CHAPTER NO

10

6 MK

STATES OF MATTER

(SOLIDS ,LIQUIDS, GASES)

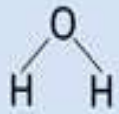
LECTURE NO - 2

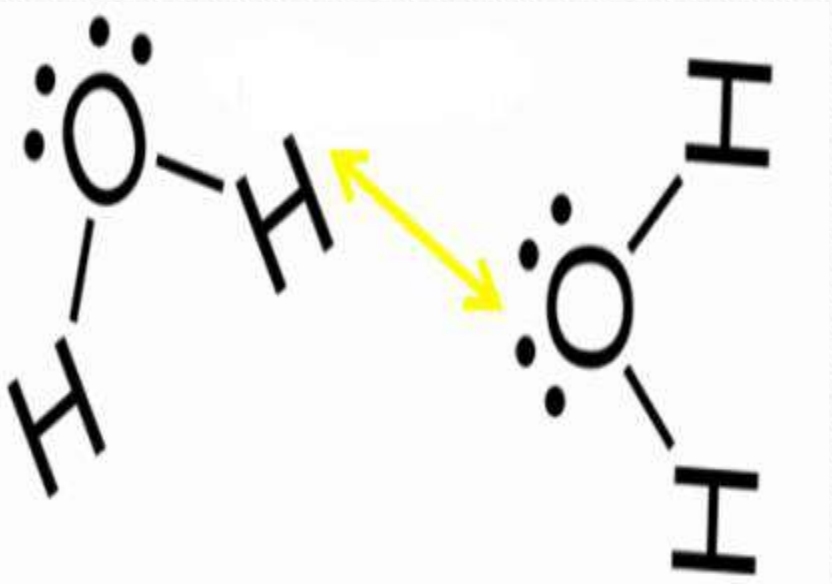
PART – 2	INTERMOLECULAR FORCE & INTRAMOLECULAR FORCE

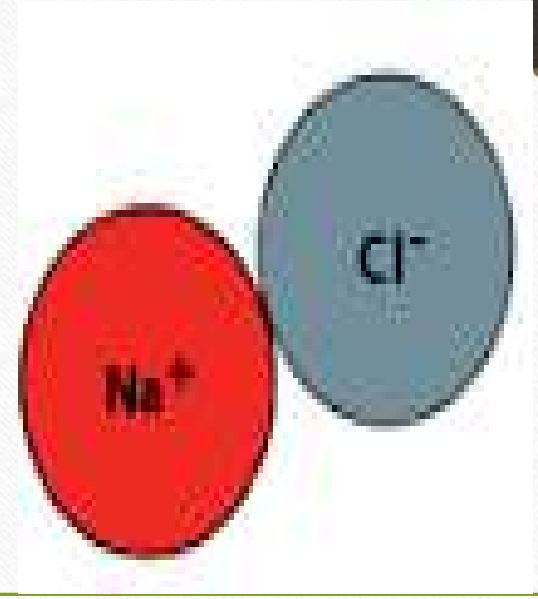
- What is Chemical Bond ?

  A chemical bond is the force of attraction which binds together atoms or molecules or ions.

  Examples :

Chemical formula	Structural formula	Space-filling model
H_2	H—H	
O_2	O=O	
H_2O		





ATOMS MOLECULES IONS

TYPES OF BONDS (TYPES OF FORCES)

PHYSICAL FORCE

INTERMOLECULAR FORCE

STRONG FORCE

Hydrogen Bonding

WEAK FORCE

1. Dipole – Dipole Interaction
2. Dipole – Induced dipole Interaction
3. Ion – dipole Interaction
4. Ion – Induced dipole Interaction
5. Instantaneous dipole – Induced dipole Interaction

CHEMICAL FORCE

INTRAMOLECULAR FORCE

1. Ionic Bond
2. Covalent Bond
3. Co-ordinate covalent Bond
4. Metallic bond

CHEMICAL FORCE/INTRAMOLECULAR FORCE

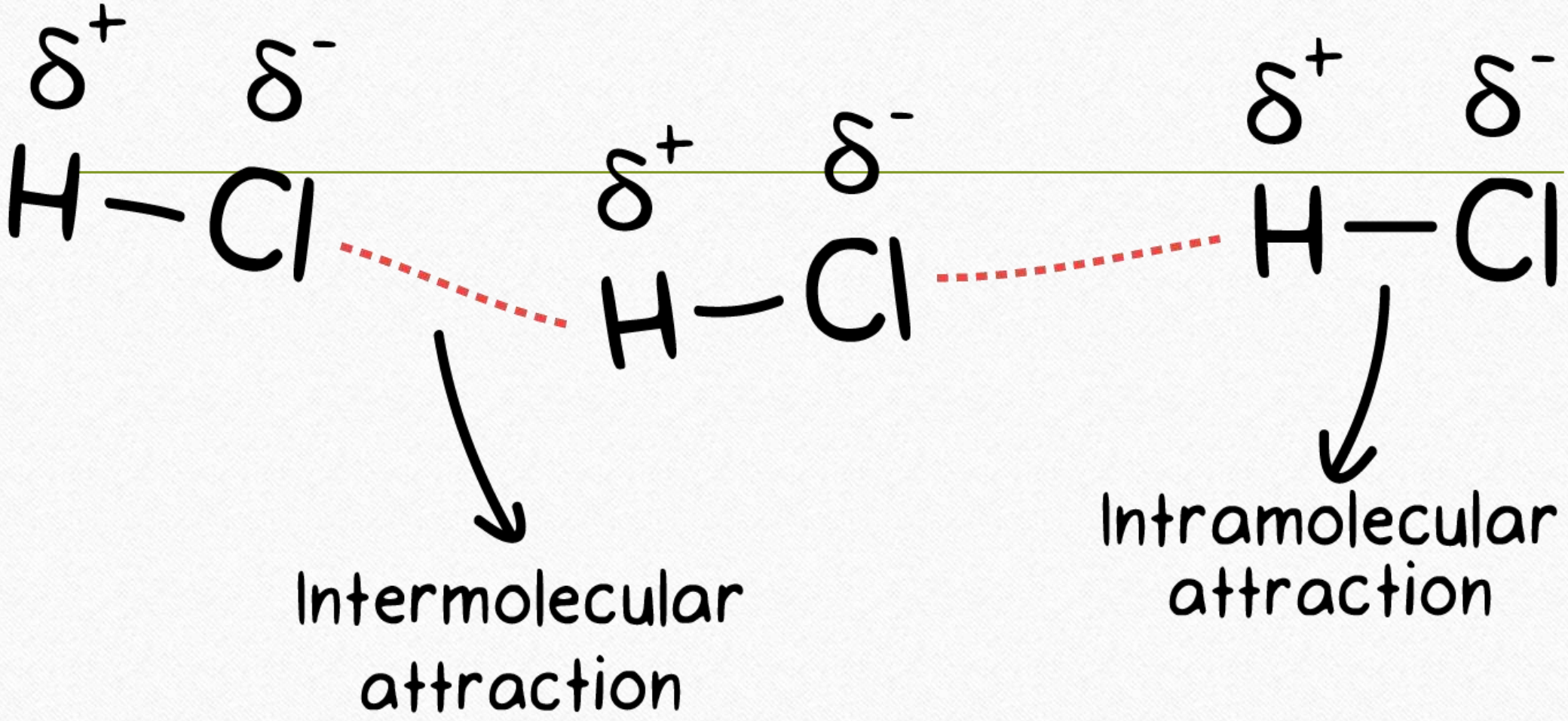
- A force of attraction that hold constituent (Individual) atom of a molecule intact in the molecule and result due to formation of chemical bond is called **INTRAMOLECULAR FORCE.**

