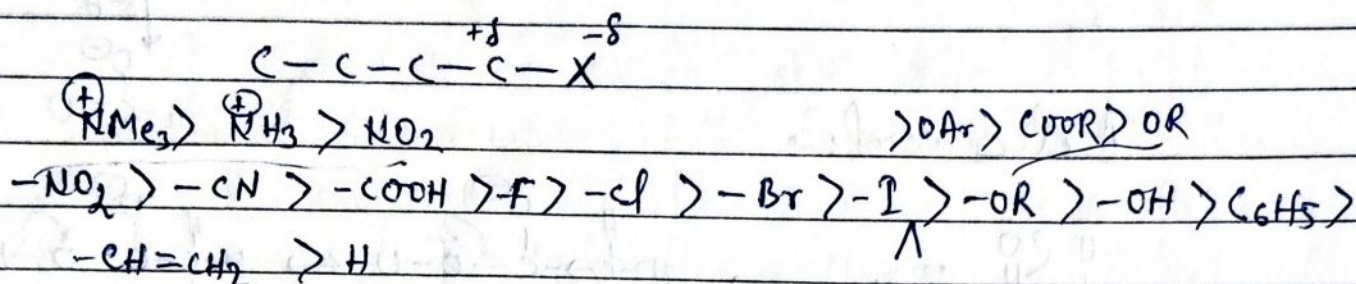


Type of Inductive effect

- (1) $-I$ effect
- (4) $+I$ effect

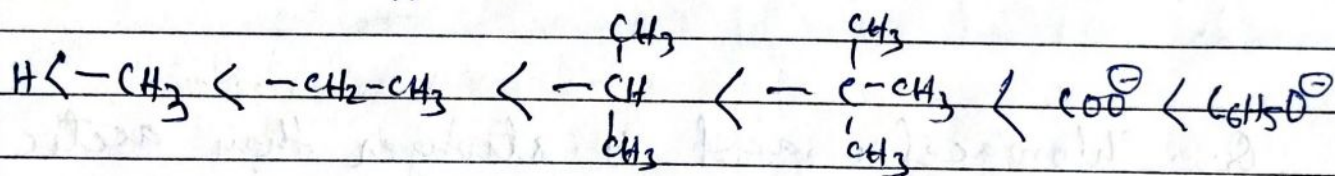
(Electron-attracting)

- (i) -I effect! $\rightarrow$ when any group or atom has electronegativity is higher than H-atom and causes Inductive effect by pulling electron from chain then that Inductive effect is called -I effect.



(electron-repelling)

- (ii) +I effect! $\rightarrow$ when Inductive effect happens due to presence of such atom or group whose electronegativity is lower than H-atom is called +I effect.

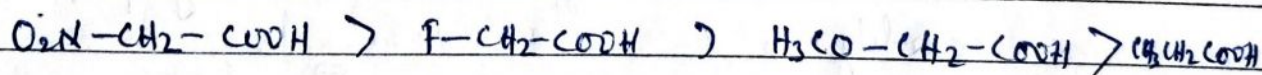


As no. of C-atom increases in alkyl group +I effect increases.

Remark $\rightarrow$ (i) Acidic strength $\rightarrow$

-I effect is directly proportional to acidic strength.

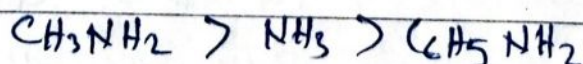
eg $\rightarrow$



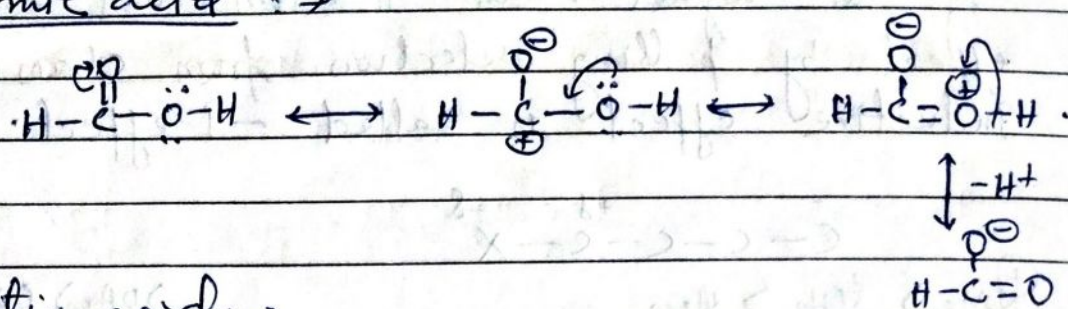
(ii) Basic strength $\rightarrow$

+I effect is directly proportional to basic strength.

