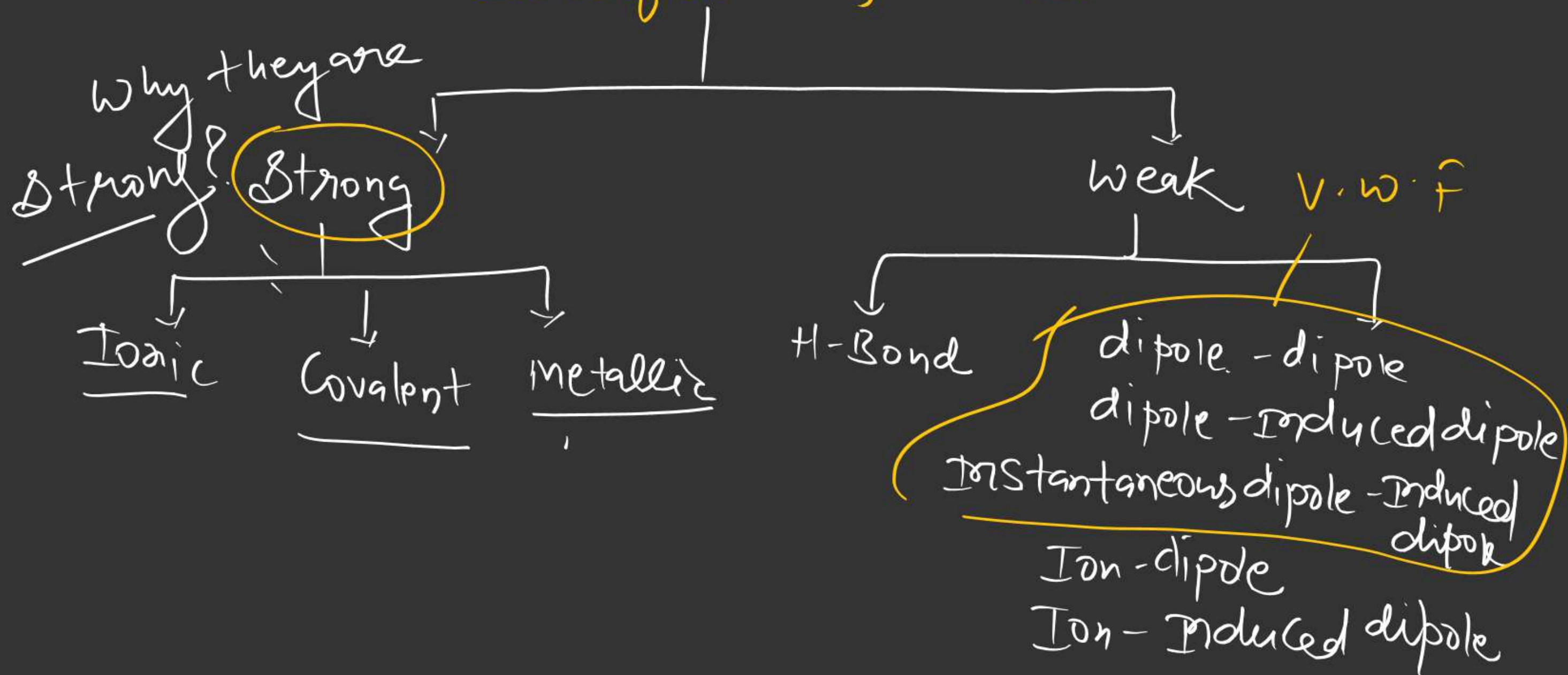# Classification of Chemical Bond

Why they are

Strong ? **Strong**

Strong:
- Ionic
- Covalent
- Metallic

weak | v.w.f

weak:
- H-Bond
- dipole - dipole
- dipole - Induced dipole
- Instantaneous dipole - Induced dipole
- Ion - dipole
- Ion - Induced dipole

$$\boxed{\overset{-}{F} \quad O \quad N}$$

$$\overset{+\delta}{H} \xrightarrow{\hspace{1cm}} \overset{-\delta}{F} \cdots\cdots\cdots \overset{+\delta}{H} - \overset{-\delta}{F}$$

$\underbrace{}_{dipole}$ (H-Bond) $\underbrace{}_{dipole}$

$$\overset{+\delta}{A} \xrightarrow{\hspace{0.5cm}} \overset{-\delta}{B}$$

$$\overset{+\delta}{H} - \overset{-\delta}{Cl} \cdots\cdots\cdots - \overset{+\delta}{H} - \overset{-\delta}{Cl}$$

