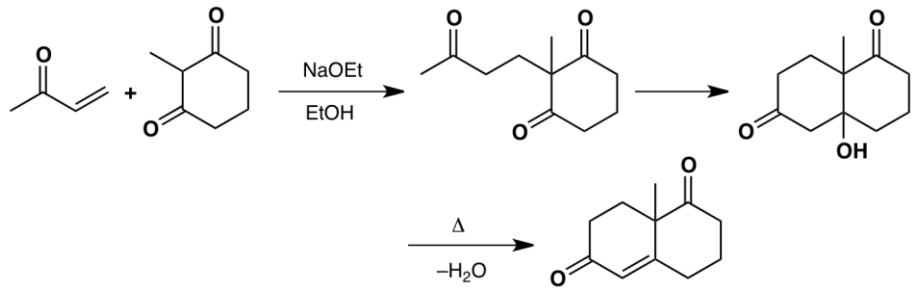
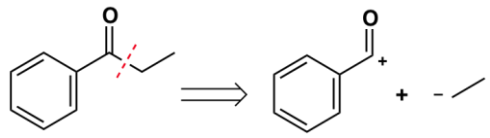
Solutions to Exercises, Chapter 23

23.1

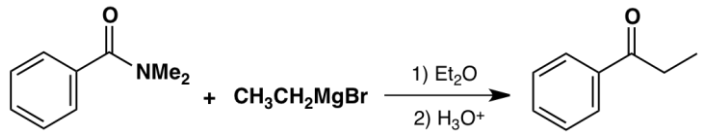


23.2

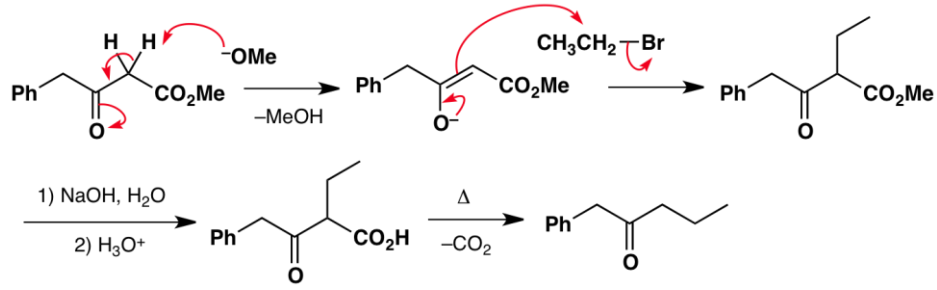
Retrosynthesis:



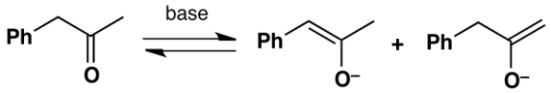
Synthesis:



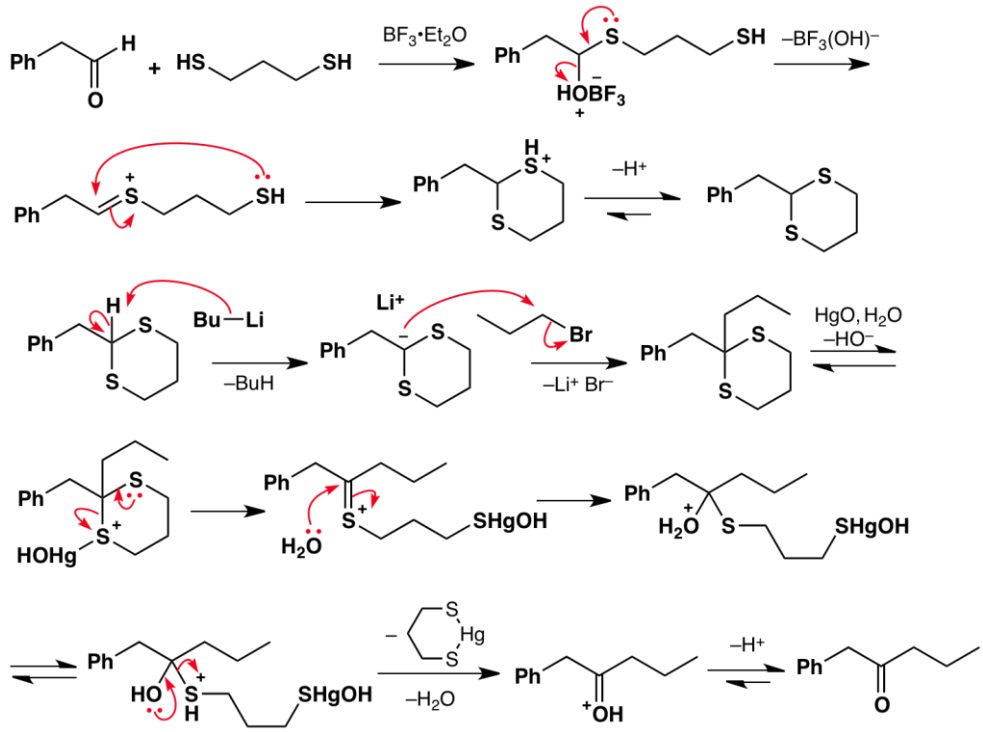
23.3 (a)



