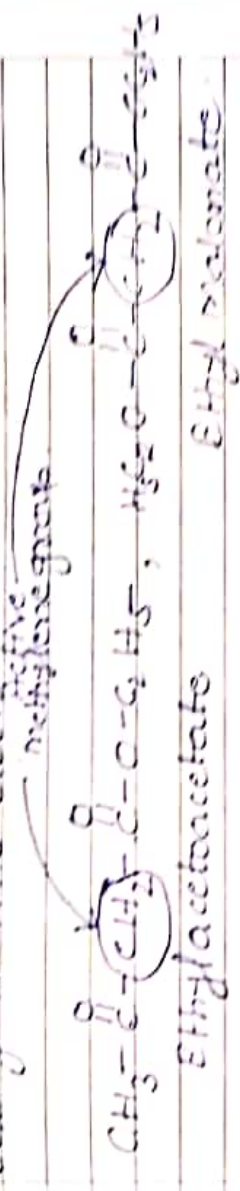


Active Methylene Compounds: →

The compounds which contain a methylene group (-CH<sub>2</sub>) directly bonded to two electron withdrawing groups such as -COCH<sub>3</sub>, -COOCH<sub>3</sub>, -CN, etc. called Active methylene compounds. This is because the -CH<sub>2</sub> group in them is acidic and reacts. Ethyl acetoacetate and dimethyl malonate belong to this class.



Ethyl Acetoacetate (EAA), CH<sub>3</sub>COCH<sub>2</sub>COCH<sub>3</sub>: →  
 of acetoacetic acid, CH<sub>3</sub>COCH<sub>2</sub>COOH. It is commonly called Acetoacetic ester. Its IUPAC name is Ethyl 3-oxobutanoate. Acetoacetic ester is one of the most valuable reagents in synthetic chemistry.

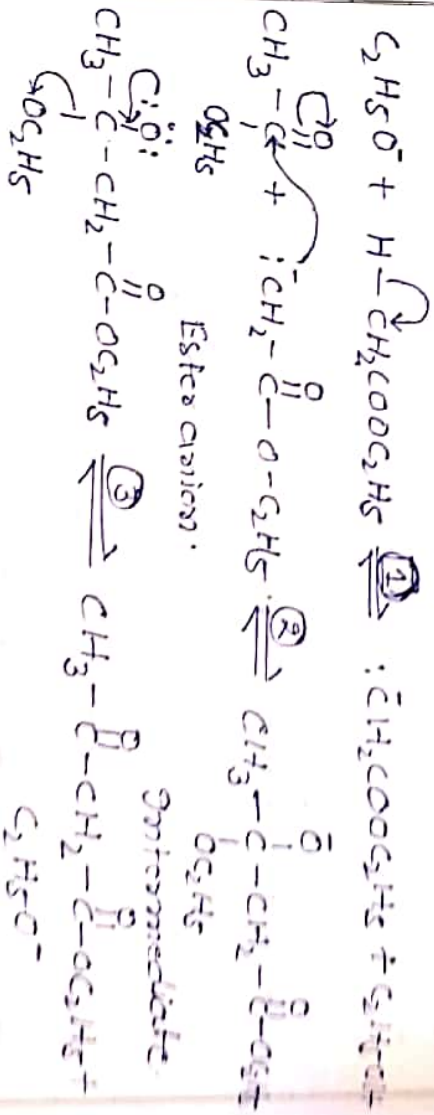
PREPARATION: →  
 When ethyl acetate is heated in the presence of sodium ethoxide and then acidified, ethyl acetoacetate is formed.



This reaction is an example of a condensation reaction known as Claisen condensation. In this reaction, condensation involves the combination of two molecules of ester that have an  $\alpha$ -hydrogen in the presence of

The mechanism of Claisen condensation which gives ethyl acetoacetate consists of three steps.

- 1) Formation of ester anion by reaction by reaction with  $C_2H_5O^-$  furnished by sodium ethoxide ( $C_2H_5O^-$ ) carbon of the second molecule of ethyl acetate.
- 2) Nucleophilic attack of the ester anion on the carbonyl carbon of the  $\beta$ -keto ester, ethyl acetate.
- 3) Elimination of  $C_2H_5O^-$  leading to the formation of the  $\beta$ -keto ester, ethyl acetate.



Properties:

Ethyl acetoacetate is colorless pleasant smelling liquid, boiling point  $180.4^\circ C$ , density  $1.0252$ . It is sparingly soluble in water but freely soluble in organic solvent. It is neutral to litmus. Ethyl acetoacetate is in fact a tautomeric mixture of keto and eno forms.



Thus it gives the reactions of the various functional groups present in the two forms. Here we will discuss only those reactions which make ethyl acetoacetate a useful synthetic reagent.