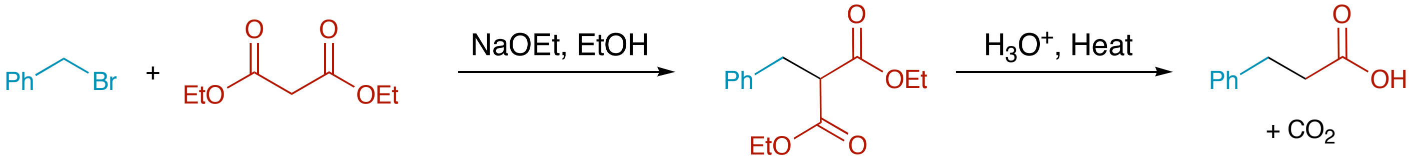
Chem 342

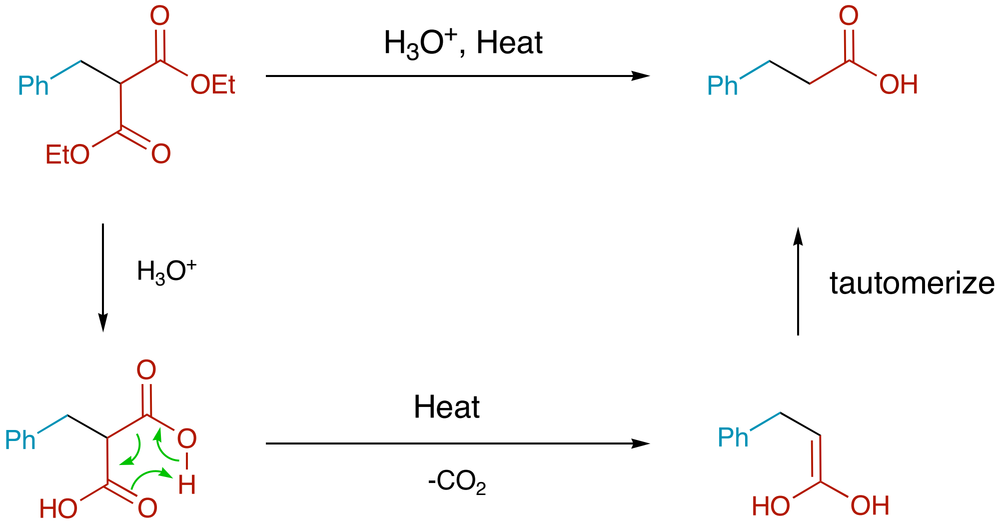
Lecture Summary 33
April 21, 2004

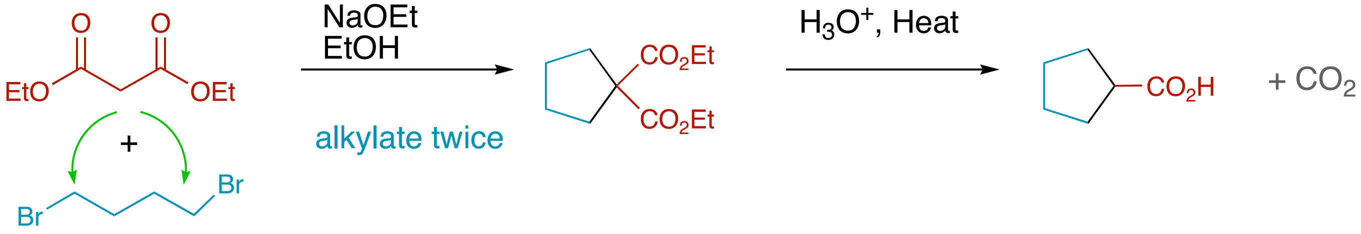
Chapter 22 - Carboxylic Alpha-Substitution Reactions

Malonic Ester Synthesis

1,3-Diester compounds are useful for preparing carboxylic acids where two additional carbons have been added. If the product of the alkylation is hydrolyzed to the diacid and heated, one of the carboxylic acids cleaves and comes off as CO_2. This only happens if a carboxylic acid is next to another carbonyl group separated by one carbon. Below is an example using this reaction with a dialkylation to make a new ring.