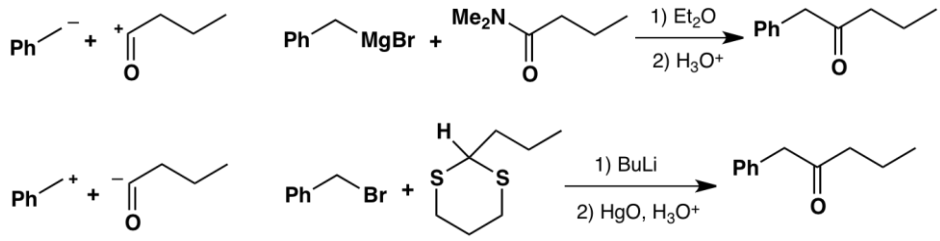
(b) When phenylpropanone is treated with a base, two enolates are possible, and the enolate at the phenyl side is more stable so normally forms more readily. Furthermore, the enolate is formed only incompletely and preferentially undergoes an aldol reaction.



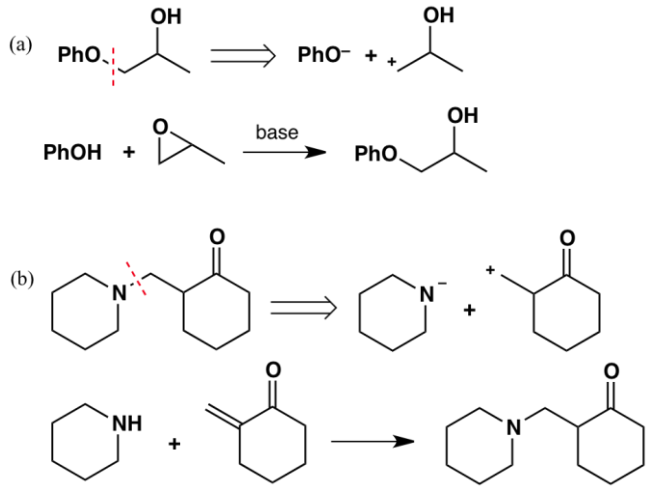
23.4



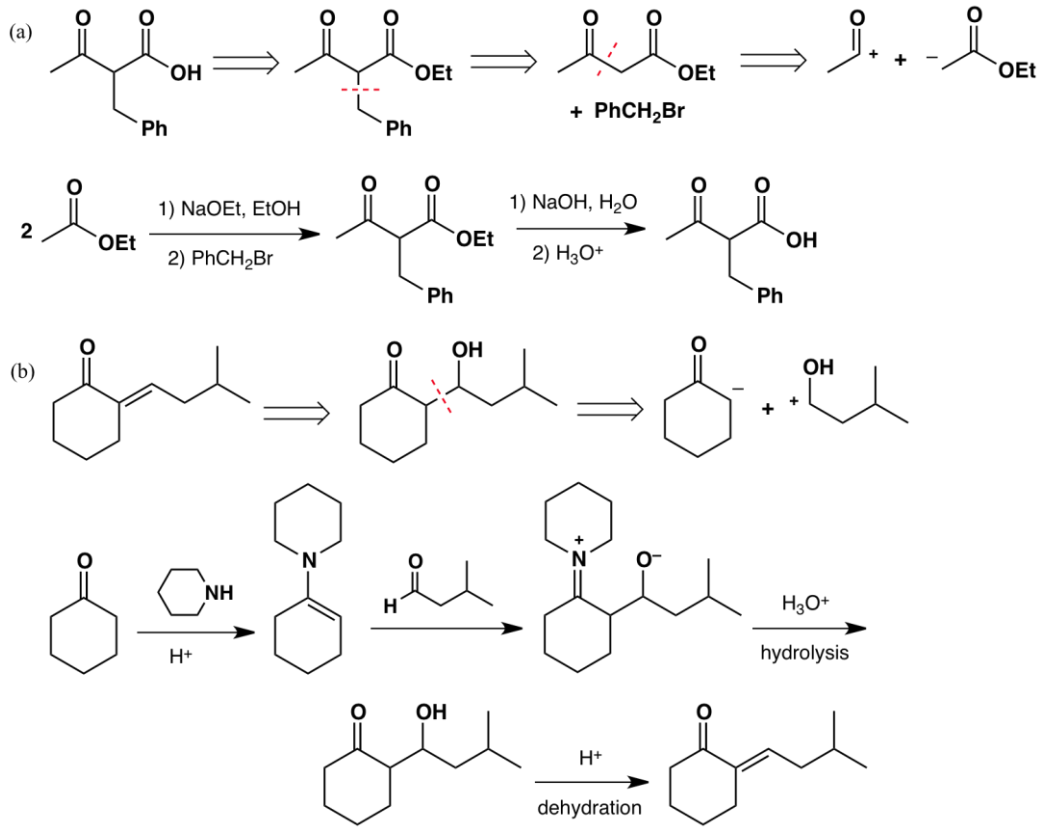
23.5



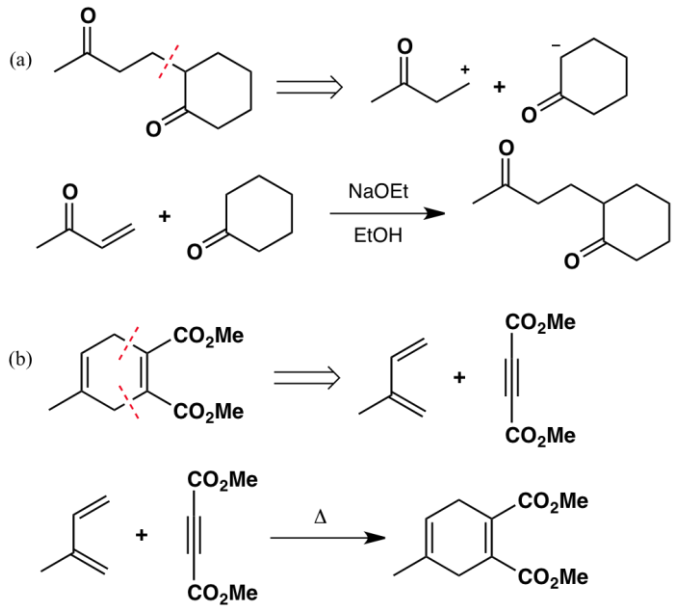
23.6



