

Unit 2: Active Methylene compounds.

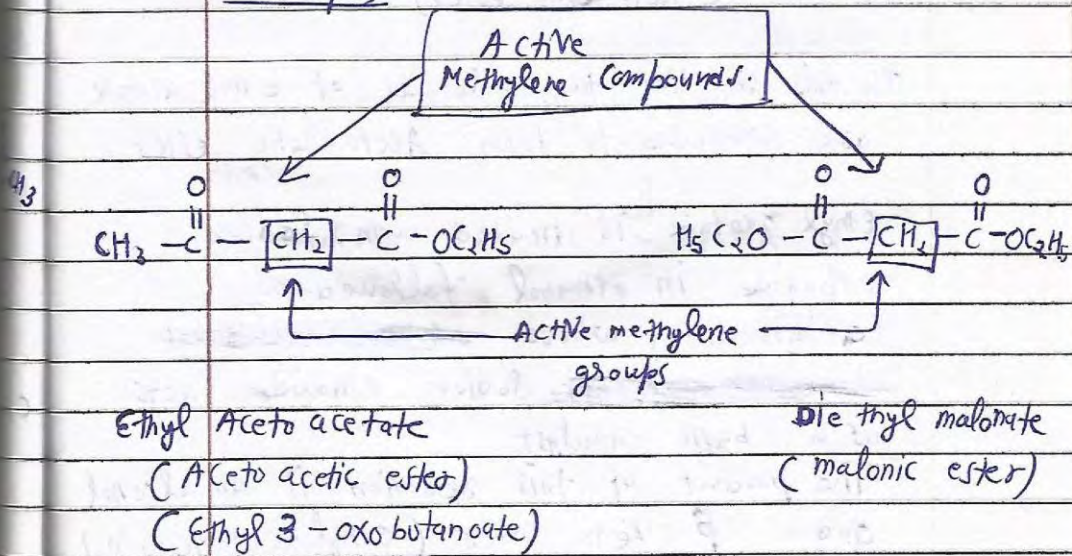
● Active Methylene compounds :-

Definition :-

The class of compounds which contain a methylene group (-CH₂-) directly bonded to the two electron withdrawing groups such as -COCH₃, -COOC₂H₅, -CN are called as "Active methylene compounds".

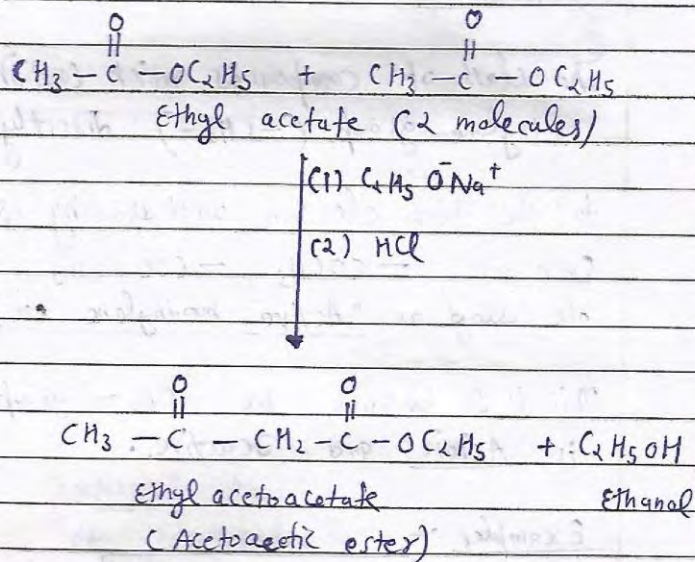
This is so because, the -CH₂- group in them is Acidic and Reactive.

Examples :-



● Preparation of Acetoacetic ester :-

Claisen-ester condensation :-



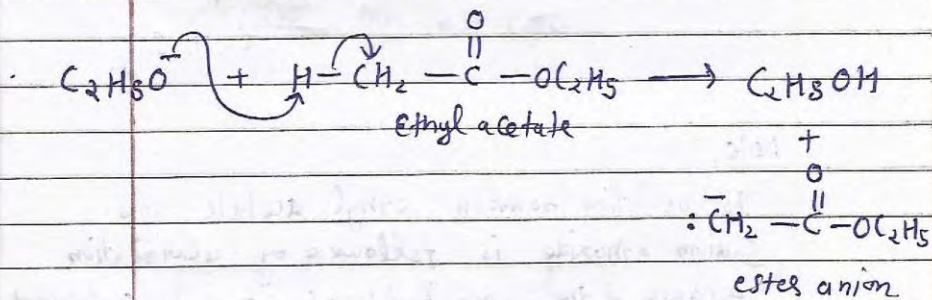
In this reaction two molecules of ethyl acetate are condensed to form Acetoacetic ester.

