class – B.Sc. Part I (subsidiary)
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Electromeric effect

A temporary effect which cause extra polarity on atoms joined by a multiple bond (= or ≡) bond owing to a complete transfer of electron pair to one or the other atom under the influence of an electrophile is known as electromeric effect. It is indicated by E and represented by a curved arrow (↷) showing the shifting of electron pair.

$$A = B \longrightarrow A^{+} - B^{-}$$

$$A \equiv B \longrightarrow A^{-} - B^{+}$$

In this example the molecule A–B which has been joined by a double bond under the influence of an electrophile developing polarity by shift of electron from A to B or vice-versa.

The electromeric effect is not independent on the electronegative of the atom –

concerned. The direction of the shift of electron pair can be decided on the basis of following steps! –

(a) when the groups linked to a multiple bond are similar, the shift can occur to either direction. e.g! – In ethylene molecule the shift can occur to any one of the carbon-atoms.

$$H_2C=CH_2 \longrightarrow H_2\overset{+}{C}-\overset{-}{\ddot{C}}H_2$$

$$H_2\overset{-}{C}=CH_2 \longrightarrow H_2\overset{-}{\ddot{C}}-\overset{+}{C}H_2$$

(b) while the dissimilar gr. are linked on the two ends of the double bond, the shift is decided by the direction of inductive effect. e.g – In propylene molecule the shift can be occur in the following manner! –

$$CH_3-CH=CH_2 \longrightarrow CH_3-\overset{+}{C}H-\overset{-}{\ddot{C}}H_2 \quad \text{—— (i)}$$

$$CH_3-\overset{-}{C}H=CH_2 \longrightarrow CH_3-\overset{-}{\ddot{C}}H-CH_2 \quad \text{—— (ii)}$$

Due to electron repelling nature of methyl gr. the electronic shift occurs according to eqn (i) and not by eqn (ii)

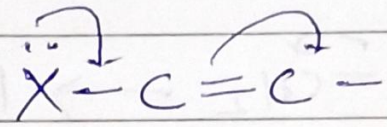
There are two types of electromeric effect +E effect and −E effect

when the transfer of electrons takes place towards the attacking reagent, the effect is called +E effect.

While the transfer of electrons takes place away from the attacking reagent, the effect is called −E effect.

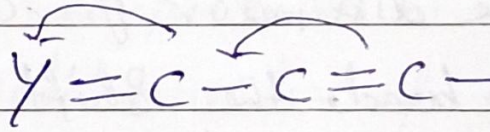
e.g. :—

<u>+E effect</u>



Displacement away from atom X

<u>−E effect</u>



Displacement towards group Y