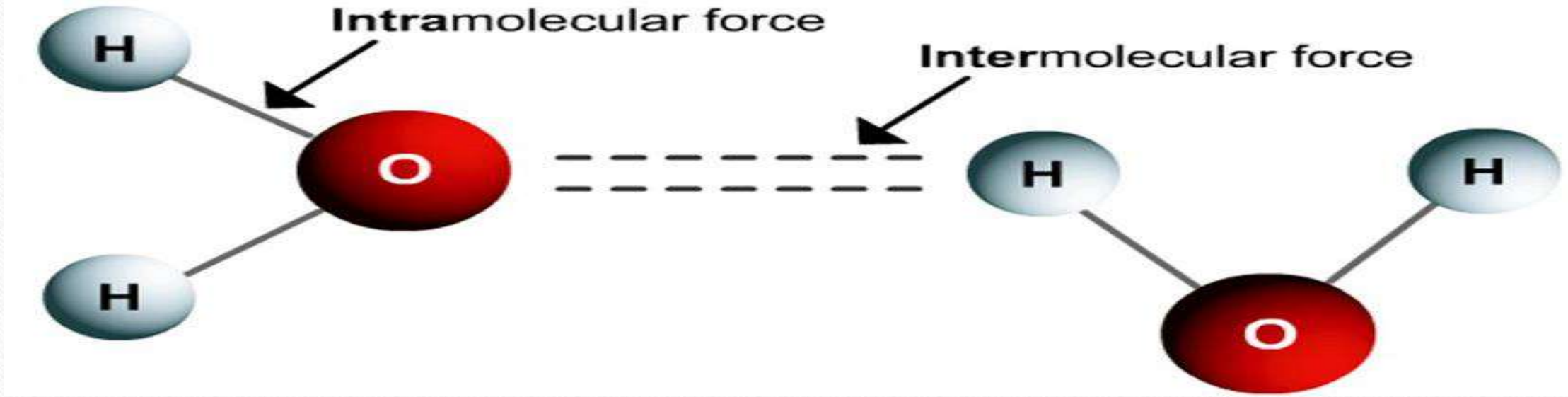
OR

DEFINITION

- **Intramolecular force** is the force that **hold atoms** together **within a molecule.**

Examples:


δ+ δ-
H—Cl
δ+ δ-
H—Cl
δ+ δ-
H—Cl
Intermolecular attraction
Intramolecular attraction


Intramolecular force
Intermolecular force
H
O
H
H
H
O


Cl⁻
Na⁺

1. IONIC BOND:(ELECTROVALENT BOND)

- The electrostatic force of attraction which holds the two (cation & Anion) oppositely charged ions together is called the **ionic bond**.

