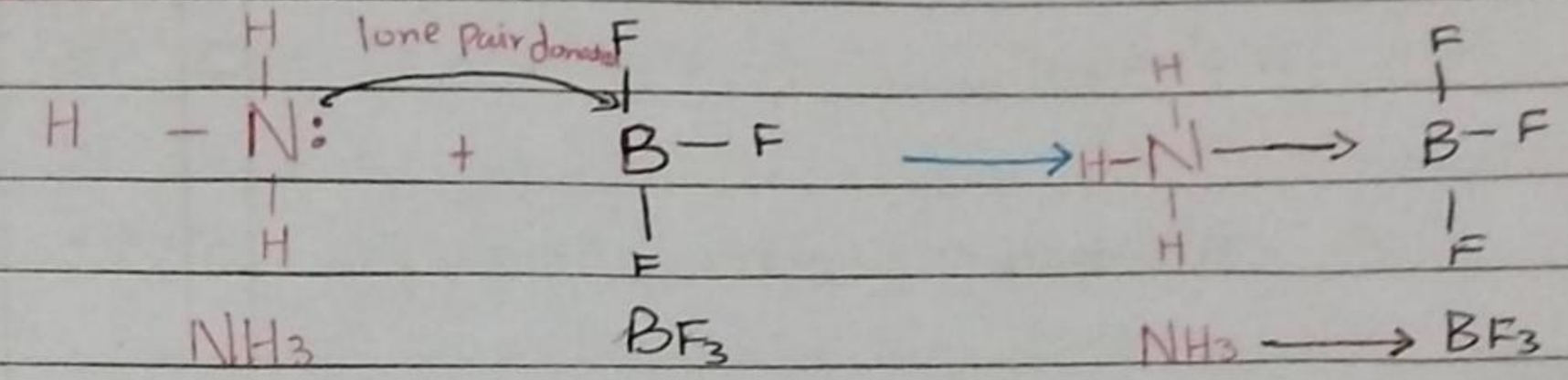


bc2 ē are not compl

also known dative bond. (dipolar).

" a two centered . two-electron covalent bond in which the 2 ē derive from the same element"

Eg 02:-



Ammonia Boron Triflouride

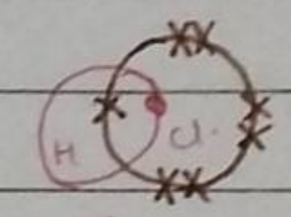
NH_3 has lone pair and BF_3 electron deficient so they form coordinated bond-

one sided e^- sharing.

Polarity:-

H - H

Non-polar



$H^{\delta+}$ — $Cl^{\delta-}$

polarity

The ē more attracted toward the atom will charge δ^- (partial -ive) and on other δ^+

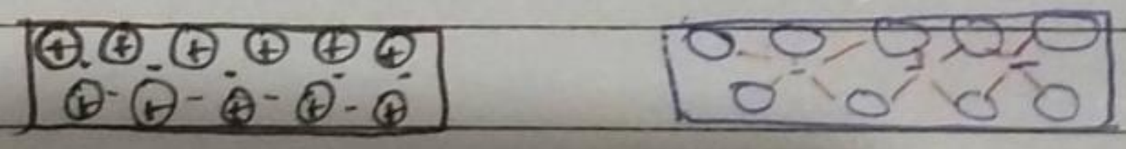
Electronegativity:- (Power) affinity to attract e^-

• Cl^- el.neg ↑ -

Metallic bonding:-

arises from the electrostatic attractive force b/w conduction e^- and +ive Charged metal. Ions

Sharing of free e^- among a structure of +ive charged ions.



move in all direction

Examiner focus:

Ch. bond Types | Coval, Ionic, Co-covalent difference b/w.

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INTER MOLECULAR FORCES. IMF.

- The attractive force b/w the molecules that held molecules together".
- ∴ the attractive & repulsive forces that arises b/w molecules of a substance.

eg:- HCl : $H^{\delta+} \cdot\!\!\times\!\!\!- Cl^{\delta-}$ ..... $H^{\delta+} \cdot\!\!\times\!\!\!- Cl^{\delta-}$ (inter.mol Force / IMF)

Types of IMF

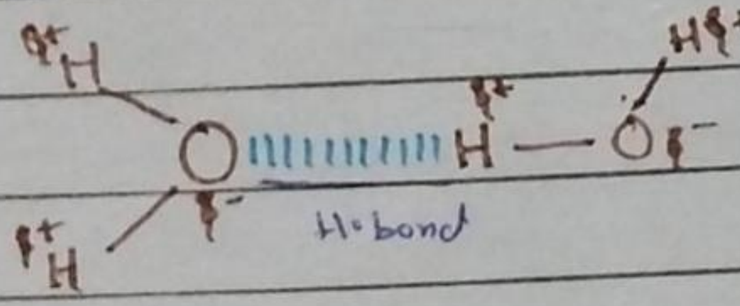
1 diapole-diapole 2 hydrogen bonding 3 London dispersion