$\underbrace{}_{dipole}$ $\underbrace{}_{dipole}$
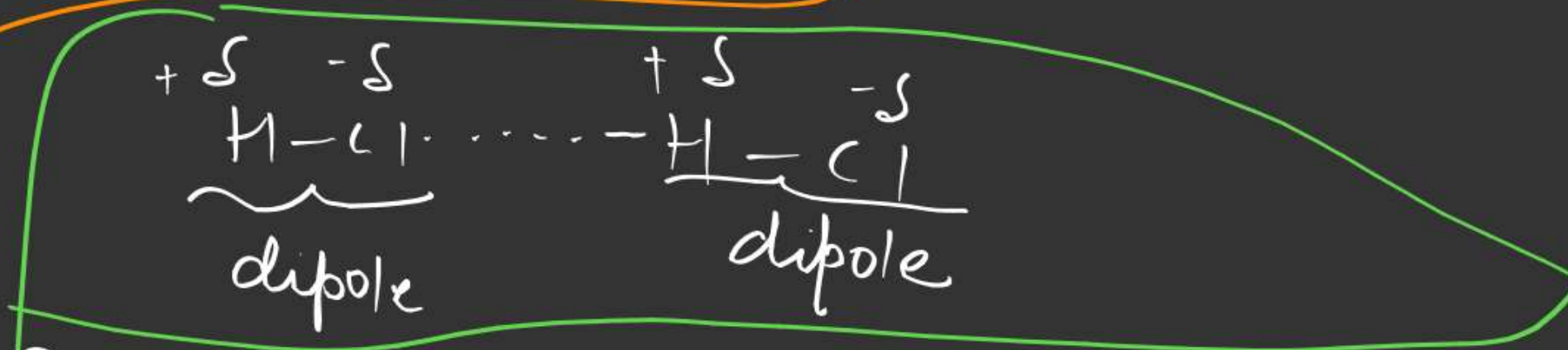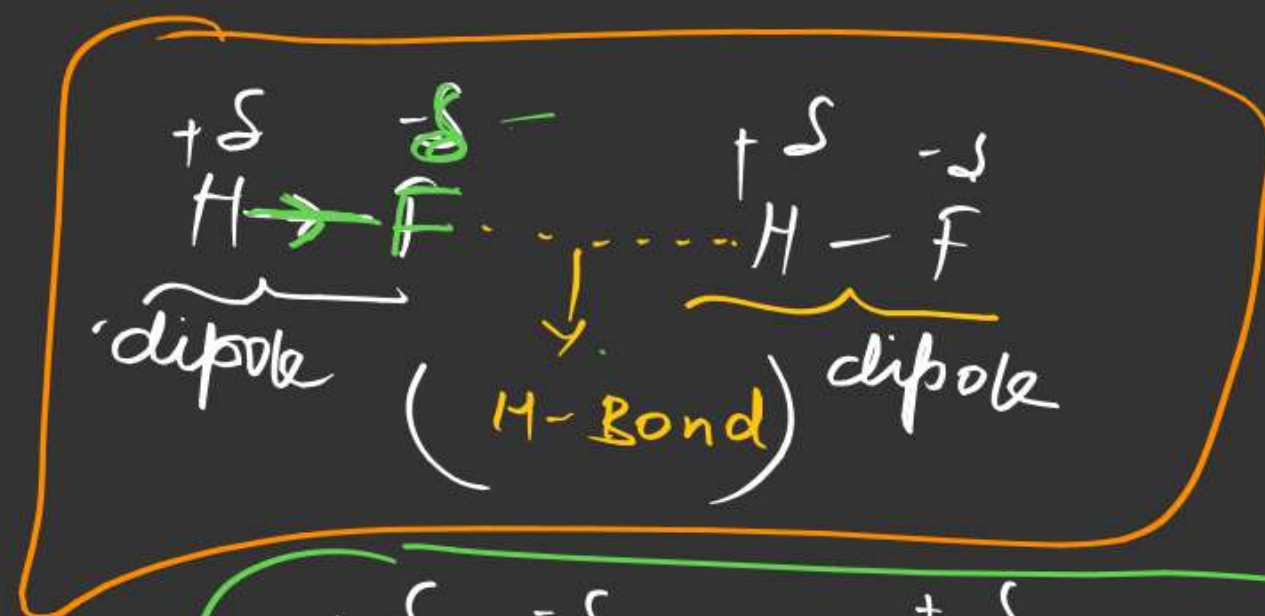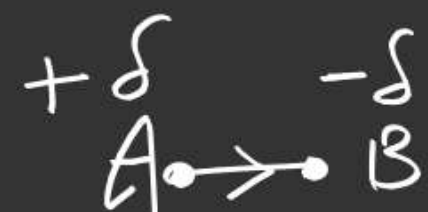
<u>Note</u> ⇒ amount of relese energy > 42 KJ/mole then it called Chemical bond