23.7



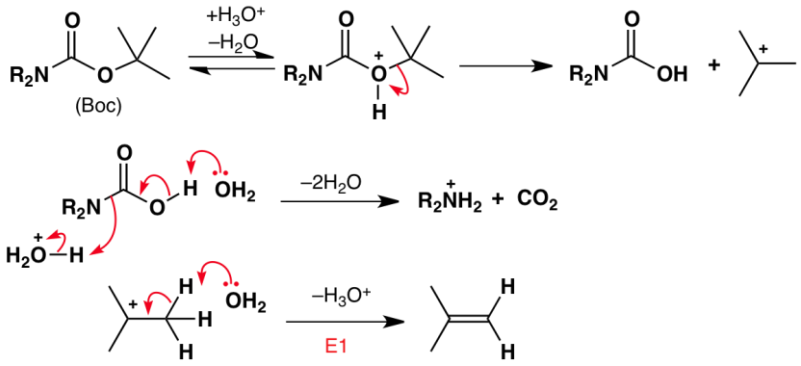
23.8



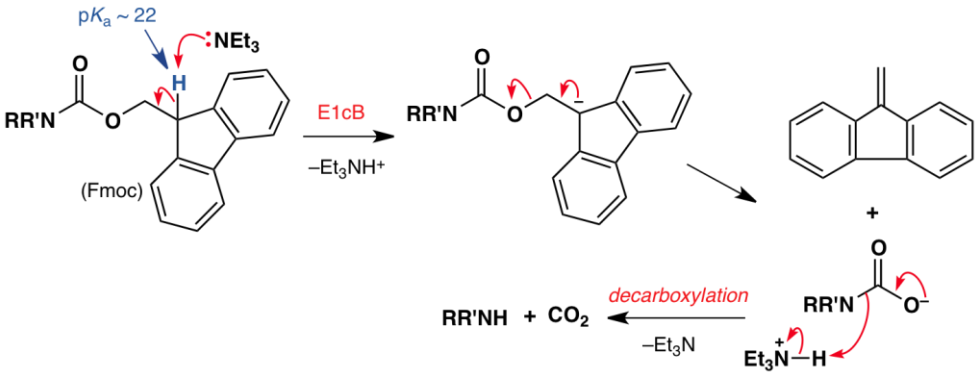
23.9 Deprotection of the trityl group from the ether occurs by an acid-catalysed S_N1 mechanism to give a trityl cation as an intermedate in the rate-determining step. Consequently (according to the Hammond postulate), the more the trityl cation is stabilized by electron-donating methoxy substituents at the *p* positions, the faster this step will be.

