Chem 342 Organic Chem II

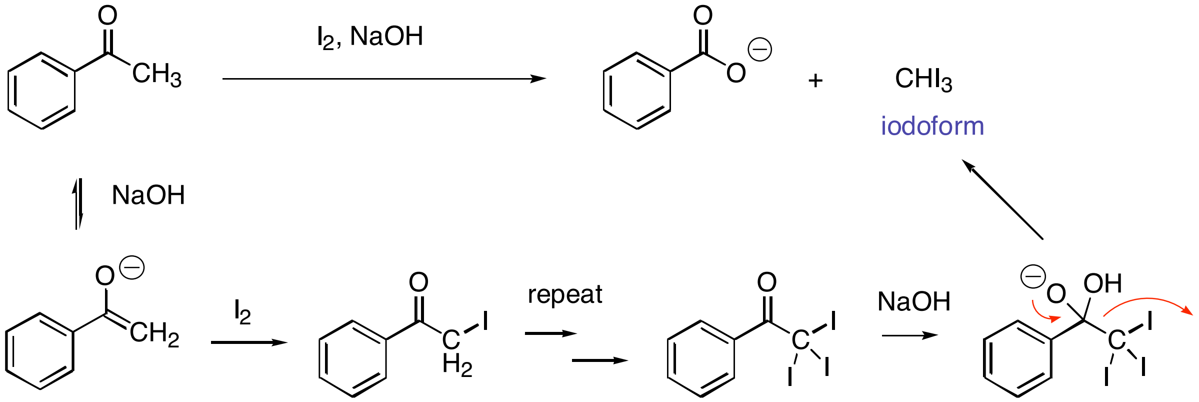
Lecture Summary 37
26 Apr 2002

These notes can be obtained at: http://www.ndsu.nodak.edu/instruct/grcook/chem342/notes.shtml

Chapter 22: Carbonyl Alpha-Subsitution Reactions

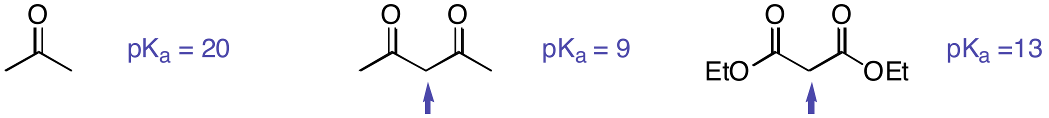
Iodoform Reaction

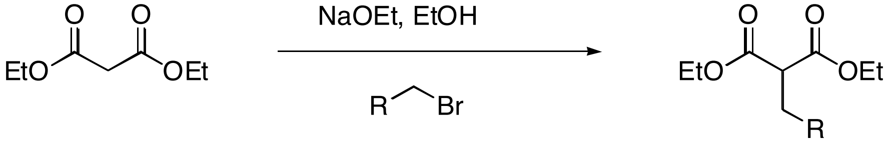
Alpha halogenation can be done with enolates as well as enols. One difference with base catalyzed conditions is that often more than one halogen adds. One can replace all the alpha hydrogens with halogens under basic conditions. A standard test for the presence of methyl ketones is to treat the compounds with iodine and sodium hydroxide. Once all three hydrogens are replaced with iodine, it is a pretty good leaving group and is substituted with the hydroxide like a typical nucleophilic acyl substitution reaction. The iodoform precipitates as a solid indicating the presence of the methyl ketone.



Malonic Ester Synthesis

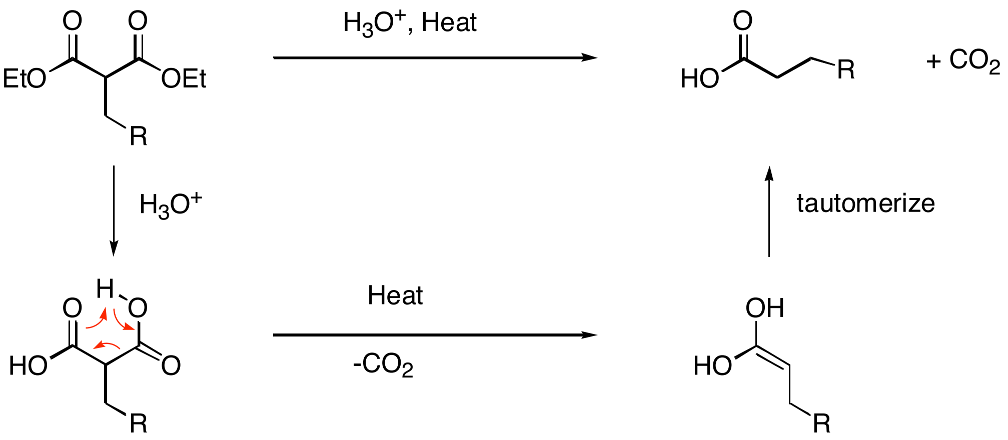
Having two carbonyls makes a proton on a carbon even more acidic than one. For example, acetone has a pK_a of 20 while the central carbon of 2,4-pentanedione has a pK_a of 9. Malonic esters are a little bit higher than the diketone, but still much more acidic than a ketone. Malonic esters can be alkylated readily with milder bases like NaOEt. Overalkylation can be a problem as the product can also enolize and react with the alkyl halide

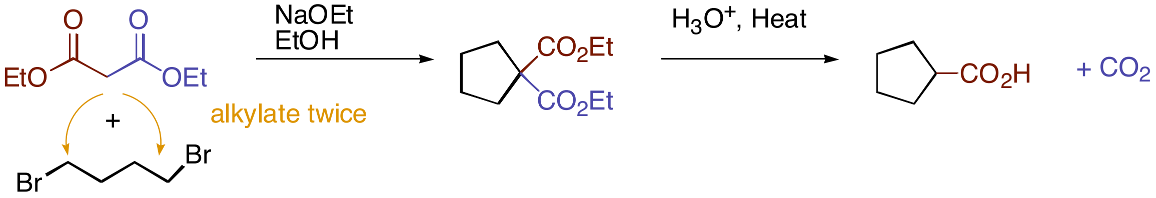




dialkylation, doing a second reaction withthe product and the electrophile, is often a problem

If the product 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.