H-Bonding $\longrightarrow$ F O N

$$\equiv C$$

and Some time Cl
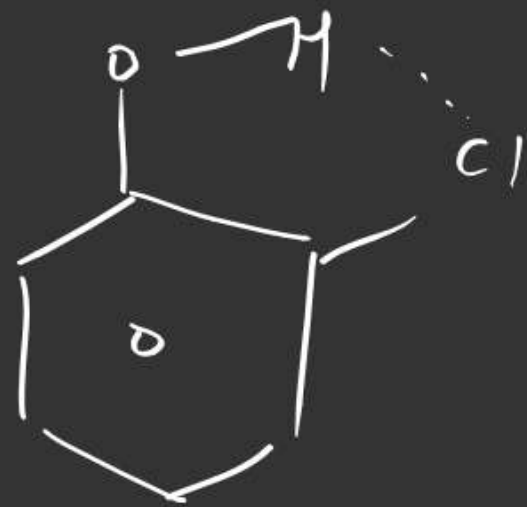
(H-Bond)
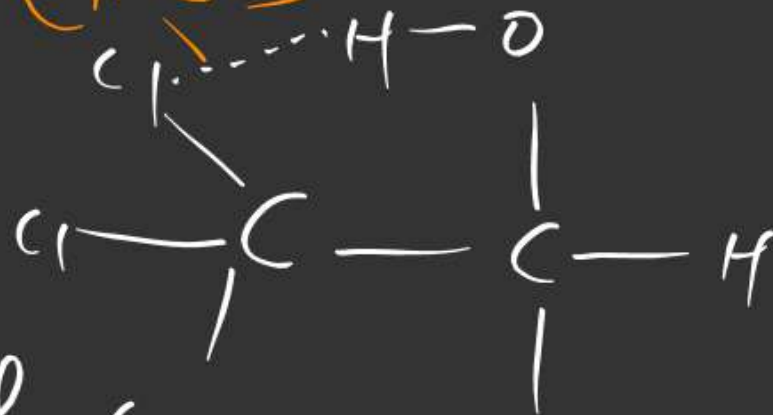
Ortho chlorophenol

Chloral Hydrate

8   42 KJ/mole

V.W.F   H-Bonding   Chemical Bonding
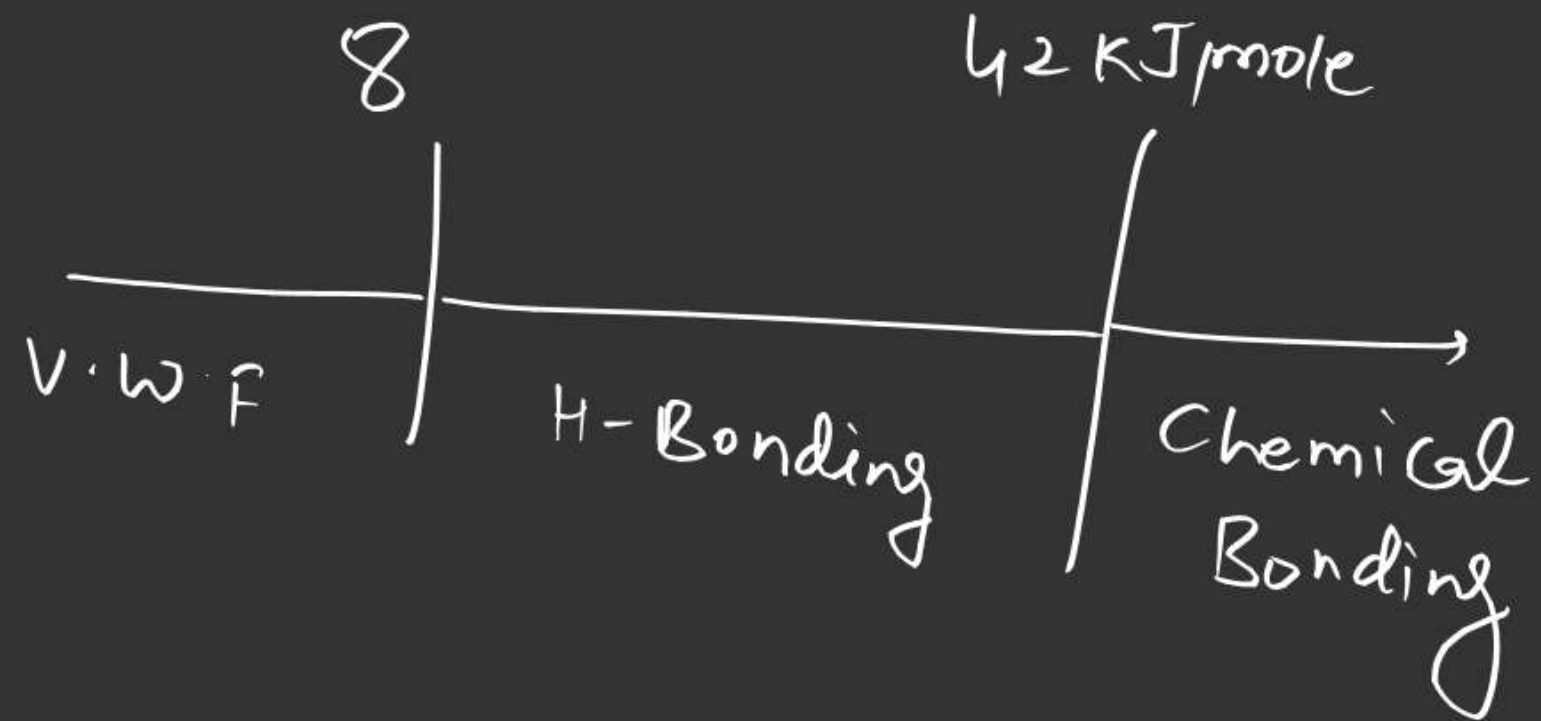
Que// Why Cl form Sometime (π-Bonding) While both Cl and N have Same E·N