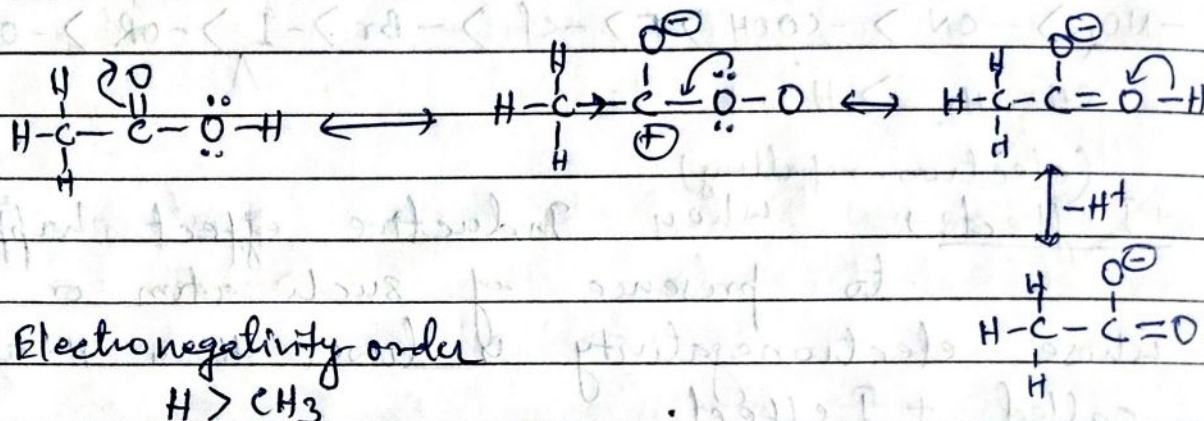
eg $\rightarrow$



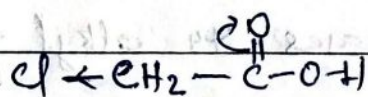
Q. formic acid is stronger than acetic acid?
 Ans → Formic acid →



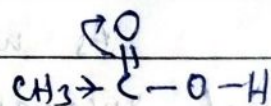
Acetic acid →



Q. Chloroacetic acid is stronger than acetic acid?

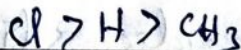


chloroacetic acid

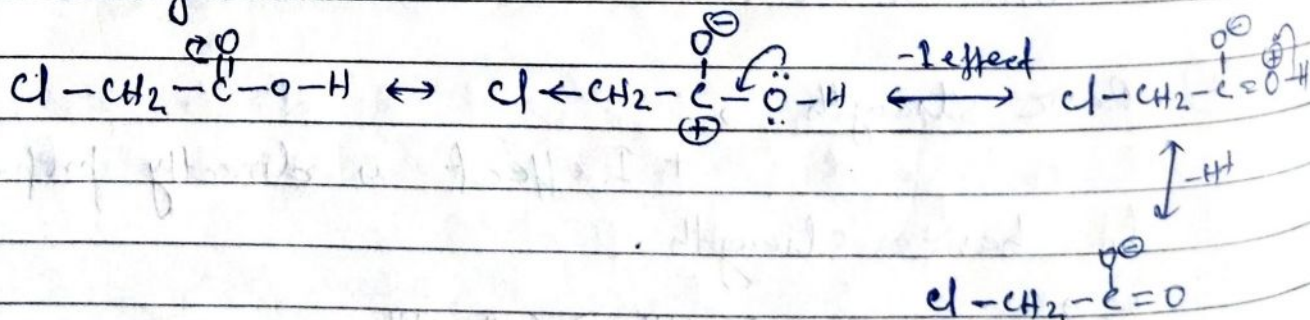


Acetic acid

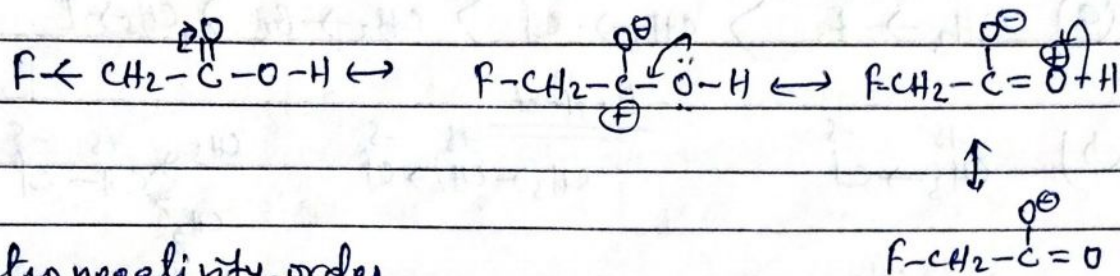
electronegativity order



We know -I effect is directly proportional to acidity.