Ethyl acetate is heated with Sodium ethoxide in ethanol, followed by acidification, where ~~ethoxide~~ ~~acts~~ ~~as~~ ~~a~~ ~~catalyst~~. Sodium ethoxide acts as a basic catalyst.

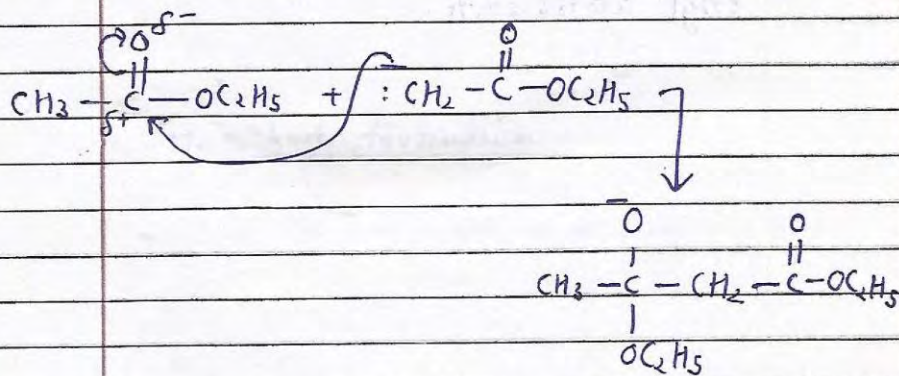
The product of this reaction is an alcohol and a β -keto ester (ethyl acetoacetate).

Mechanism of the reaction :-

Step 1 :- Ethoxide ion (from $C_2H_5O^-Na^+$) attacks ethyl acetate to give ethyl alcohol and the ester anion.



Step 2 :- ester anion attacks the carbonyl group of a second molecule of ethyl acetate.



● Synthetic Uses of Ethyl Aceto Acetate (EAA) :-

Ethyl aceto acetate or say Aceto acetic Ester can be used to synthesize so many compounds, due to its reactivity, provided by the active methylene group $-\text{CH}_2-$.

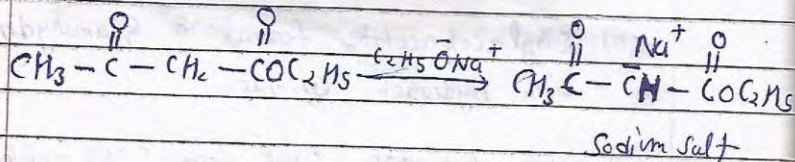
It can be used to synthesize two classes of compounds :-

- (i) Carboxylic Acids
- (ii) Ketones.

few examples are :-

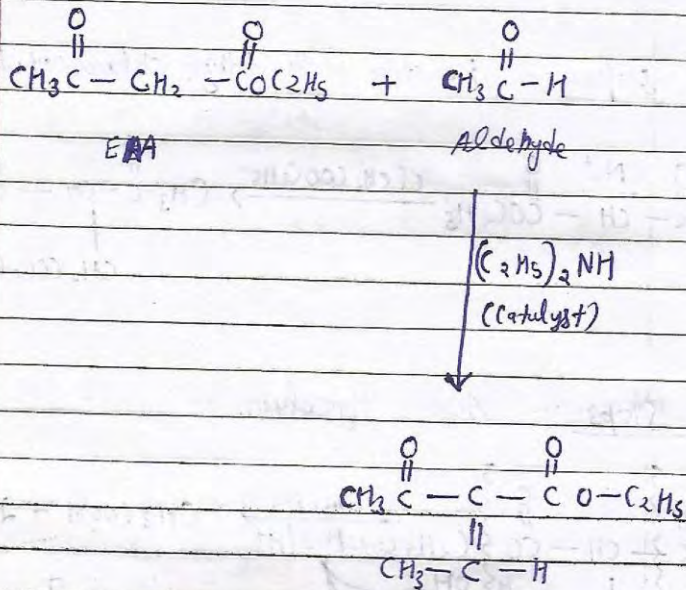
① Synthesis of Alkyl acetic acids (carboxylic acid) :-

Step 1 - Formation of Sodium Salt of the ethyl acetoacetate :-



④ Synthesis of α, β -unsaturated
Acids (Crotonic acid) (Carboxylic acid):-

Step 1 :- Reaction of ethylacetoacetate
 with aldehyde, catalysed by a base



Step 2 - Acidic Hydrolysis :-