Ans

N ⊕⁺ₑ

Cl ⊕⁺
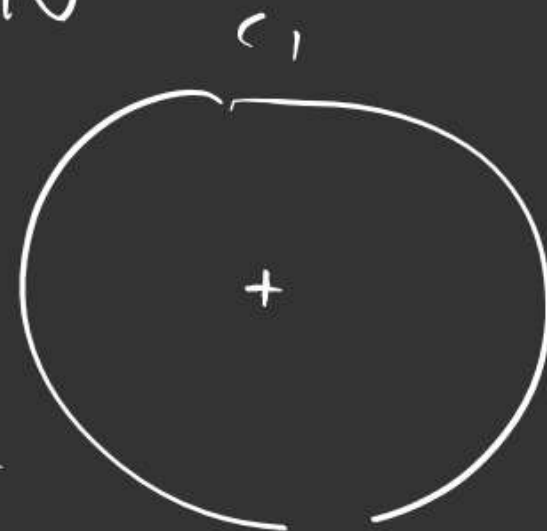
N — has small size

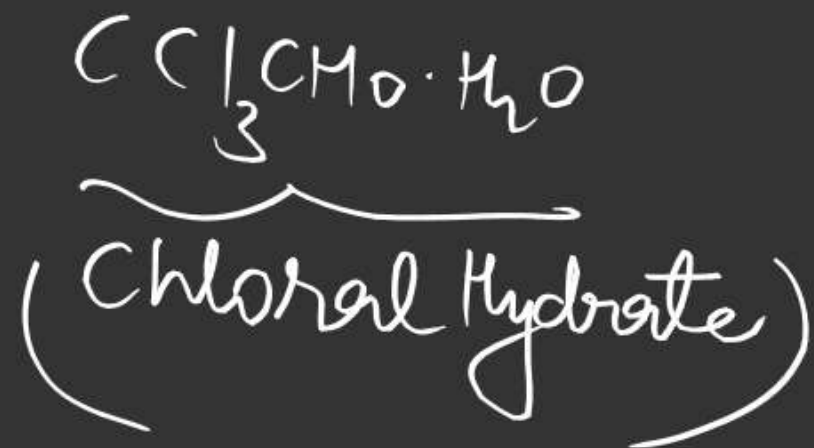So it has higher effective nuclear charge

Que H-Bond is a Special Case of

(1) Ion-Induced dipole

(2) dipole-dipole

(3) Ion-Induced dipole

(4) none

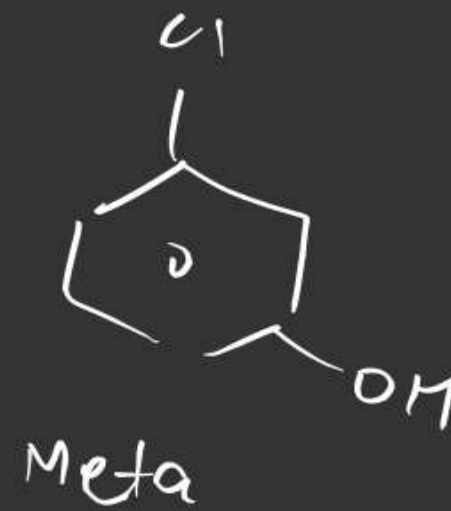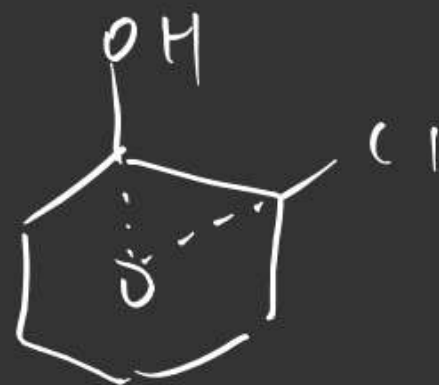one Which of the following Compound can form H- Bonding

Ans ✓(i) ortho- chlorophenol

$CCl_3CHO \cdot H_2O$

(ii) Chloral CCl_3CHO

$\underbrace{}$

(Chloral Hydrate)

(iii) both

(iv) none

ortho

Meta

Para

one   which of the following
is Correct

$$H - F \overset{x}{\dots\dots} H \overset{y}{-} F$$

B·L order

(a) $\boxed{x > y}$

(b) $x < y$

(c) $x = y$

(d) none

---

one $HF_2^{\ominus}$

$$F^{\ominus} \overset{x}{\dots\dots} H \overset{y}{-} F$$

Correct order of B·L

(a) $x > y$

(b) $x < y$

(c) $x = y$

(d) none

Hydrogen bonding — Symm

— unsymm

$$\overset{+\delta}{H} - \overset{-\delta}{F} \cdots \overset{x}{\cdots} \overset{+\delta}{H} \overset{-\delta}{F}$$

unsymm

$HF_2^{\ominus}$

Ion

$$\overset{\ominus}{F} \cdots \overset{+\delta}{H} - \overset{-\delta}{F}$$

x y

$$\left[\begin{matrix} \text{Hydrogen} \\ \text{bond (B·y)} \end{matrix}\right] \underset{y}{\overset{x}{>}} \left[\begin{matrix} \text{Covalent bond} \\ B \end{matrix}\right]$$

