GOC

Basics :- Sara khel electron density ka hai.

$$\boxed{\text{Electron density} \propto \frac{1}{\text{size}}}$$

E.g :- Size :- $C > N > O > F$

Electron density :- $C^\ominus < N^\ominus < O^\ominus < F^\ominus$

$$\boxed{\text{Electron density} \propto (-ve) \text{ charge} \propto \frac{1}{(+ve) \text{ charge}}}$$

E.g :- Electron density :- $A^{3-} > A^{2-} > A^- > A > A^+ > A^{2+}$

Inductive effect

- Operate to sigma bond.
- Partial charge development.
- Distance dependent effect.
- Can be neglected after 3rd 'C'-atom.

$\Rightarrow$ Power of Inductive effect

$\Rightarrow$ +I Power :- (e⁻ donating grp)

- $-\overset{\ominus}{C}H_2 > -\overset{\ominus}{N}H > -\overset{\ominus}{O} > -COO > 3°R > 2°R > 1°R > -Me$

- $-T > -D > \boxed{H} \rightarrow$ No inductive (zero)

$\Rightarrow$ -I group :- (e⁻ withdrawing grp)

$-\overset{+}{N}f_3 > -\overset{+}{N}R_3 > -\overset{+}{S}R_2$

Na farhan   Na ritik   shahrukh

$-NH_3 > -NO_2 > SO_3H > -CN >$

Na himesh Na ompuri Salman cyna

$-CHO > -COOH > -F > -Cl > -Br >$

ali   ki   car me father collector Beta

$-I > -OR > -OH > -C\equiv CH >$

Inspector aur Alcohol ki mummy Alkyne

$-NH_2$ or $NR_2 > -Benz > Ene > H$

nahi hai   Benz ene   hai

Applications

① To compare Acidic strength of Aliphatic carboxylic Acid
without Benzene ring ← (openchain cycloalkane)

$\Rightarrow$ OP Point :-

① $$\boxed{A.S \propto [H^+] \propto Ka \propto \frac{1}{PH} \propto \frac{1}{pka}}$$

$\boxed{-I} - \overset{\overset{O}{||}}{C} - O - H \rightleftharpoons \boxed{-I} \leftarrow \overset{\overset{O}{||}}{C} \leftarrow O^{\ominus} + H^{\oplus}$

good Acid   More stable
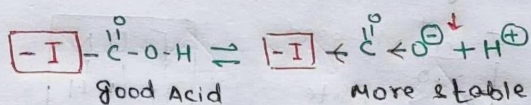
$\boxed{A.S \propto -I \propto \frac{1}{+I}}$ $\boxed{\begin{array}{l}-I \text{ stabilizes anion} \\ +I \text{ destabilizes anion}\end{array}}$

② $\underset{\text{Distance}}{D} > \underset{\text{Number}}{N} > \underset{\text{Power}}{P}$ $\boxed{\text{DNP}}$ Trick
DO NOT PLAY

② To compare A.S of Alcohols

$\boxed{-I} - O - H \rightleftharpoons \boxed{-I} - O^{\ominus} + H^{\oplus}$
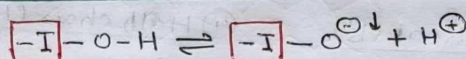
$\boxed{A.S \propto -I \propto \frac{1}{-I}}$ → same as carboxylic Acid.

③ To compare Basic strength of Amines

$$\boxed{B.S \propto +I \propto \frac{1}{-I}}$$

$\underset{1°}{R-NH_2}$ $\underset{2°}{R_2NH}$ $\underset{3°}{R_3N}$
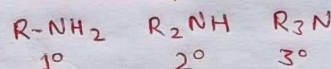
In gas phase :- $3° > 2° > 1°$

In aquous medium :- R = me $(2° > 1° > 3°)$
R = Et $(2° > 3° > 1°)$

onwards → R = prop, but ... etc
↳ Always $[3° > 2° > 1°]$

According to solvation :- $[1° > 2° > 3°]$
According to +I effect :- $[3° > 2° > 1°]$

④ To compare stability of Carbocations

$\boxed{+I} \rightarrow \overset{\oplus}{C} \leftarrow \boxed{+I}$ $\boxed{\text{Stability} \propto +I \propto \frac{1}{-I}}$
         ↑   (c+)
      $\boxed{+I}$
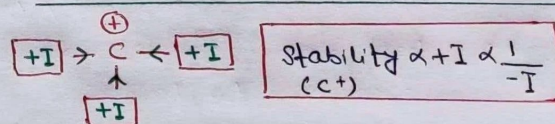
⑤ To compare stability of carboanions

$\boxed{-I} \leftarrow \overset{\ominus}{C} \rightarrow \boxed{-I}$
         ↓
      $\boxed{-I}$ $\boxed{\text{stability} \propto -I \propto \frac{1}{+I}}$
                            (c-)