~~Acidic Strength & Strength~~ acid - lec 7

In case of Carboxylate ion negative charge is delocalised over two more electronegative oxygen atom, whereas it is less effectively delocalised over one oxygen atom and less electronegative carbon atoms in phenoxide ion. Hence Carboxylate ion is more stabilised rather than phenoxide ion, so phenol is less acidic than Carboxylic acid.

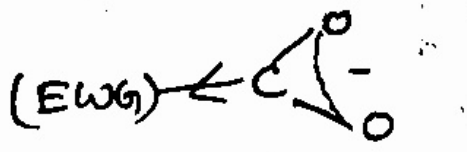
iii). Inductive effect:

Inductive effect are of two types

i) –I effect (It is due to electron withdrawing group)

ii) +I effect (It is due to electron releasing group)

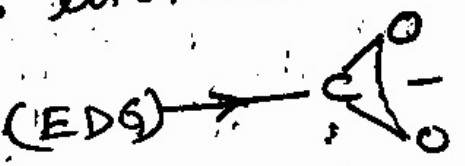
We know, As –I effect increases or the no. of electron withdrawing group increases acidic Strength of Carboxylic acid increases, and as +I effect or no. of electron releasing group (i.e alkyl group) increases in Carboxylic acid acidic Strength decreases and base Strength increases.



–I effect

(acidic Strength increases)

(H+ ion from COOH can be released easily)



+I effect

(Acidic Strength decreases)

(H+ ion from –COOH group can not be released easily)

Electron withdrawing group (EWG) which causes −I effect or acidic strength (enhancing) is as follows:-

Ph < I < Br < Cl < F < CN < NO_2 < CF_3

Comparision of acidic strength of some molecules on the basis of −I effect & +I effect are as follows:-

i) $HCOOH < CH_3COOH$

+I effect is more in CH_3COOH due to presence of CH_3 group so acidic strength of $CH_3COOH < HCOOH$

ii) $CH_3COOH < Cl\cdot CH_2\cdot COOH$

due to presence of Cl in $Cl\cdot CH_2\cdot COOH$ −I effect is more, so $Cl\cdot CH_2\cdot COOH > CH_3COOH$.

iii) $F\cdot CH_2\cdot COOH > Cl\cdot CH_2COOH > Br\cdot CH_2COOH$

due to more −I effect in F > Cl > Br, $F\cdot CH_2COOH > Cl\cdot CH_2\cdot COOH > Br\cdot CH_2\cdot COOH$.

iv) $Cl\cdot CH_2\cdot COOH < Cl_2\cdot CH\cdot COOH < Cl_3\cdot C-COOH$

due to increased no. of Cl or more −I effect

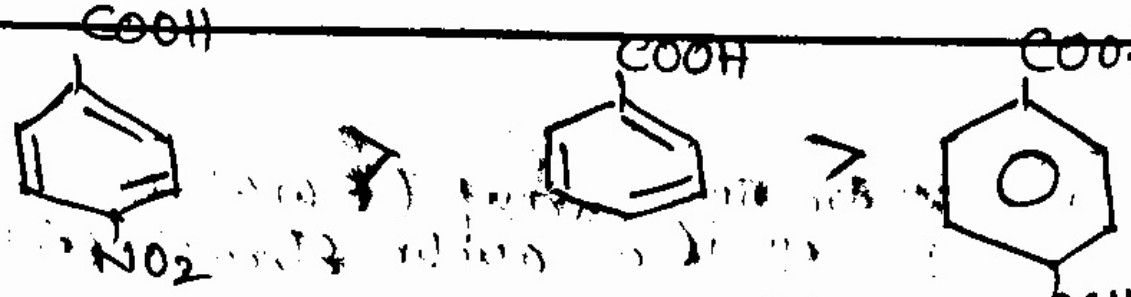
$Cl_3\cdot C\cdot COOH > Cl_2\cdot CH\cdot COOH > Cl\cdot CH_2\cdot COOH$.

v) $CF_3\cdot COOH > CCl_3\cdot COOH > CHCl_2\cdot COOH > NO_2\cdot CH_2\cdot COOH$.

2nd is due to −I effect of CF_3, CCl_3, $CHCl_2$, $NO_2\cdot CH_2$,

vi) $C_6H_5COOH > C_6H_5CH_2COOH$.

Teacher's Signature : _____



NO_2 is greater e withdrawing grp show −I effect

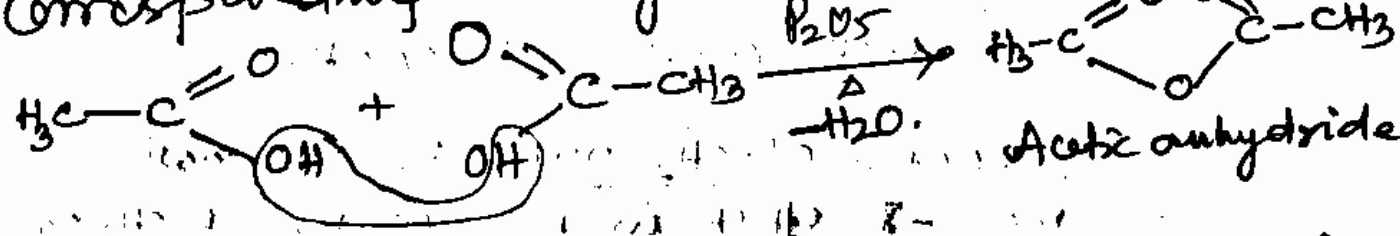
No EWG group

OH, N, EDG, shows +I effect.

Hence EWG increases −I effect or acidic strength whereas EDG decreases +I effect or decreases acidic strength of carboxylic acid.

(B) Reactions involving cleavage of C−OH bond :→

1) Reaction ~~with~~ in presence of dehydrating agent like P_2O_5 two mols of carboxylic acid combine togather by releasing water molecule & form corresponding anhydrides.



2) Esterification :→

When carboxylic acid react with alcohol in presence of some drops of conc. H_2SO_4 (as dehydrating agent) it form ester & water, this reaction is called Esterification reaction. In presence of water this reaction is reversible reaction Thats why water is absorbed in presence of conc. H_2SO_4 and the reversibility of the reaction is prevented