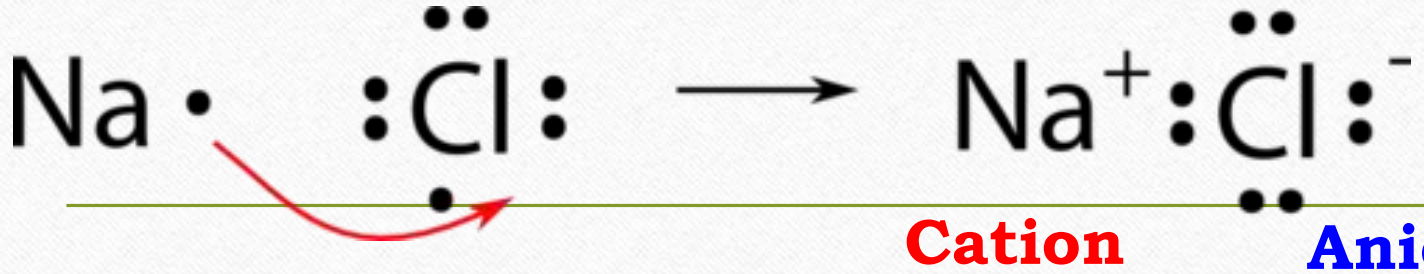
OR

DEFINITION

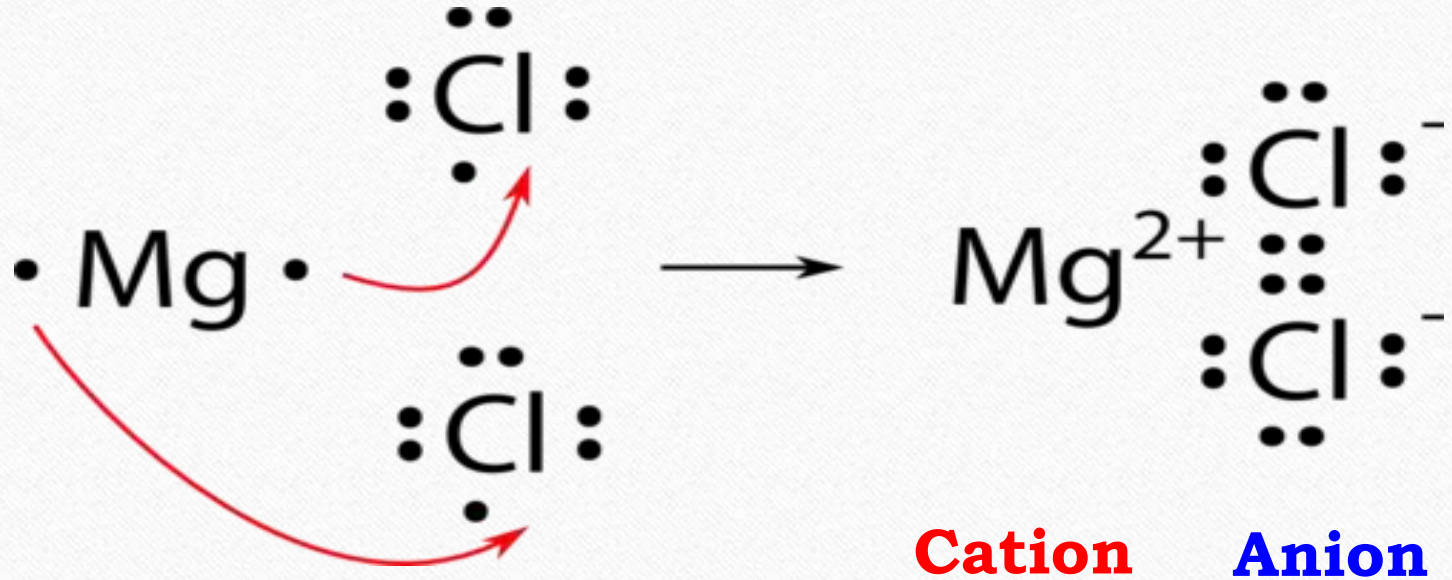
- A chemical bond is formed between two atoms by the complete transfer of one or more electrons from one atom to the other as a result of which the atoms attain their nearest inert gas configuration.

- Ionic bonds form between atoms with large differences in electronegativity.

- **Examples:**



Cation **Anion**



Cation **Anion**

Ionic Bond Shows Complete Positive & Negative charges.

2. COVALENT BOND:

- A bond formed by mutual sharing of electrons between the two atoms to attain stability like noble gas configurations.

