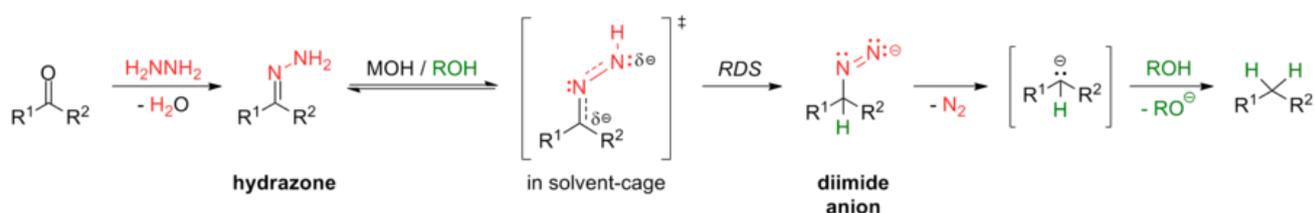


Question #61068 – Chemistry – Organic Chemistry

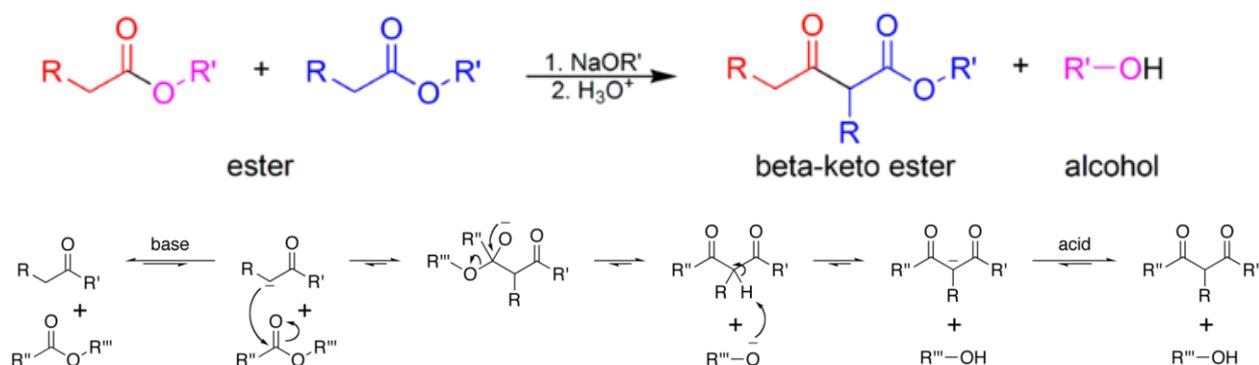
Question:

Give mechanism of the following reactions
 i) Wolf-Kishner reduction
 ii) Claisen condensation
 iii) Ozonolysis of 2-butene

- i) In general, the reaction mechanism first involves the *in situ* generation of a hydrazone by condensation of hydrazine with the ketone or aldehyde substrate. Sometimes it is however advantageous to use a pre-formed hydrazone as substrate (see modifications). The hydrazone is deprotonated by alkoxide base followed by a concerted, rate-determining step in which a diimide anion is formed. Collapse of this alkyldiimide with loss of N_2 leads to formation of an alkyl anion which can be protonated by solvent to give the desired product.



- ii) The Claisen condensation is a carbon–carbon bond forming reaction that occurs between two esters or one ester and another carbonyl compound in the presence of a strong base, resulting in a β -keto ester or a β -diketone.^[1] It is named after Rainer Ludwig Claisen, who first published his work on the reaction in 1887.^{[2][3][4]}



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 stoichiometric 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.

iii)