23.10

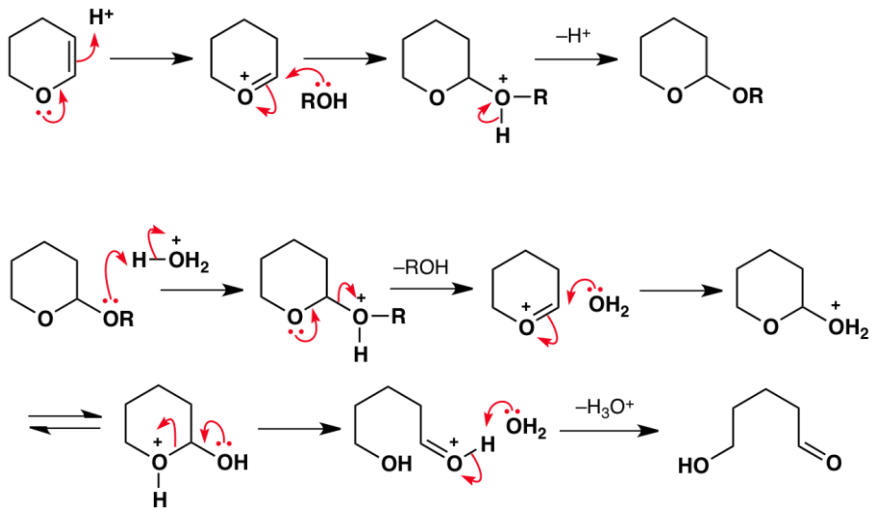
(a)



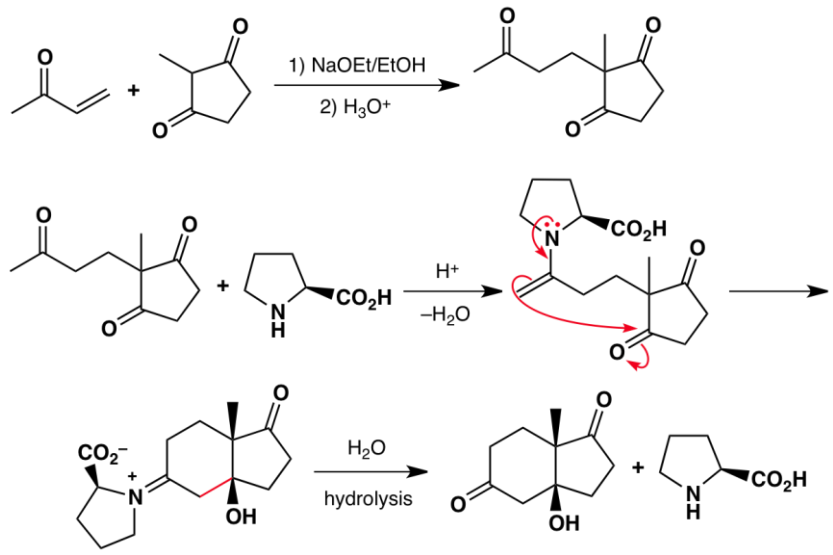
(b) Deprotection of an amine-Fmoc derivative is an elimination reaction which could be by the E2 or E1cB mechanism. The aromatic stabilization of the fluorenyl anion (low pK_a) and the poor leaving ability of the carbamate nucleofuge indicate the E1cB mechanism. The instability of the carbamate ion, however, leads to immediate decarboxylation.



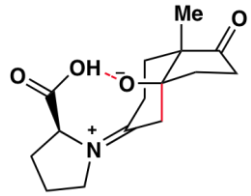
23.11



23.12



The observed stereoselectivity is generated in the cyclization step. The following stereochemical representation is an attempt to show H-bonding between the carboxylic hydrogen of the proline and the oxygen of the (developing) alkoxide group in the formation of the preferred iminium intermediate. Nucleophilic attack of the enamine at the other electrophilic carbonyl group does not allow the required proximity of the carboxy group and the incipient alkoxide for the formation of an H-bond. (This is more convincingly shown using molecular models.)



Note that cyclization of the regioisomeric enamine, which may also be formed (reversibly), would give a strained four-membered ring and does not occur.

23.13