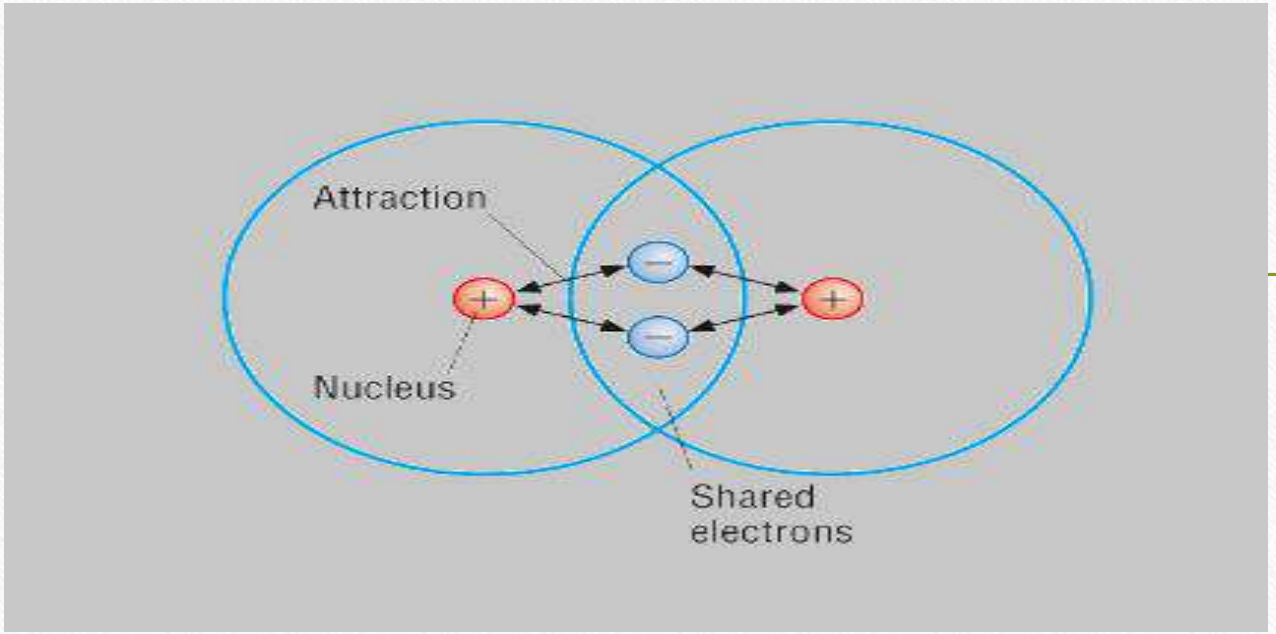
DEFINITION

OR

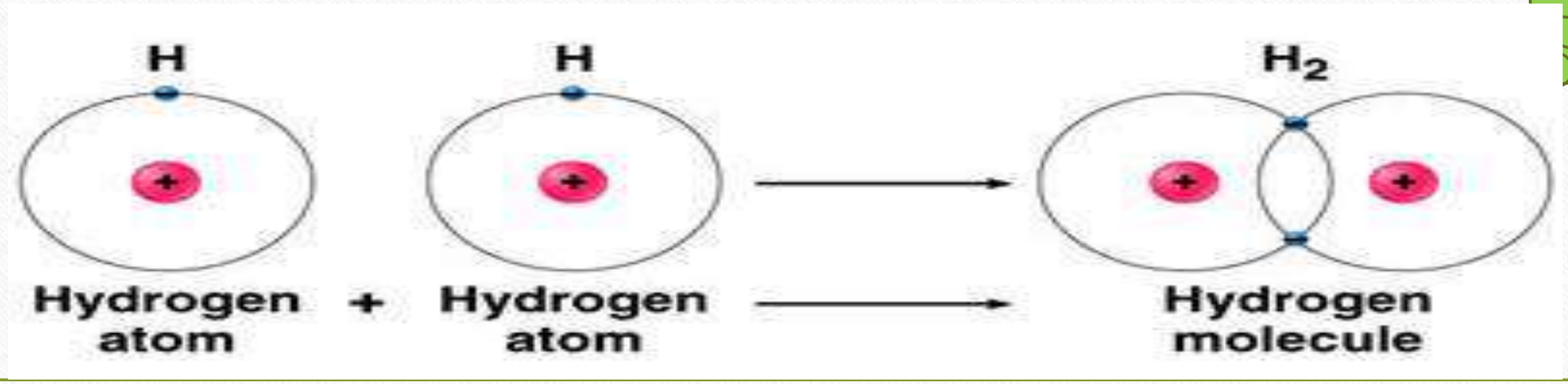
- A bond formed by the sharing of a pair of electrons by two atoms.(Single Bond)

- Covalent bonds form between atoms with small differences in electronegativity.

- **Examples:**



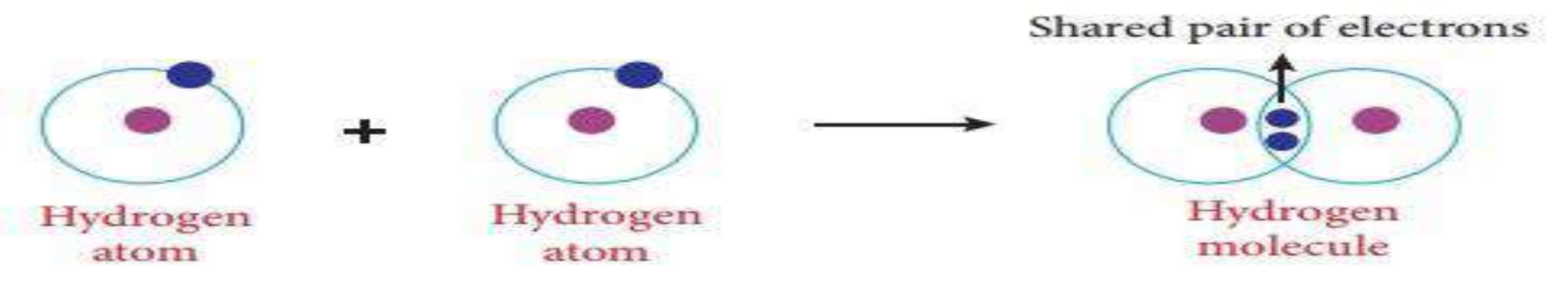
Covalent Bond can be Achieved in two Ways:



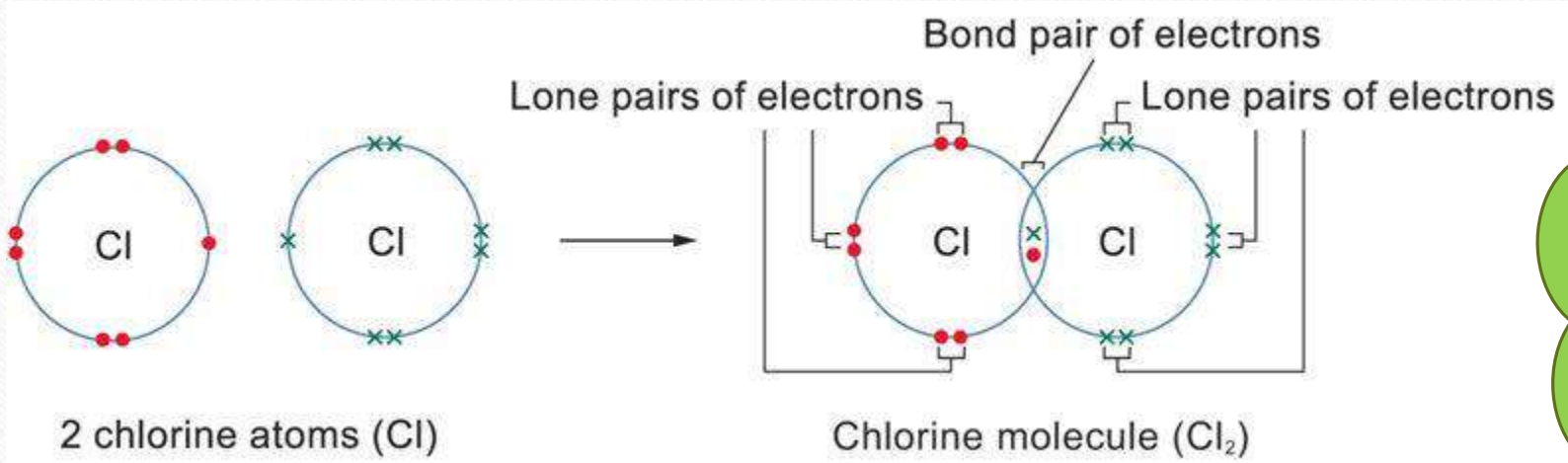
A. Non – Polar Covalent Bond:

- A bond formed by sharing electrons between the same kind of atoms called Non – polar covalent bond.
- Non – polar covalent bond do not show any separation charges [partial positive (δ^+) and partial negative (δ^-)] due to similar electronegativity.(electronegativity difference between two atoms is zero)
- Examples:

1. Formation of H_2 Molecule:

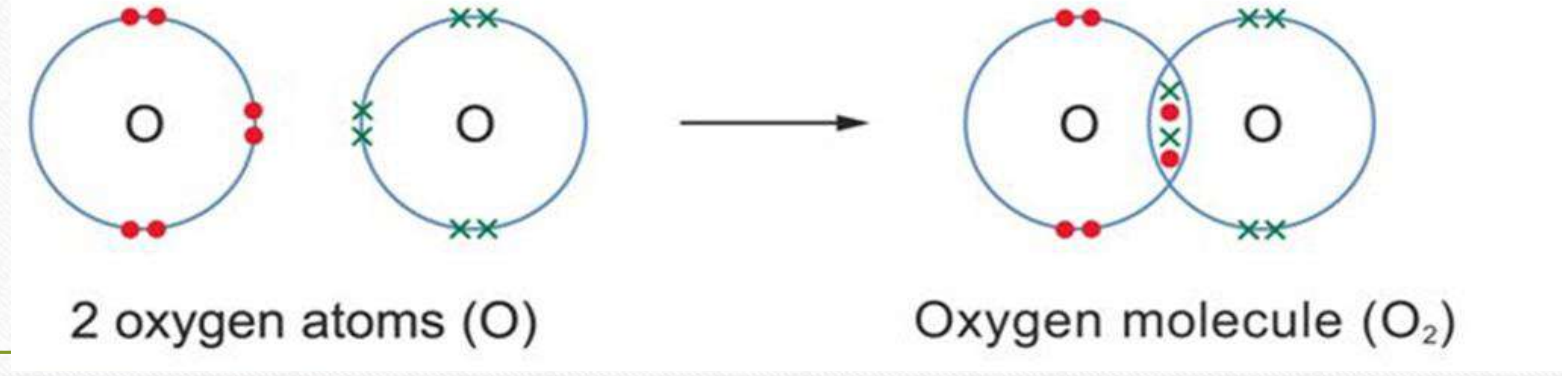


2. Formation of Cl_2 Molecule:



Non – polar Molecules
(No Charges)

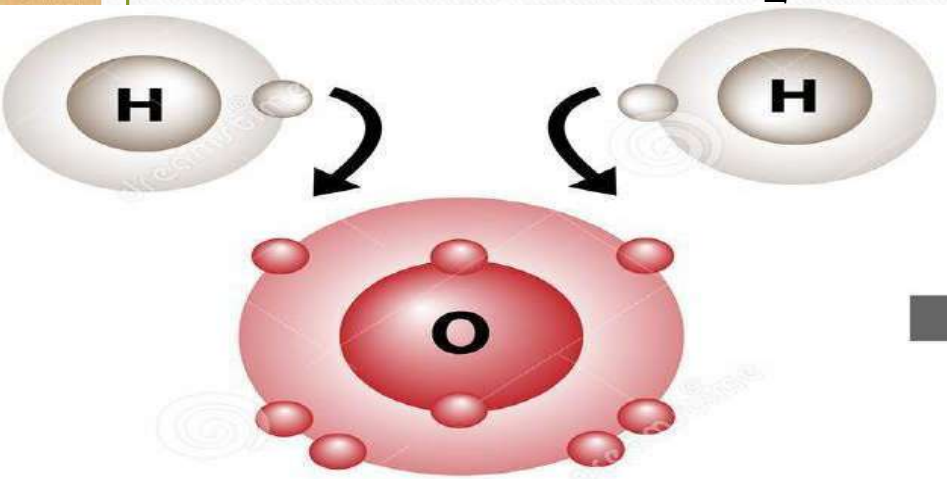
3. Formation of O_2 Molecule:

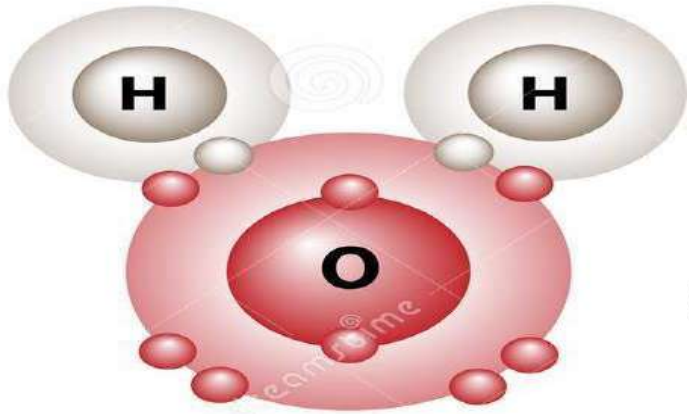


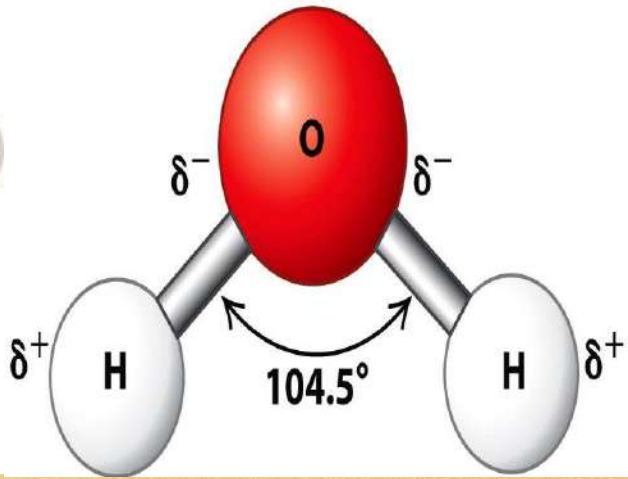
B. Polar Covalent Bond:

- A bond formed by unequal sharing electrons between the different kind of atoms called polar covalent bond.
- Polar covalent bond shows separation charges [partial positive (δ^+) and partial negative (δ^-)] due to slightly difference in electronegativity.
- Examples:

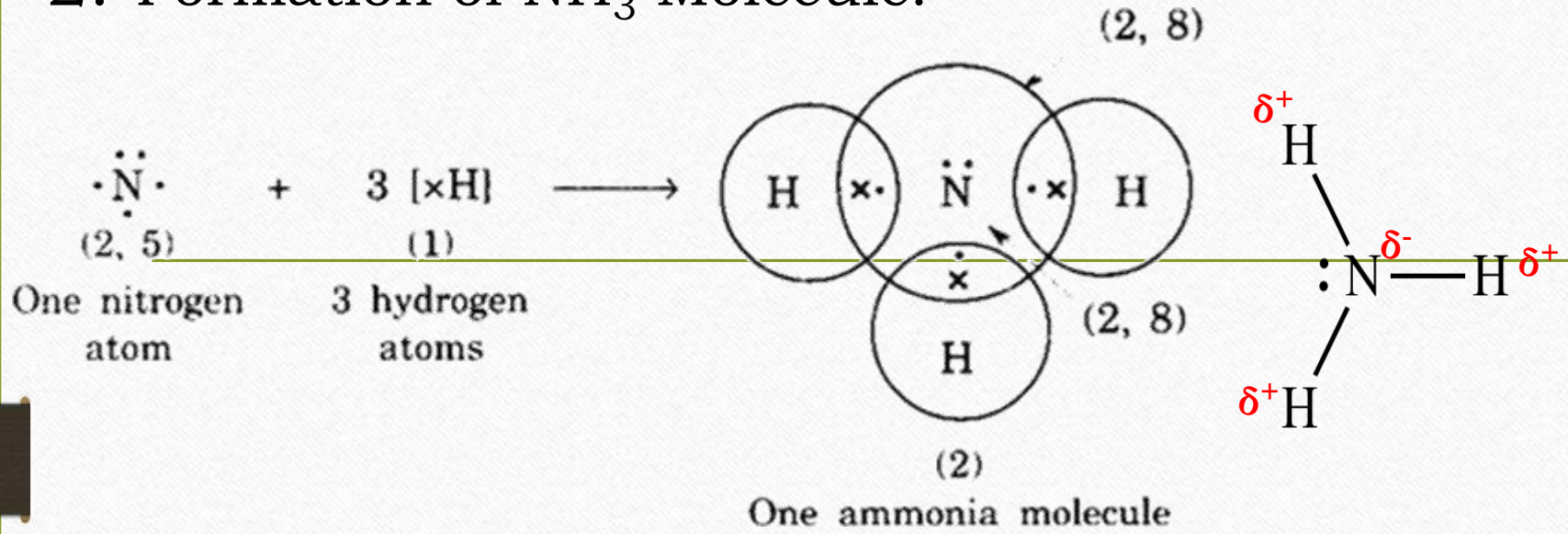
1. Formation of H_2O Molecule:





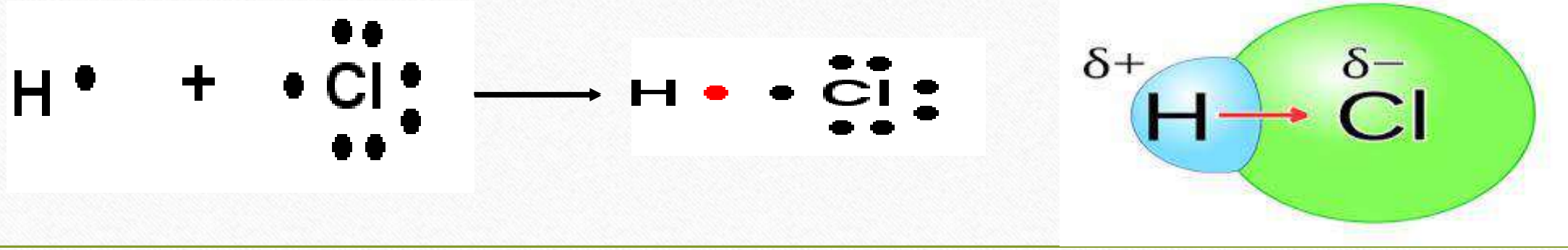


2. Formation of NH_3 Molecule:

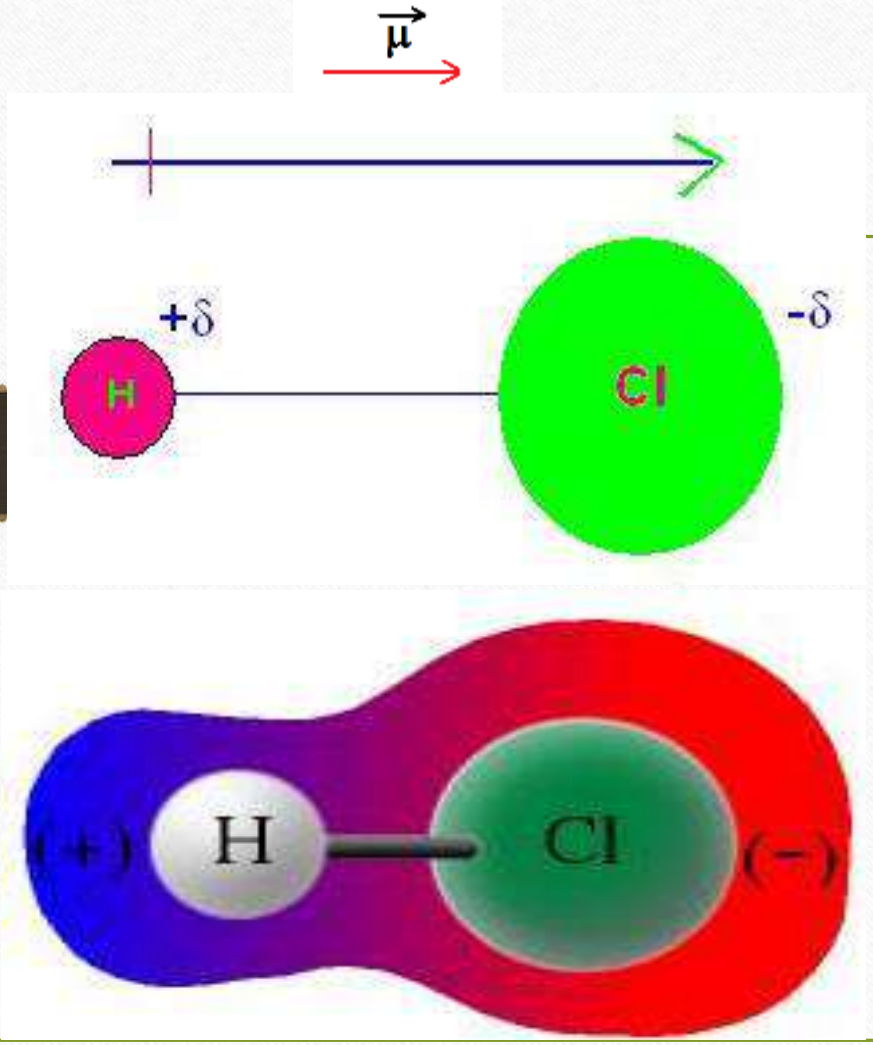


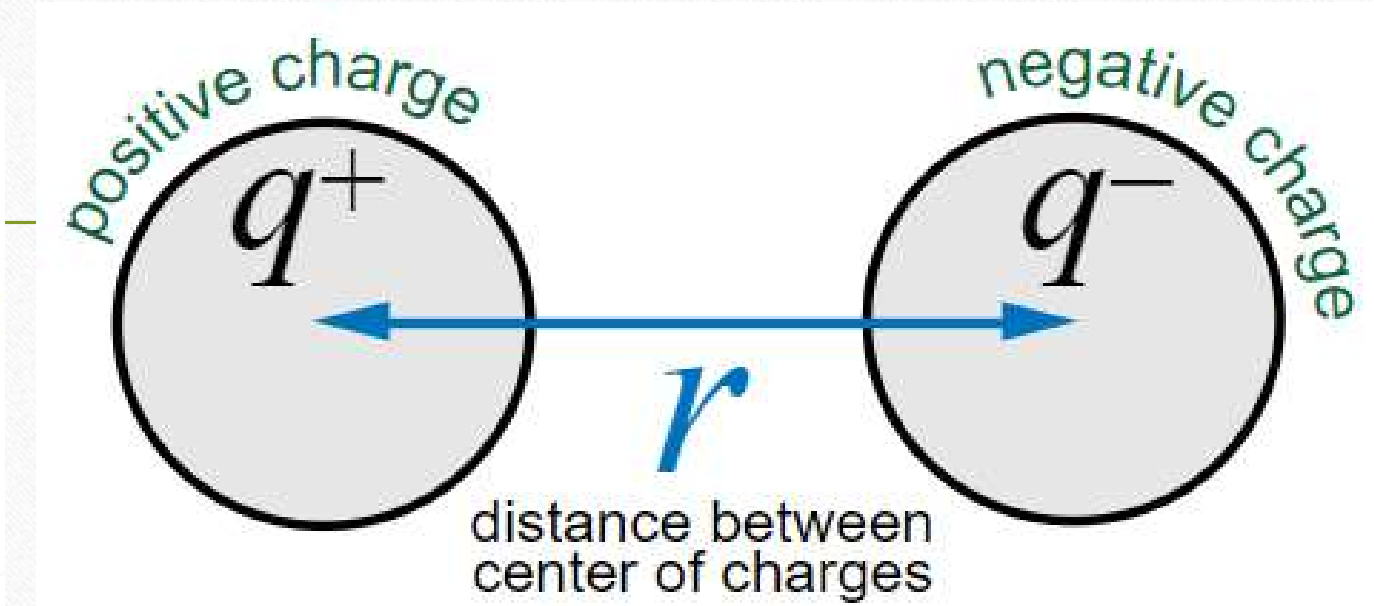
Polar Molecules (Charges)

3. Formation of HCl Molecule:



DIPOLE MOMENT (μ):





$$\mu = q \cdot r$$

dipole moment — separated charge — distance between

DEFINITION

DIPOLE MOMENT (μ):

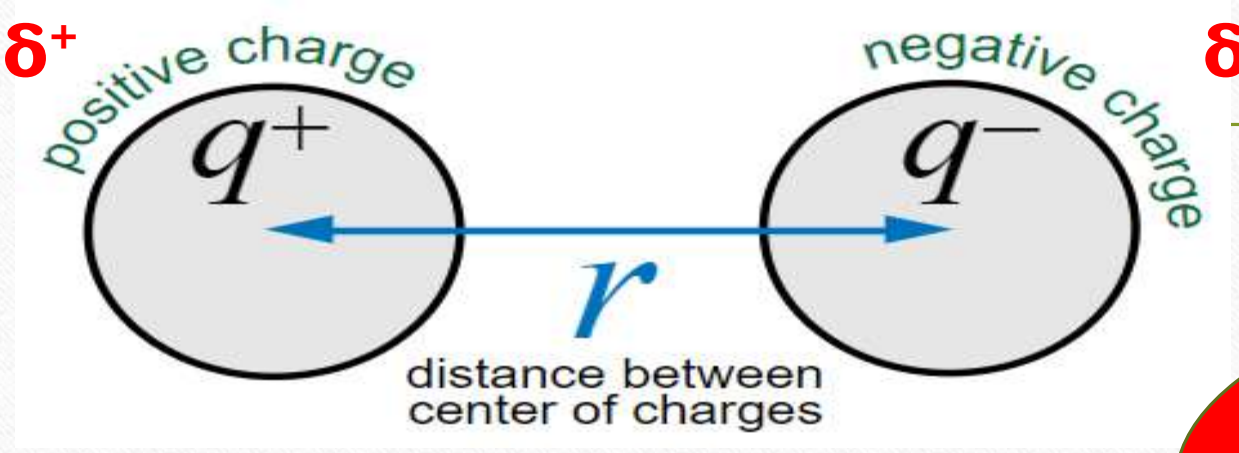
- Dipole moment (μ) is the product of the magnitude of the charge (Q) and the distance (r) between the centres of positive and negative charge (r). [μ = Q x r]

OR

- Dipole moment of a polar molecule is defined as the product of the magnitude of charge(Q) and the distance (l) between separation of opposite charges. [μ = Q x l]
- It is designated by a Greek Letter (μ) (mu). Its unit is Debye (D).
- Dipole moment is a vector quantity and is depicted by a small arrow with tail in the positive centre and head pointing towards the negative centre.