$x \approx y$
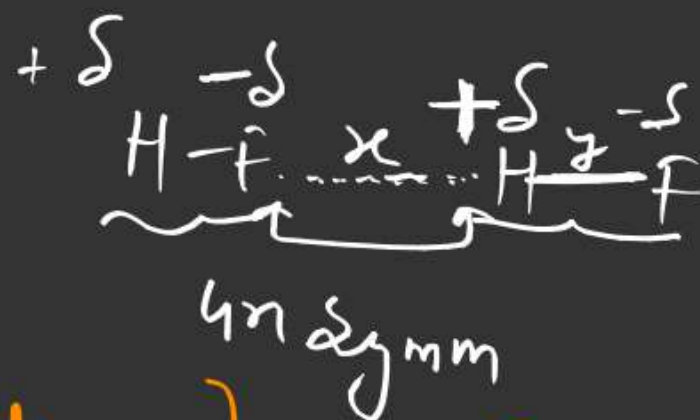
Note :- Hydrogen bond is special case of dipole-dipole and Ion-dipole

$$\overset{+\delta}{H} - \overset{-\delta}{F} \cdots \overset{+\delta}{H} - \overset{-\delta}{F}$$

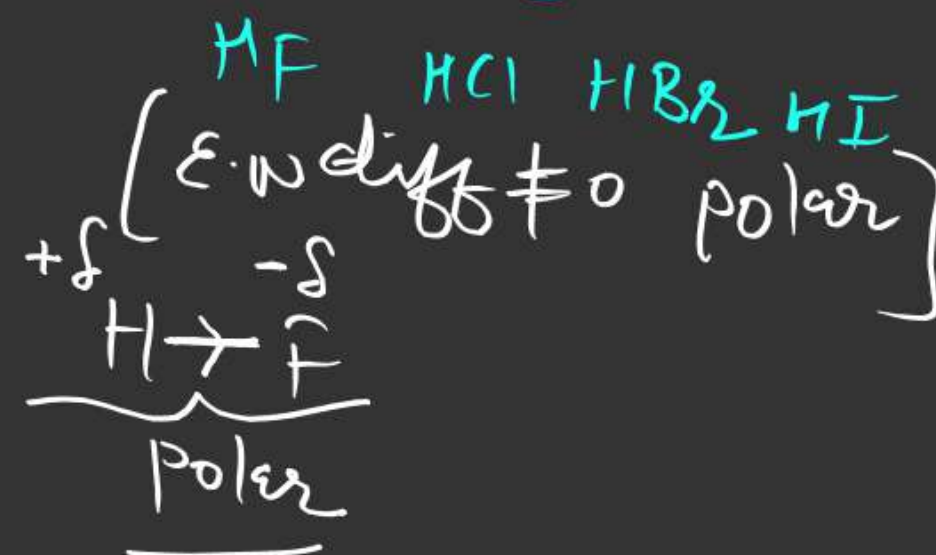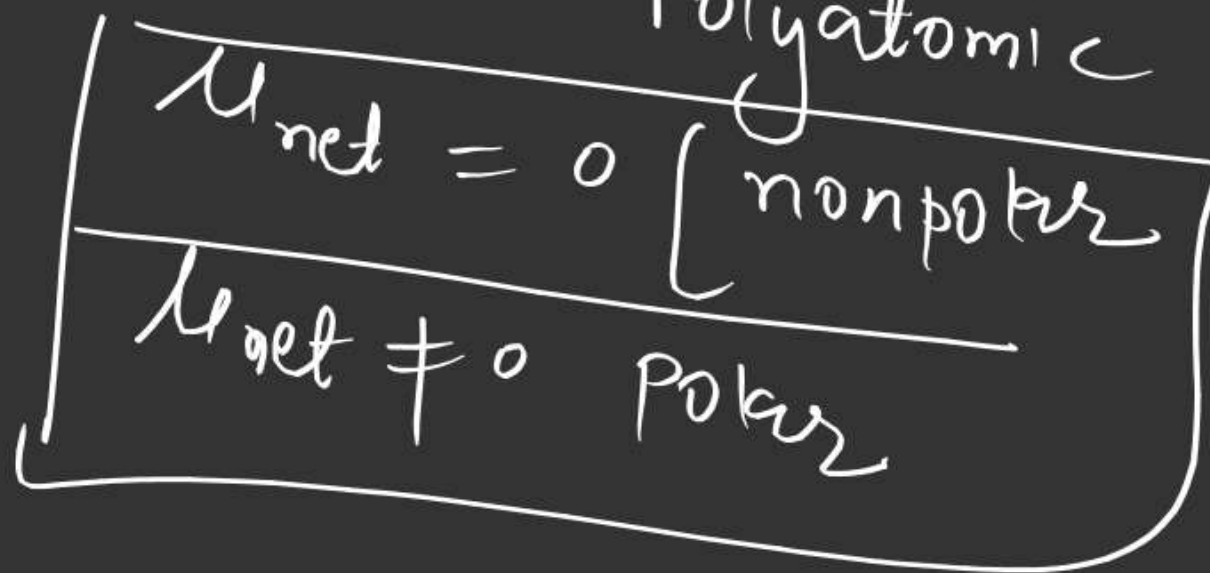$$\overset{\ominus}{F} \cdots \cdots \overset{+\delta}{H} - \overset{-\delta}{F}$$

