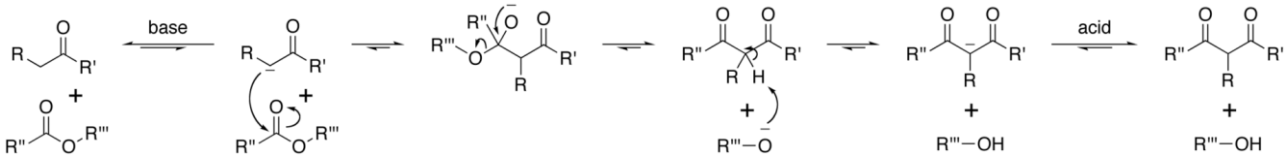
Answer on Question#52201 - Chemistry - Organic Chemistry

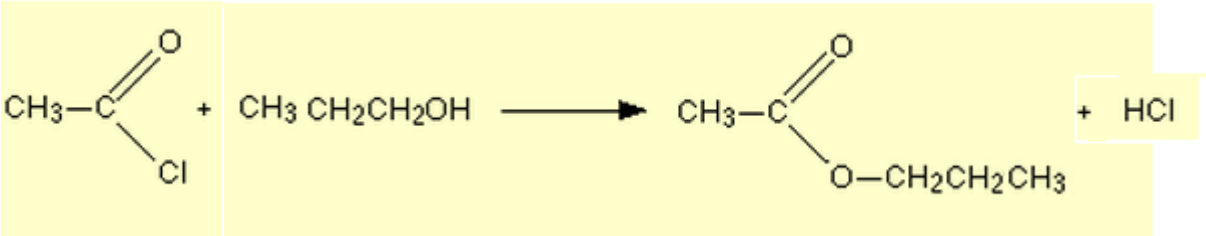
16. Discuss the mechanism of Claisen condensation.



In the first step of the mechanism, an α-proton is removed by a strong base, resulting in the formation of an enolate anion, which is made relatively stable by the delocalization of electrons. Next, the carbonyl carbon of the (other) ester is nucleophilically attacked by the enolate anion. The alkoxy group is then eliminated (resulting in (re)generation of the alkoxide), and the alkoxide removes the newly formed doubly α-proton to form a new, highly resonance-stabilized enolate anion. Aqueous acid (e.g. sulfuric acid or phosphoric acid) is added in the final step to neutralize the enolate and any base still present. The newly formed β-keto ester or β-diketone is then isolated. Note that the reaction requires astoichiometric amount of base as the removal of the doubly α-proton thermodynamically drives the otherwise endergonic reaction. That is, Claisen condensation does not work with substrates having only one α-hydrogen because of the driving force effect of deprotonation of the β-keto ester in the last step.

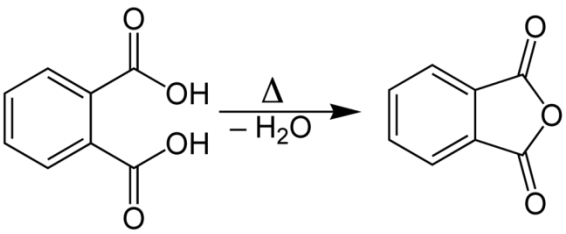
17. Give the products of the following reactions: (1×5)

i) Ethanoyl chloride + propanol

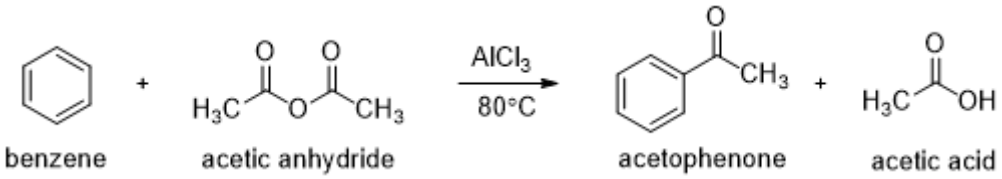


ii) Ethanoic acid + thionyl chloride

iii) 1, 2 – benzenedicarboxylic acid



iv) Benzene + ethanoic anhydride



v) N-methylbutanamide