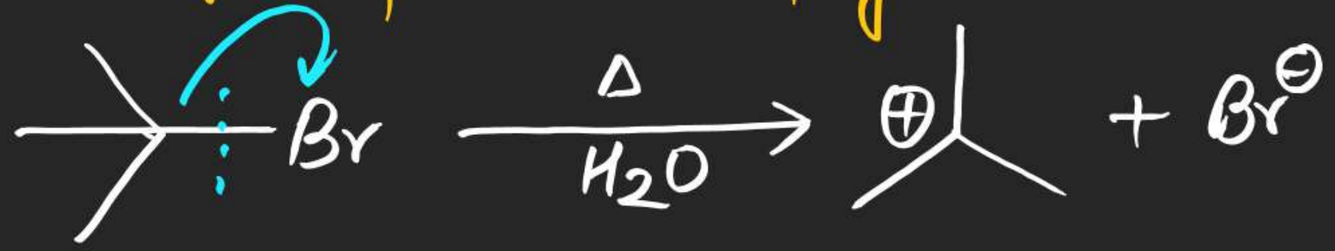
(#) Few Examples of Bond Breaking.

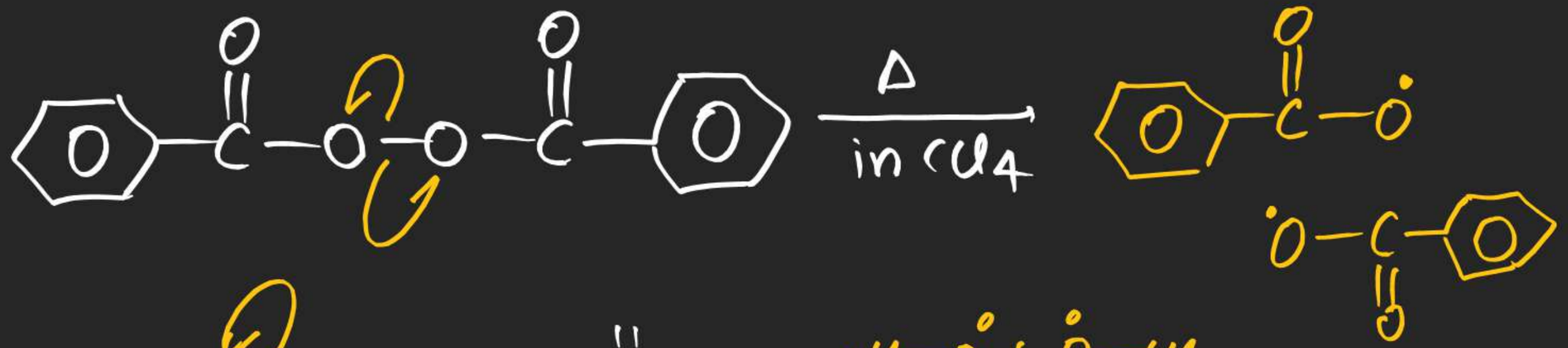
(1) 

(2) 

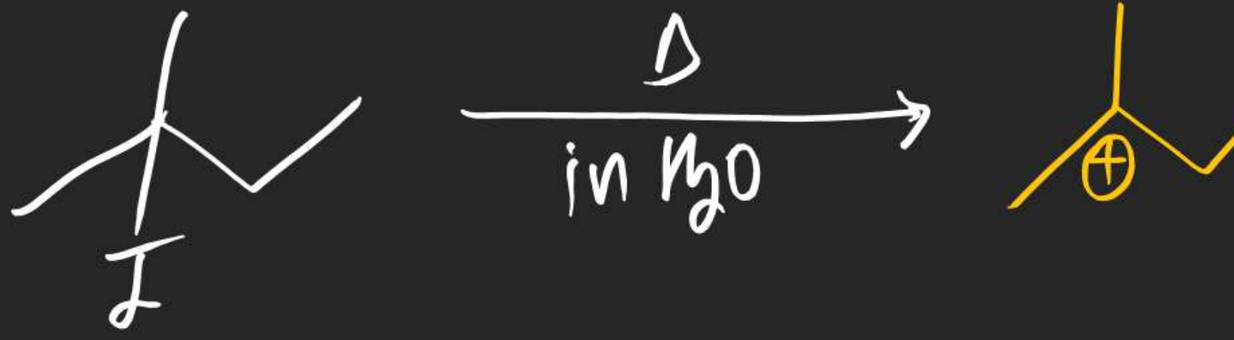
(3) $Cl-Cl \xrightarrow{\nu} Cl^{\bullet} + Cl^{\bullet}$