Weak force

① dipole — dipole [keesom force]

H_2 N_2 O_2

molecule [di atomic atomic → Homonuclear diatomic
E.N diff $= 0$ [Nonpolar]
→ Hetereo nuclear diatomic

Polyatomic

$\mu_{net} = 0$ [nonpolar
$\mu_{net} \neq 0$ polar]

HF   HCl   HBr   HI

[E.N diff $\neq 0$ polar]

$+\delta$ $-\delta$
$H \rightarrow \hat{F}$
⏟
Polar
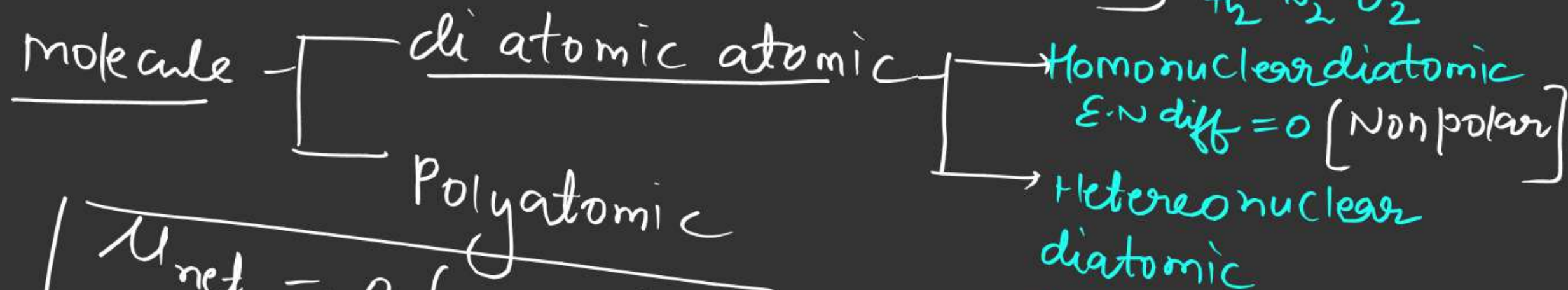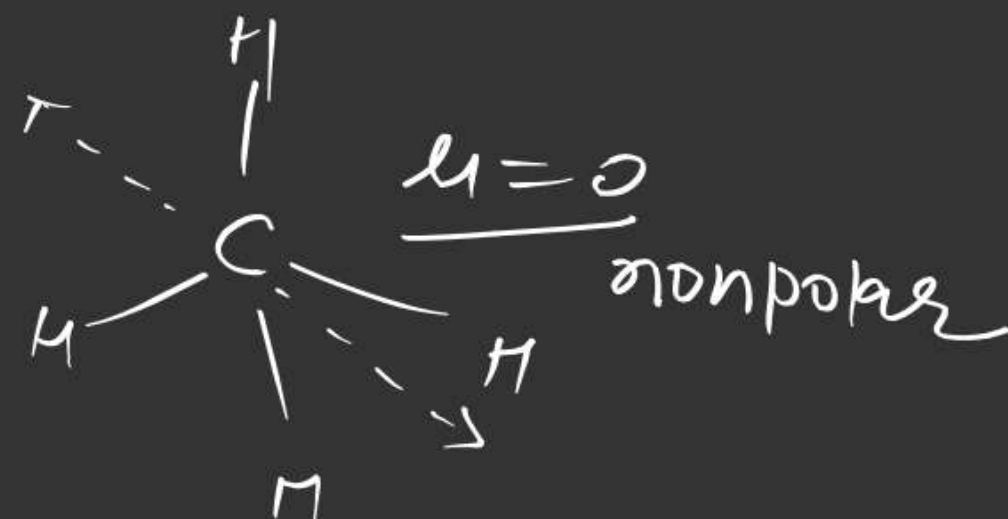
Qu.   <u>JEE Mains</u>

