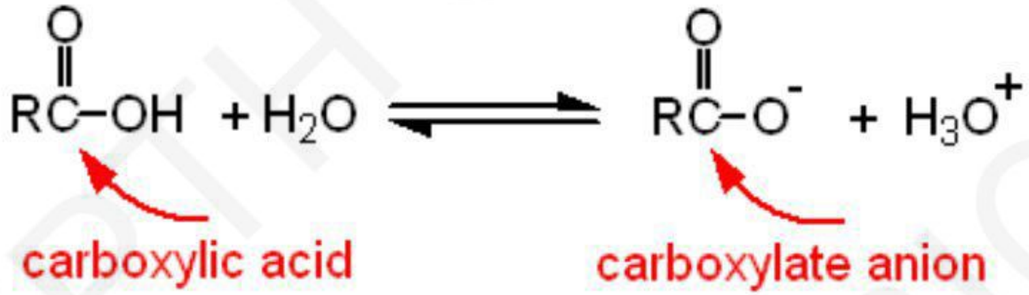
ACIDITY OF COOH

If we dissolve an acid in H_2O ; the acid is the proton donor



The tendency to loose proton of an acid is termed as acidity

PKa

value of H_2SO_4= -3

Acid dissociation constant

Ka value = acidity increase

Pka value = basicity increase

Hence, Pka= -log Ka

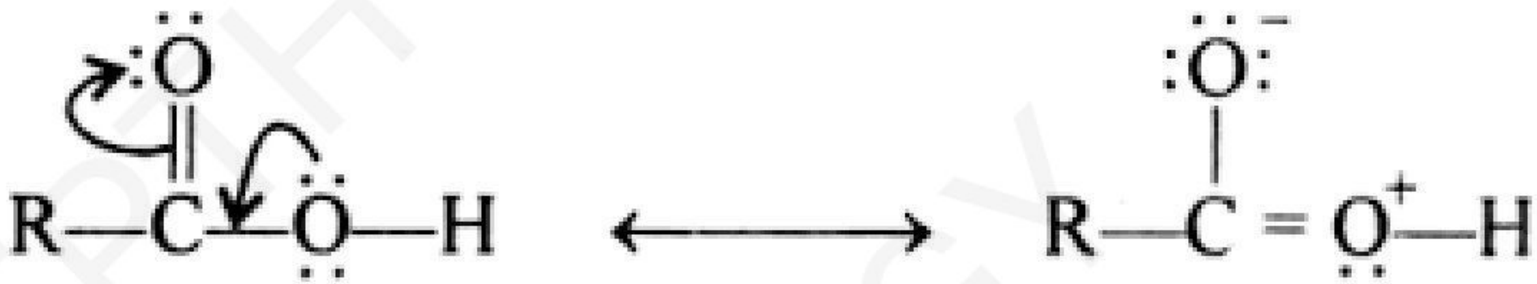
$$Pka \propto \frac{1}{acidity} \quad \text{OR} \quad Pka \propto acidity^{-1}$$

If Pka decrease then acidity increase

Pka value of ethanoic acid=4.7

(it is less acidic due to more Pka value as compared to H_2SO_4

- COOH acidity is less as compared to H_2SO_4
- COOH acidity is more as compared to alcohol (R-OH)



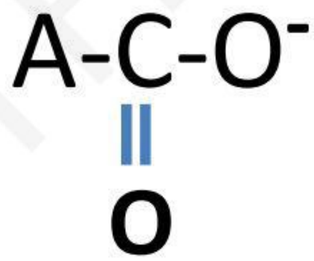
- They have the ability to show resonance & gain stability but it is not shown in alcohols [DEPTH OF BIOLOGY]
- Lesser the Pka greater the acidity {COOH=4-5}
  {OH=14-16}
- COOH ionise faster than OH
- Ionisation of Oh produce anion & there is no delocalisation of charge [DEPTH OF BIOLOGY]
- Electron withdrawing effect of carbonyl carbon weakens the bond OH bond & facilitate ionisation of COOH & compared to OH

[DEPTH OF BIOLOGY]

EFFECT OF SUBSTITUENT ON THE ACIDITY OF COOH

- Acidity of COOH is due to good resonance in carboxylate ion [DEPTH OF BIOLOGY]
- Some compound change the acidity of COOH

➢ Increase due to substitution of electron withdrawing group	➢ Decrease due to substitution of electron donating group



-I	A is Electron withdrawing group
+I	A is Electron donating group

a. If A is electron withdrawing group-

It decreases magnitude of negative charge & help to remove H+ ion.

Increases the stability of COOH ion

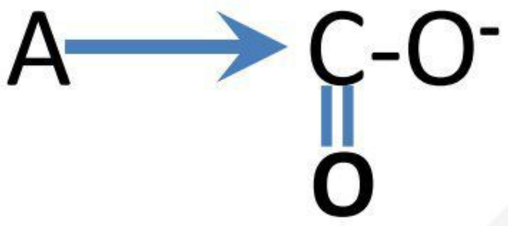
Then increase in acidity [DEPTH OF BIOLOGY]

b. If A is electron donating group-

It increase magnitude of negative charge

Decrease stability of COOH ion

Thus decrease acidity



[DEPTH OF BIOLOGY]

- Eg- depend on substituents also-

CCl_3COOH > CH_3COOH [DEPTH OF BIOLOGY]

Pka =0.64 Pka=4.74

Depends on distance also-

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2.86 4.52 [DEPTH OF BIOLOGY]

Much closer effect of Cl ↓ effect of Cl so

So acidity increase acidity decrease

[DEPTH OF BIOLOGY]

Pka= 4.4

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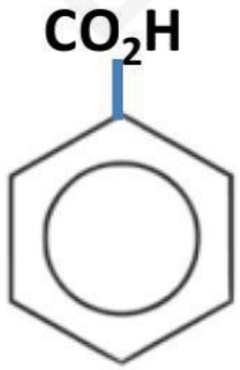

Pka= 4.2

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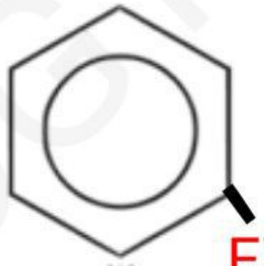
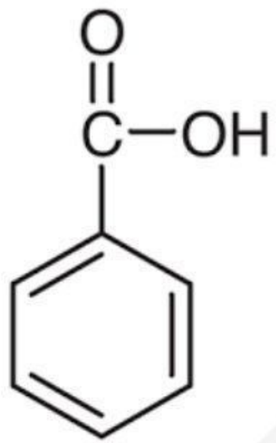


Pka= 3.8



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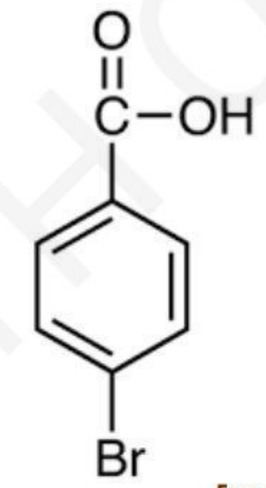

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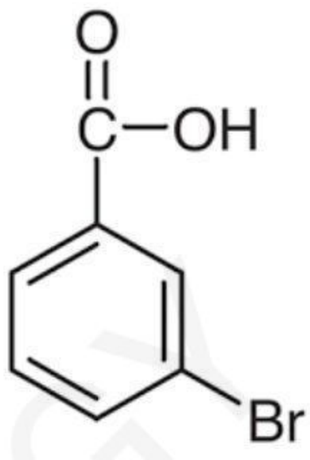

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