(4) 

(5) 

(6) 

(7) 

(8) 

Carbocation :-

⇒ Trivalent
⇒ Incomplete octet
⇒ highly unstable
⇒ highly Reactive
⇒ BP = Bond pair = 3
⇒ UP = Un pair = 0
⇒ LP = lone pair = 0
⇒ m.m = magnetic moment = $\sqrt{n(n+2)}$ = 0
⇒ Diamagnetic
⇒ Hybridisation sp^2
⇒ Trigonal planer

Carbon free Radical

⇒ Trivalent
⇒ Incomplete octet
⇒ highly unstable
⇒ highly Reactive
⇒ BP = Bond pair = 3
⇒ UP = Un pair = 1
⇒ LP = lone pair = 0
⇒ m.m = magnetic moment = $\sqrt{n(n+2)}$ = $\sqrt{3}$ BM
⇒ Paramagnetic
⇒ Hybridisation sp^2
⇒ Trigonal planer

Carbanion

⇒ Trivalent
⇒ complete octet
⇒ highly unstable
⇒ highly Reactive
⇒ BP = Bond pair = 3
⇒ UP = Un pair = 0
⇒ LP = lone pair = 1
⇒ m.m = magnetic moment = $\sqrt{n(n+2)}$ = 0
⇒ Diamagnetic
⇒ Hybridisation sp^3
⇒ Pyramidal

Electronic Displacement Effect

- Tempory Effect
  - Inductomeric effect
  - Electromeric effect
- Permanent effect
  - Induction
    - Inductive effect
  - Resonance
    - Resonance effect or mesomeric effect
  - Hyperconjugation
    - Hyperconjugation effect.

Tempory Effect

⇒ Tempory displacement of $\bar{e}$ density due to presence of an External Reagent is known as Tempory effect.

⇒ This effect would disappear in absence of Reagent.

Inductomeric effect: Tempory displacement of σ Bond $\bar{e}$s are known as Inductomeric effect.

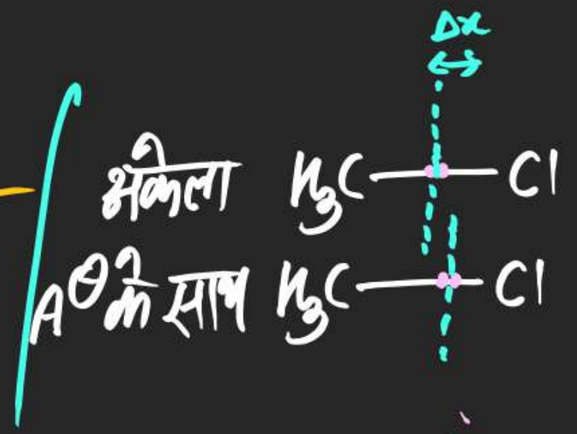
(Ex: अकेला)

$H_3C^{\delta+}-\cdots-Cl^{\delta-}$

$A^{\ominus}$ के Presence में

$A^{\ominus}$ $H_3C^{\delta'+}-\cdots-Cl^{\delta'-}$ (or)

$\delta' > \delta$



(#) Electromeric Effect :-

⇒ Temporary displacement in π $\bar{e}$ density due to presence of an External Reagent.

Ex: (1) $H_2C=CH_2$ अकेला

$\overset{\delta+}{H_2C}=\overset{\delta-}{CH_2}$ (Δx) $\oplus$ B की Presence में

