

class - SEM-I [U.G.]

Paper - MJC - 1 [T]

Unit - 03

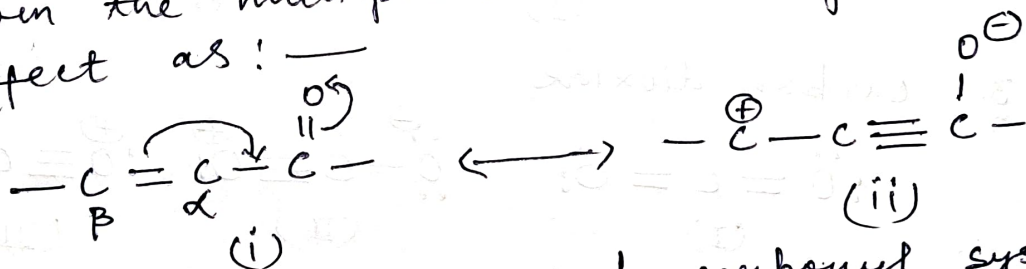
Topic - RESONANCE OR MESOMERIC EFFECT

Name :- DR VANDANA KUMARI
Dept. of chemistry

RESONANCE OR MESOMERIC EFFECT

"Resonance or Mesomerism involves displacement of electrons. The effects caused by the phenomena of resonance or Mesomerism in a molecule or an ion is called Resonance or Mesomeric effect."

This is particularly important in systems with an extended conjugation of multiple bonds such as polyenes, α, β -unsaturated carbonyl compounds, benzenoid compounds etc. when group such as $>C=O$, $-NO_2$, $-C \equiv N$, $-COOR$, etc are adjacent to a multiple bond, they withdraw π -electrons from the multiple bond through R or M-effect as:



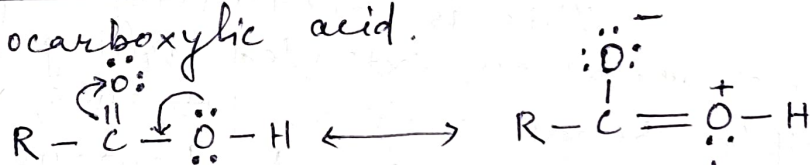
The α, β -unsaturated carbonyl system is thus a resonance hybrid of structure I & II.

If a compound having a certain molecular formula can be represented by different structural formulae which differ only in the arrangement of the electron pairs and not of the atoms, such like structures are called resonating or contributing or canonical structures and the phenomenon is known as Resonance. The compound cannot be represented completely by any of the resonating or contributing structures but by a mixture of all of them which is called Resonance hybrid (cannot be actually represented).

Resonance is indicated by the sign $\longleftrightarrow$.

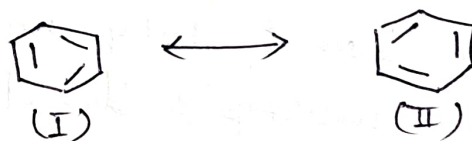
Examples of Resonance :

1. Monocarboxylic acid.

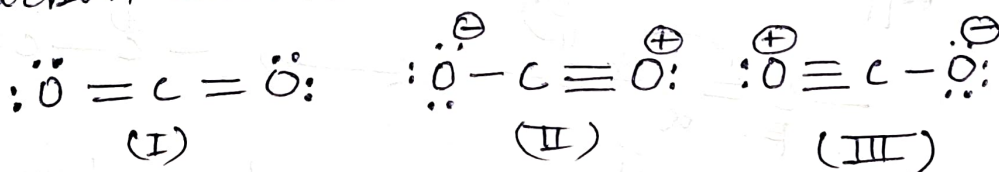


Acidic character of monocarboxylic acid is explained with the help of Resonance.

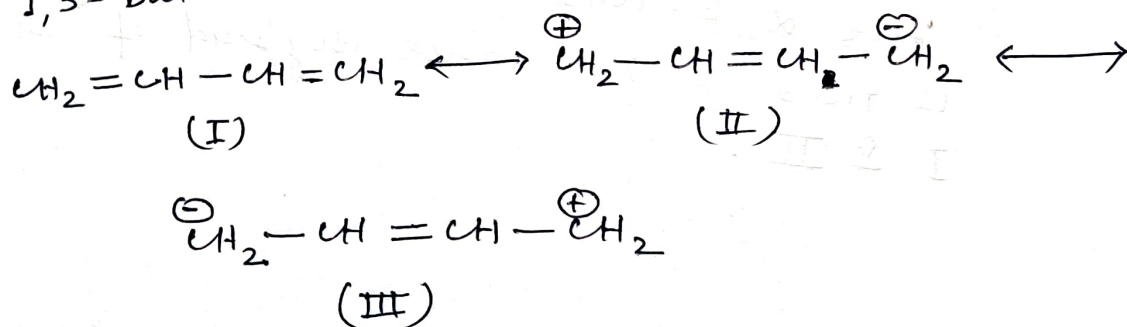
2. Benzene.



3. Carbon dioxide.



4. 1,3-butadiene.



Types of Resonance :

(i) Groups having electron-withdrawing resonance effect [-M OR -R Effect]:

Groups such as $-\text{NO}_2$, $>\text{C}=\text{O}$, $-\text{C}\equiv\text{N}$, $-\text{COOH}$, $-\text{COOR}$, etc. tend to withdraw electrons from the adjacent carbon-carbon multiple bonds through Resonance or Mesomerism are said to cause -M OR -R effect.

(ii) Groups having electron releasing resonance effect [+M OR +R Effect]:

Groups such as $-\ddot{\text{N}}\text{H}_2$, $-\ddot{\text{N}}\text{HR}$, $-\ddot{\text{O}}\text{H}$, $-\ddot{\text{O}}-\text{R}$, $-\ddot{\text{Cl}}$, etc. which can release or donate electrons through resonance are said to cause +M OR +R effect.

Applications of Resonance Effect :

1. Explanation for the Acidic character of carboxylic acids, Phenols
 2. comparison of relative basic strength of
 - a. ethyl amine and acetamide
 - b. ethyl amine and aniline
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