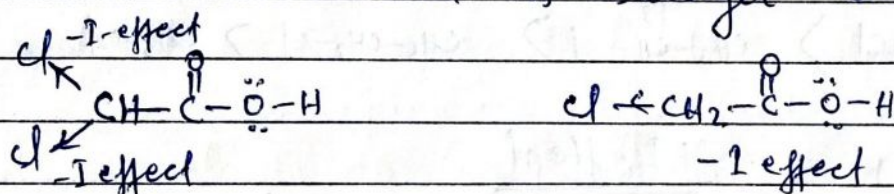


Q. Fluoroacetic acid is stronger than chloroacetic acid
Fluoroacetic acid! →



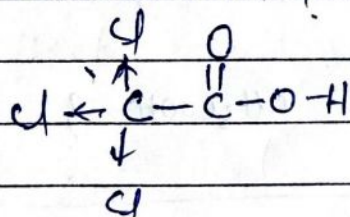
electronegativity order
 $\text{F} > \text{Cl}$

Q. Dichloroacetic acid is stronger than chloroacetic acid?



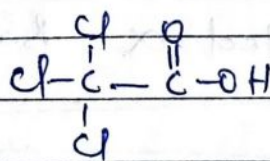
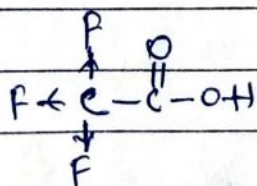
Thus, dichloroacetic acid is more electronegative than chloroacetic acid

Q. ~~Tri~~ Trichloroacetic acid is stronger than dichloroacetic acid?



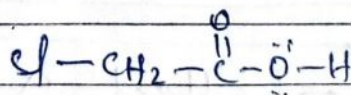
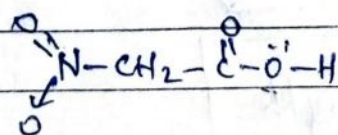
Trichloroacetic acid > dichloroacetic acid

Q. Trifluoroacetic acid is stronger than trichloroacetic acid?



$\boxed{\text{F} > \text{Cl}}$

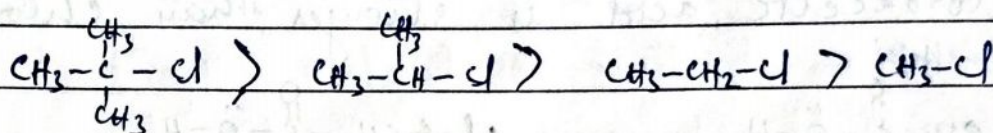
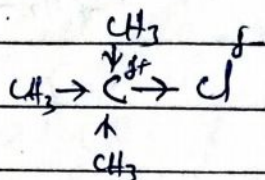
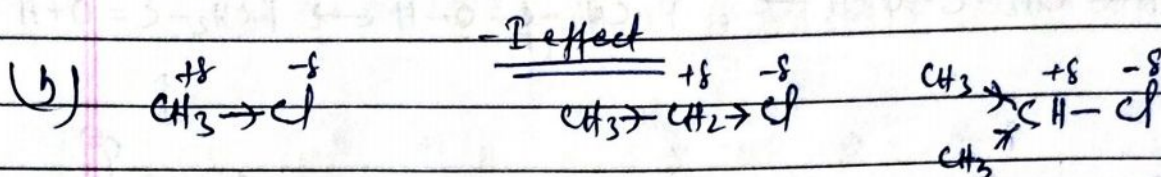
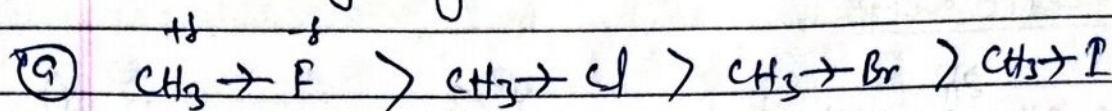
Q. Nitroacetic acid is stronger than chloroacetic acid?



$\boxed{\text{Cl} < \text{NO}_2}$

A hand-drawn diagram of a cell. It is an oval shape with a dashed line on the left side. Inside, there is a smaller circle labeled 'Nucleus' and a larger area labeled 'Cytoplasm'. The entire cell is enclosed in a solid line labeled 'Cell Membrane'.