which of the following pair
has dipole-dipole attraction

(a) $CHCl_3 + CH_4$

(b) $CH_3CN + CCl_4$

(c) $CH_3CN + CH_3CN$

(y) $CCl_4 + CCl_4$

$\mu = 0$
nonpolar
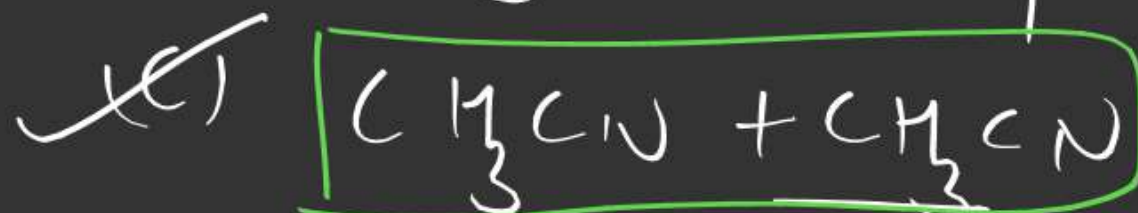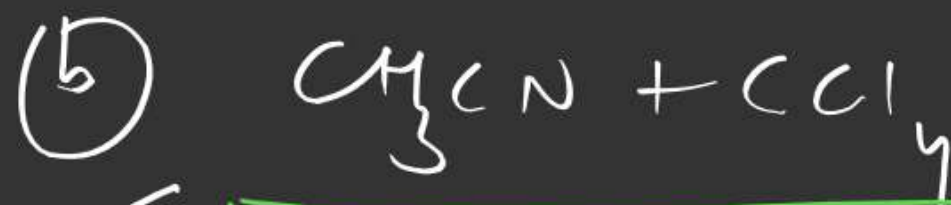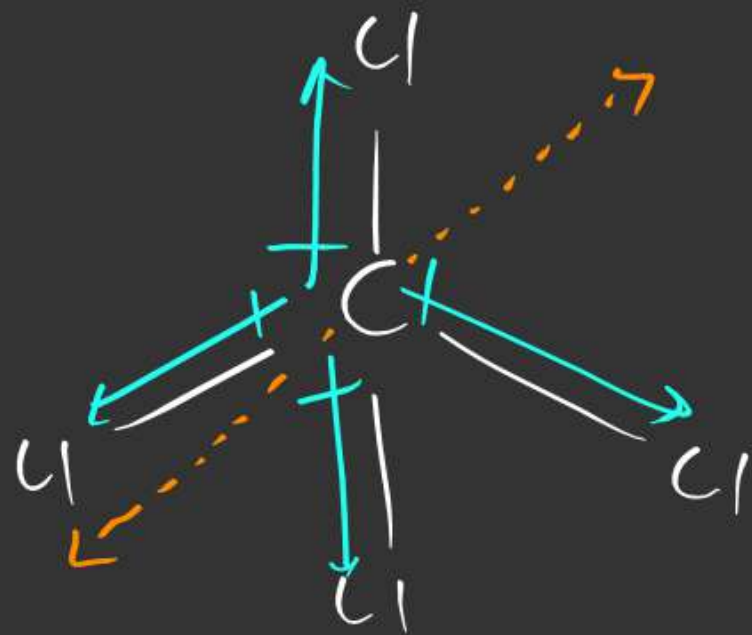
$$\underline{\mu = 0} \quad \text{nonpolar}$$

dipole moment direction
less E·N to more E·N

Note → Polar molecule also called dipole

JEE mains

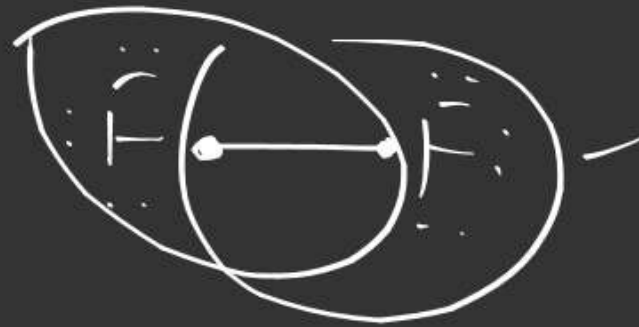que. Which of the following type of Hydrogen bonding present in HF

(a) Symm (b) unsym (c) both (d) none

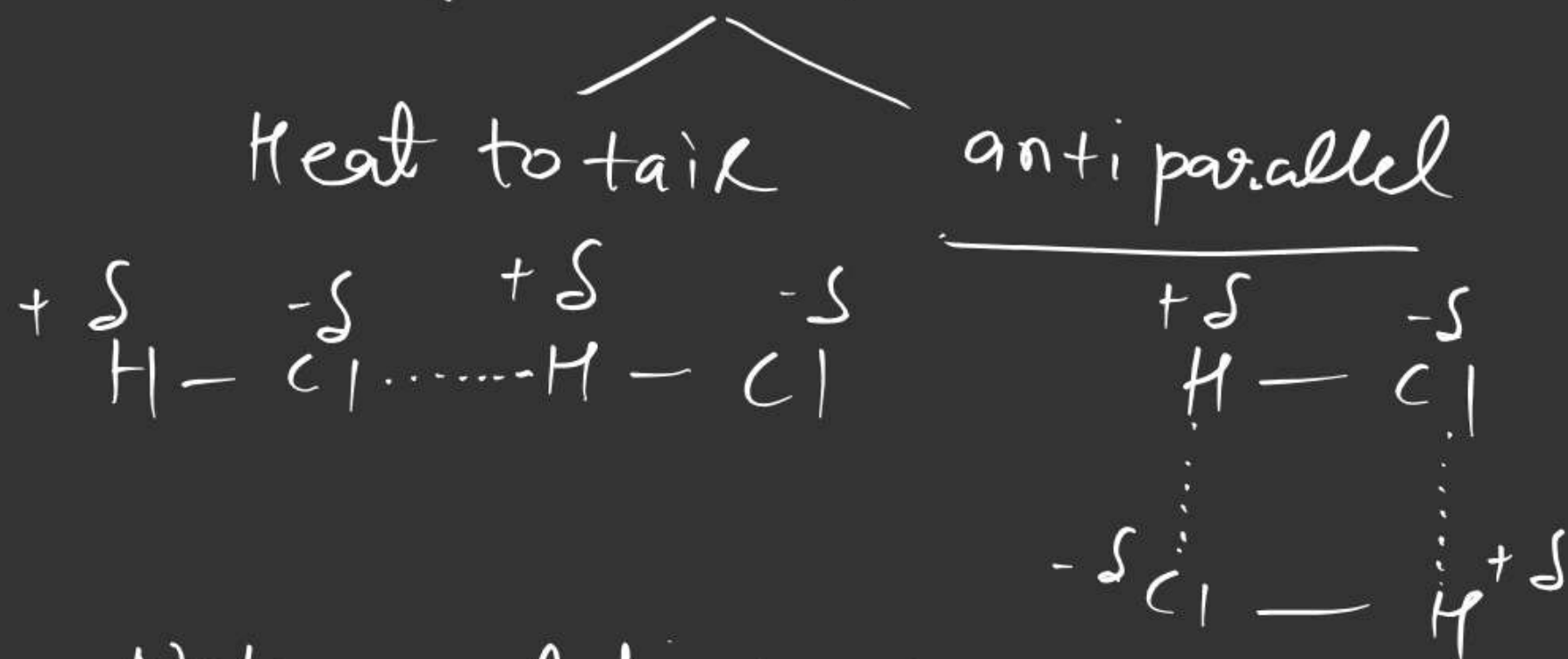(B·L equal)