Ex: (2) $\overset{\delta+}{H_2C}=\overset{\delta-}{O}$ $\delta' > \delta$

$A^{\ominus}$ $\overset{\delta+}{H_2C}=\overset{\delta-}{O}$

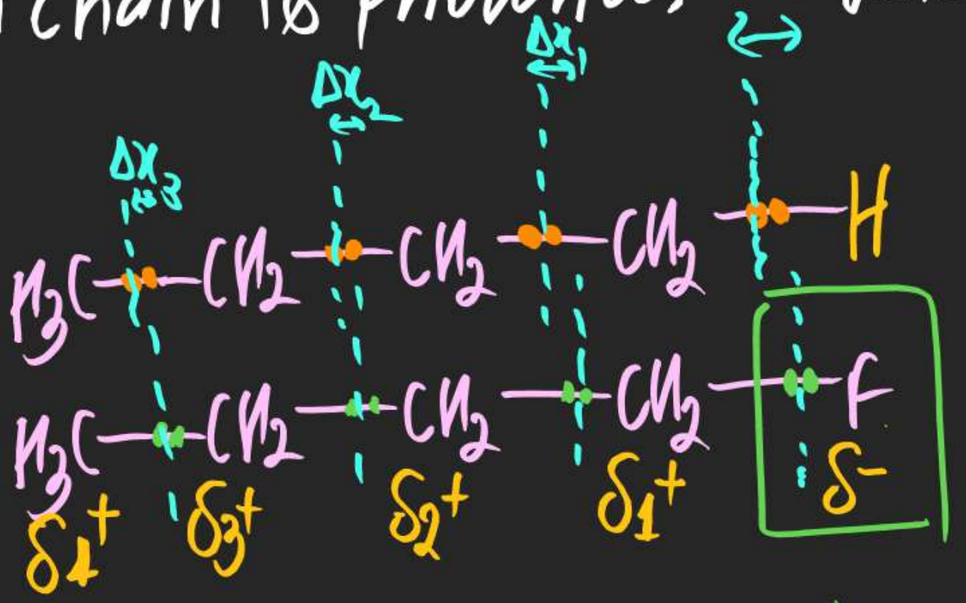
(#) Permanent Effect :-

⟹ These effects due to electronic displacement and always present in molecules always irrespective of conditions.

Inductive effect

⟹ Permanent polarisation of σ e⁻s due to ΔEn of directly attached Atom/group on entire Carbon Chain is known as Inductive effect of that Atom/group.

Ex: Let us Consider a Compound
1-Fluoro Butane



Note :-

(*) $\Delta x > \Delta x_1 > \Delta x_2 > \Delta x_3$

(*) $\delta > \delta_1 > \delta_2 > \delta_3 > \delta_4$

(*) $\delta = \delta_1 + \delta_2 + \delta_3 + \delta_4$

(*) $\delta_4 \simeq 0$ (For Calculation)

(*) I effect distance dependent effect

(*) $>C-H$ Bond is taken as a Reference.

(*) only 10% of effect observed in next Bond

(*) Weak effect (because σ Bond is strong)

(*) I effect takes place due to ΔEn.

Types of Inductive effect:-

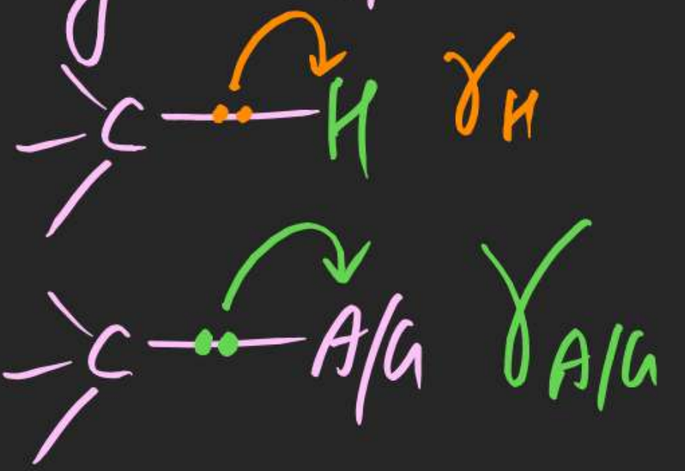
(1) —Inductive effect (-I effect)

Atom/groups which withdraw σ e⁻s are showing -I effect.

OR

It rate of attraction of σ Bond e⁻s By any A/G ($\gamma_{A/G}$) is higher than rate of attraction of same σ Bond e⁻ pair By Hydrogen (γ_H) Then this effect is known as -I effect of A/G

$$\gamma_{A/G} > \gamma_H$$



−I series

(*) Decreasing order of En/group En is known as −I series.

$$-\overset{\oplus}{N}F_3 > -\overset{\oplus}{N}R_3 > -\overset{\oplus}{N}H_3 > -NO_2 > -C\equiv N > -COOH$$

$$> -F > -Cl > -Br > -I > -COOR > -OR$$

$$> -OH > -NH_2 > -\overset{sp}{C}\equiv CH > \text{  } > -\overset{sp^2}{C}H=CH_2$$

+Inductive effect :-

$\Rightarrow$ A/G which are electron donating are known as +I groups.

or

$\Rightarrow$ - - - - -

$$\gamma_{A/G} < \gamma_H$$

+I series decreasing order of Electron donating Tendency.