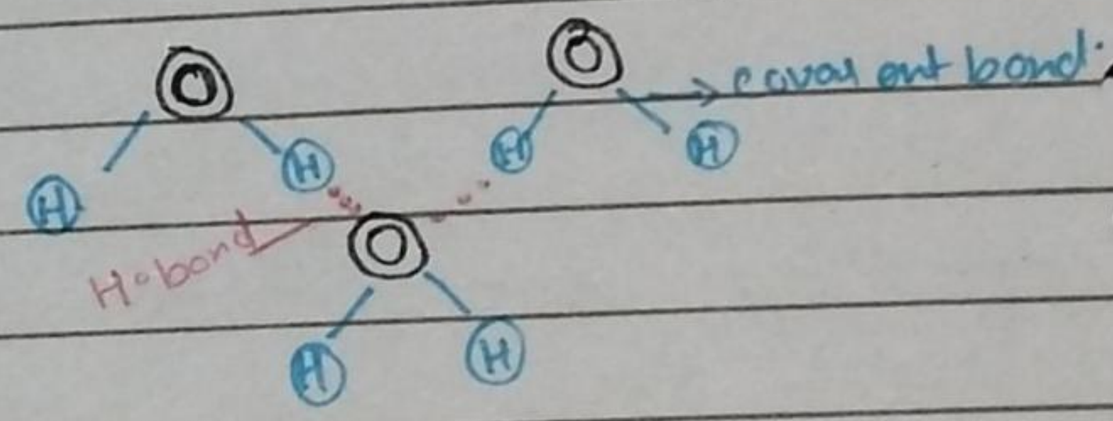
1. Diapole-Diapole forces:
attractive forces b/w the +ive end of one ↑ polar molecule and the -ive end of another polar molecule.

NaCl

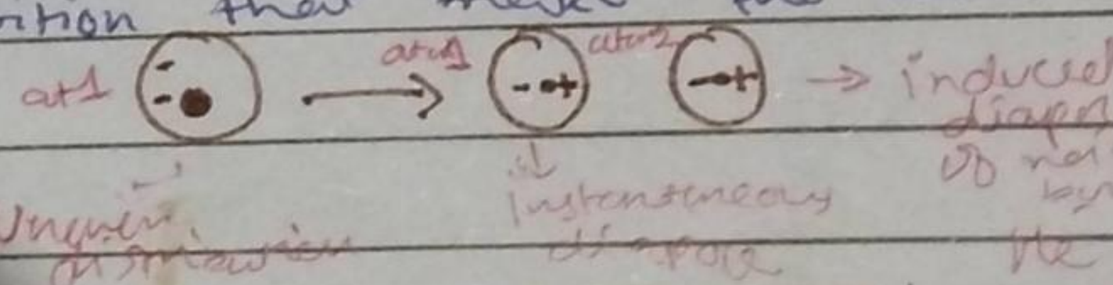
$Na^{\delta+} \cdot\!\!\times\!\!\!- Cl^{\delta-}$ ..... $Na^{\delta+} \cdot\!\!\times\!\!\!- Cl^{\delta-}$ (diapole-diapole)

2: Hydrogen bonding.
a special type of diapole-diapole forces. in H.bonding the diapole-diapole attraction occurs b/w hydrogen and a highly electronegative atom (O, F, Cl etc). much Stronger than a general diapole-diapole forces.





3 London dispersion forces:-
Temp ↑ at forces that results when the e^- in two adjacent atoms occupy position that make the atoms to form temp diapole.



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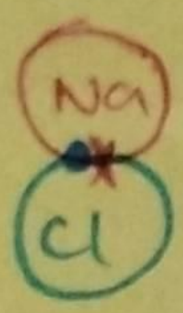
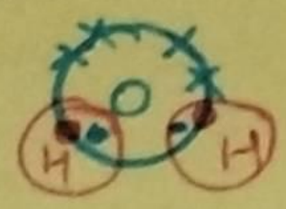
Intramolecular forces. ∴ IntraMF acts b/w atom inside a molecule, binding them via ch. bond.

Ionic



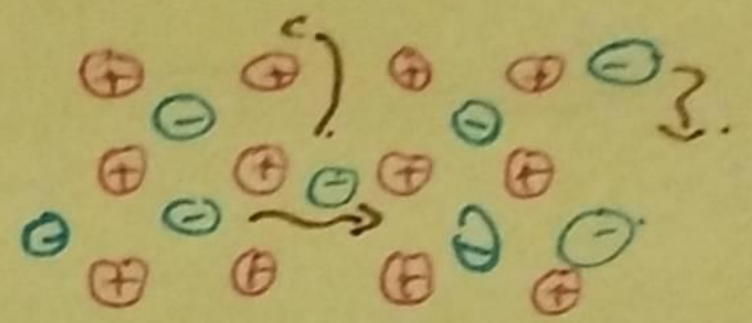
NaCl

Covalent



H_2O

Metallic



Fe.

INTRA MOLECULAR FORCES imf