Hydrogen bond B·L and covalent bond B·L both are equal

B·L of Hydrogen bond higher than covalent bond B·L

$$\text{Na}^{+} \qquad \text{Cl}^{-}$$

type of dipole

Heat to tair   anti parallel

$+\delta$ $-\delta$ $+\delta$ $-\delta$
$H - Cl \cdots\cdots H - Cl$
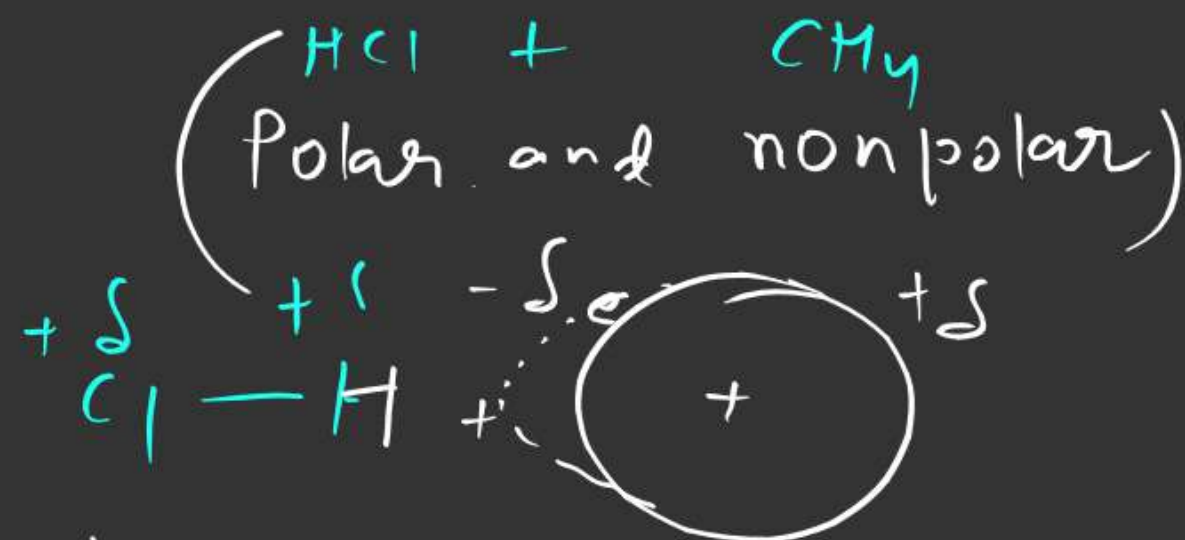
$+\delta$ $-\delta$
$H - Cl$

$-\delta Cl - H^{+\delta}$

Note $\Rightarrow$ Anti paralell is better arrangment than Head to tail When thermal agitation is not too high and molecule is not too fatty

$[$ distortion force $]$ $[$ debye force $]$

dipole $-$ Induced dipole

$\left(\begin{array}{c} HCl + CH_4 \\ Polar \ and \ nonpolar \end{array}\right)$

$\overset{+\delta}{Cl}\overset{+}{\underset{}{-}}\overset{-\delta}{H} + \cdots$ $\overset{-\delta}{\bigodot}\overset{+\delta}{+}$

dipole $-$ Induced dipole

$\underline{Note} :\rightarrow$ When size of Non polar molecule increases then dipole $-$ Induced dipole $\uparrow$

$\overset{+\delta}{H} - \overset{-\delta}{Cl}$

$\overset{-\delta}{Cl} - \overset{+\delta}{H}$

$H_3C - \underset{\underset{CH_3}{|}}{\overset{\overset{CH_3}{|}}{C}} - CH_3$