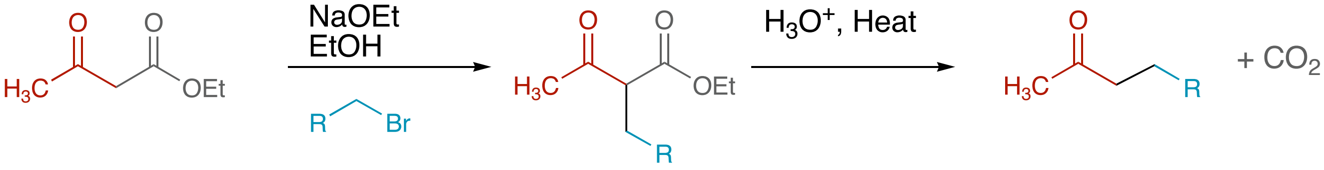


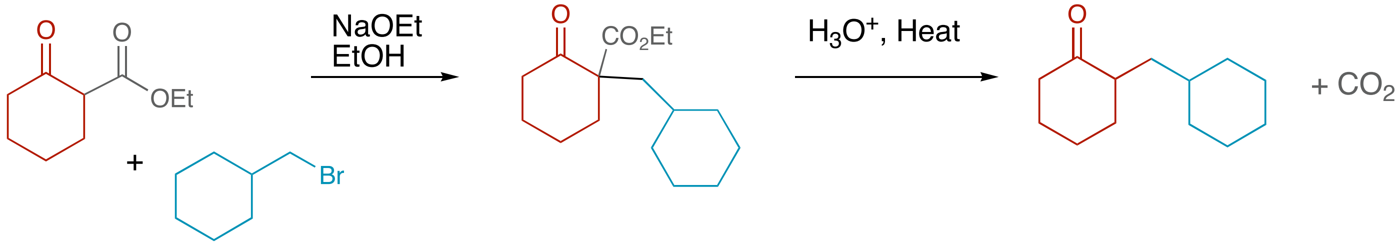




Acetoacetic Ester Synthesis

Identical to the malonic ester synthesis, if one of the carbonyls is a ketone instead of an ester, you can add the equivalent of acetone to an alkyl halide. Note that only the Carboxylic Acid part cleaves off in the end, not the Ketone part.

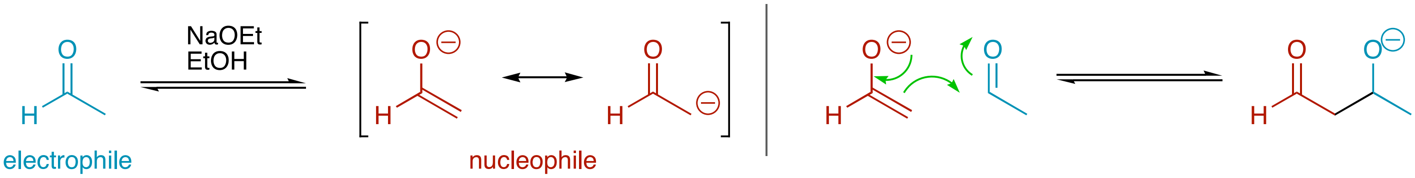




Chapter 23 - Carbonyl Condensation Reactions

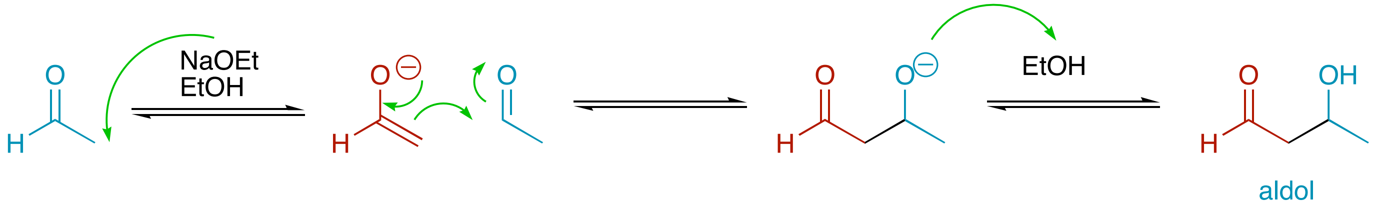
Carbonyls and Enolates

Carbonyl compounds generally react as an electrophile. That is, nucleophiles readily add to the carbonyl carbon. However, when deprotonated, an enolate is a nucleophile. Thus, when ketones and aldehydes are treated with bases that result in equilibrium between the carbonyl and the enolate (eg. alcoxides), they can react with each other. This we call a carbonyl condensation reaction.



Aldol Reaction

The product of the reaction of an enolate with an aldehyde contains aldehyde and alcohol functional groups. Thus, this is referred to as an aldol. The mechanism for the aldol reaction is base catalyzed. It is also readily reversible.



Since the reaction is reversible, the success of the reaction depends on the steric nature of the product. The more crowded it is, the more the equilibrium will shift to the starting materials. In general, α-branched aldehydes are poorer, as are ketones.