① Reactivity of alkyl halide : $\rightarrow$



+ I effect

2. Acid strength of carboxylic acid : $\rightarrow$

Q. HCOOH is stronger than acetic acid?

Q. $\text{CH}_3\text{-CH}_2\text{-COOH}$ is weaker than CH_3COOH ?

Q. $\text{Cl}-\text{CH}_2-\text{COOH}$ is stronger than CH_3COOH }

$+I \text{ effect} \propto \frac{1}{\text{Acid strength of carboxylic acid}}$

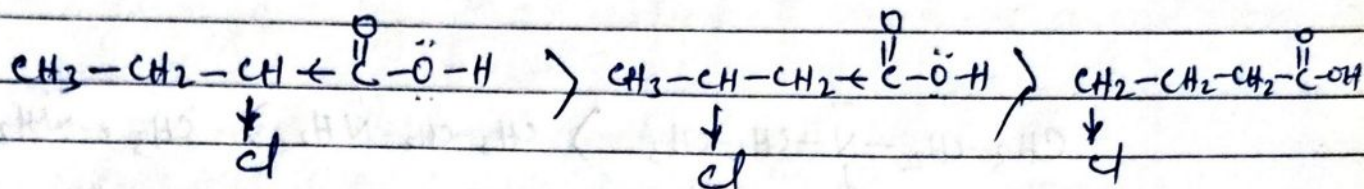
$+ I_{\text{eff}} \propto \text{Basic strength}$

- Effect $\propto$ Acidic strength

Inductive effect $\propto \frac{1}{\text{Acidic strength}}$

*

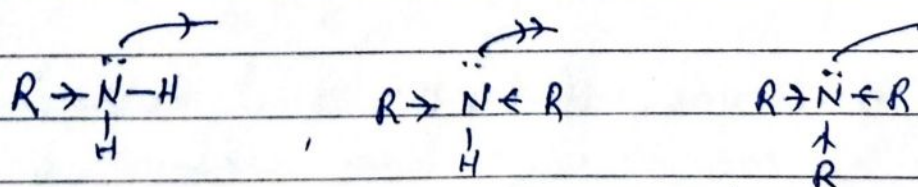
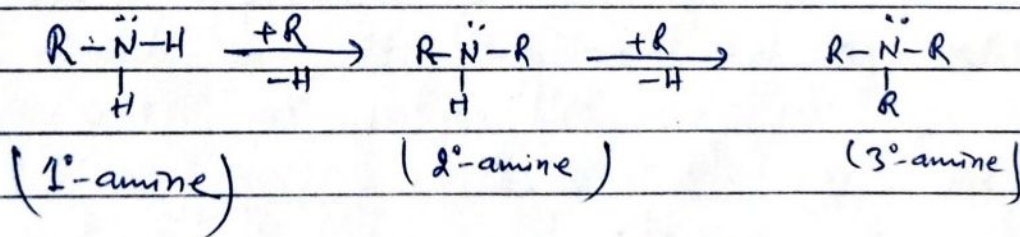
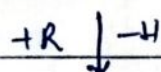
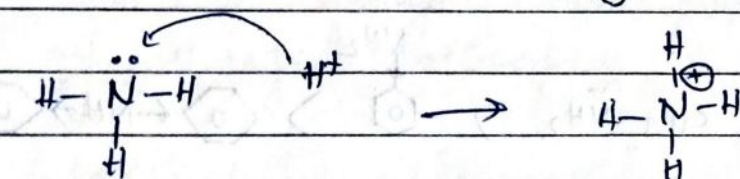
Acid strength also depends upon the relative position of $-COOH$ group: $\rightarrow$



As $-I$ effect causing group becomes far and far from $-COOH$ group strength of carboxylic acid decreases.

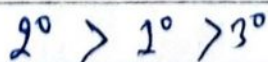
* Effect on bond lengths: $\rightarrow$ $\text{CH}_3 \rightarrow \text{I}$, $\text{CH}_3 \rightarrow \text{Br}$, $\text{CH}_3 \rightarrow \text{Cl}$, $\text{CH}_3 \rightarrow \text{F}$
 bond length $\rightarrow 2.14 \text{ \AA}$, $1.94 \text{ \AA}$, $1.78 \text{ \AA}$, $1.38 \text{ \AA}$
 decreasing bond length $\rightarrow$

* Basic strength of organic bases $\rightarrow$



Basic strength decreasing order $\rightarrow$

Due to molecular over crowding i.e bulky compds. thus $3^\circ < 1^\circ$



Thus,