- It is used to measure the dipole moment of polar molecule.
- General representation of Dipole moment:



$\mu = Q \times r$

$= (q_1^+ \times q_2^-) \times r$

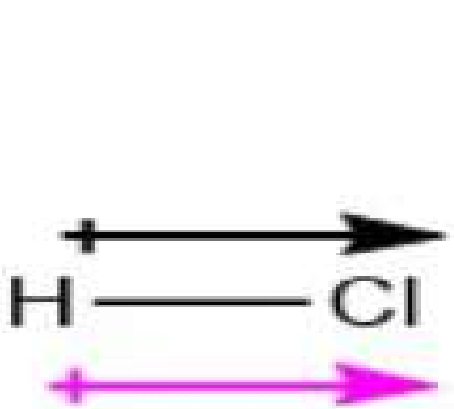
$= (10^{-10} \text{ esu}) \times 10^{-8} \text{ cm}$

$= 10^{-18} \text{ esu.cm}$

$\mu = 10^{-18} \text{ D}$

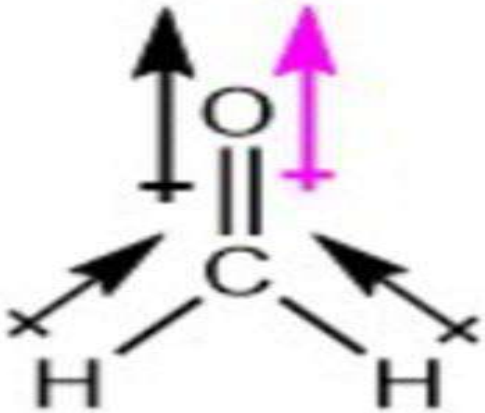
1 D = 10^{-18} esu.cm

FIND OUT WHETHER THE COVALENT COMPOUND IS POLAR & NON – POLAR.



Net dipole

HCl



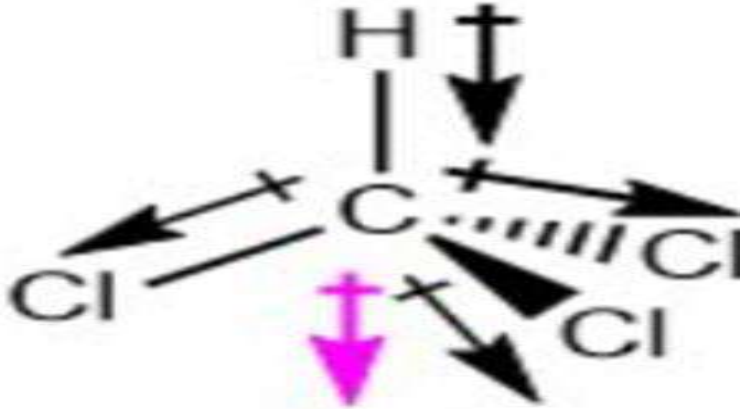
Net dipole

CH_2O



Net dipole

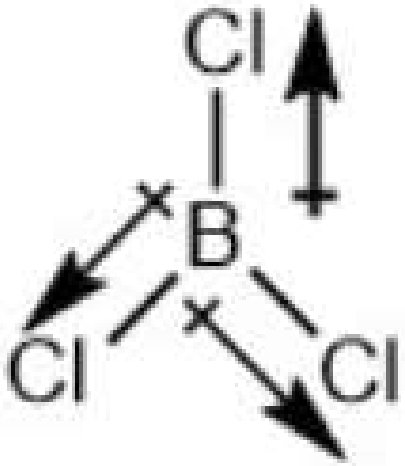
NH_3



Net dipole

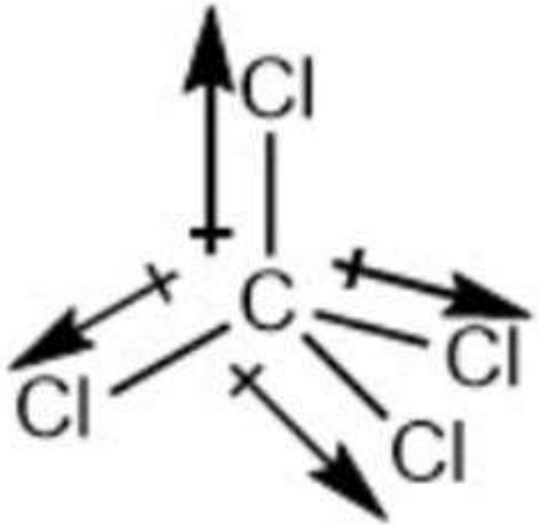
$CHCl_3$

Molecules with asymmetrical charge distributions have a net dipole moment is Non – zero , such compounds are Polar.



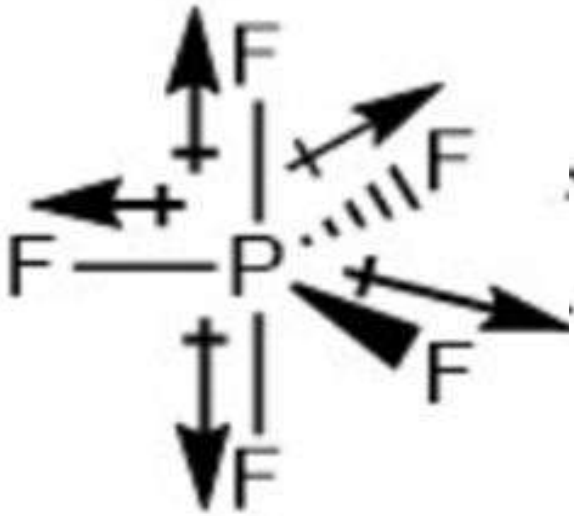
No net dipole

BCl_3



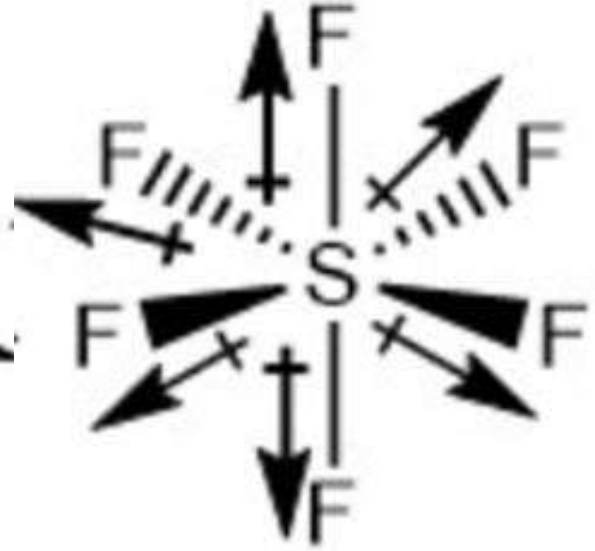
No net dipole

CCl_4



No net dipole

PF_5



No net dipole

SF_6

Molecules with symmetrical charge distributions have a no net dipole moment i.e. dipole moment is zero, such compounds are Non polar.



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