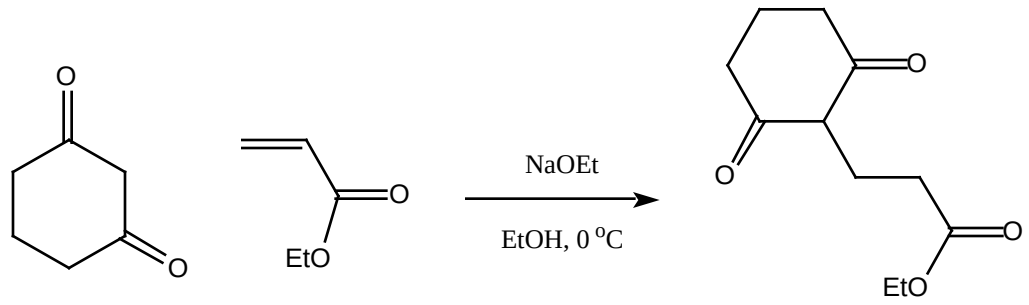
GTQ on Michael Reactions. (20 points, synthesis, mechanism)

(a) Show the overall reaction and also provide the mechanism for the Michael addition of 1,3-dioxocyclohexane and ethyl propenoate. Use NaOEt at the base in ethanol solvent.

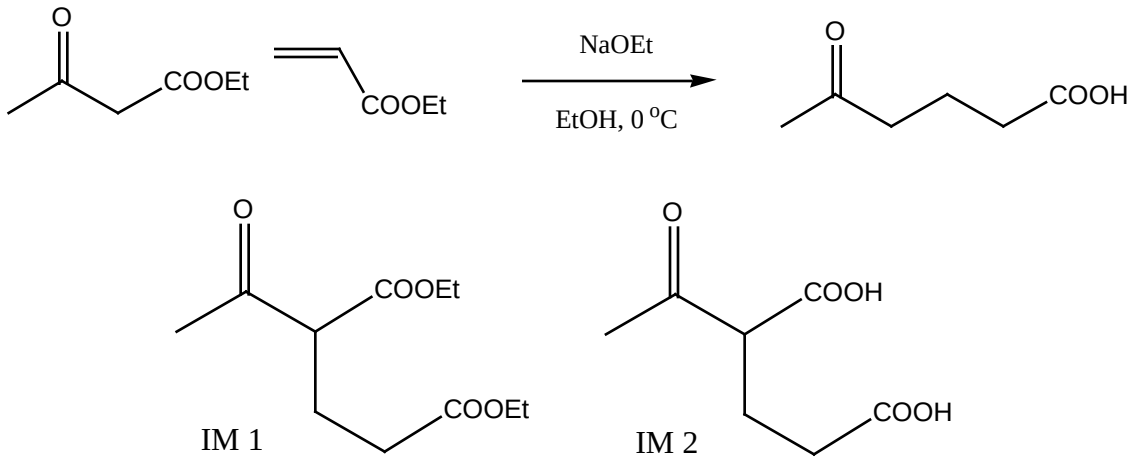


Reaction Product

Mechanism:

Base makes carbanion of the beta-dicarbonyl
carbanion adds to beta-C of the unsaturated ester
protonation and tautomerization gives the 1,2-addition product.
Ester not hydrolyzed under these conditions (needs a lot more heat)

(b) The Michael addition is a useful method for the **synthesis of 1,5-dicarbonyl systems**. When **acetoacetic ester** is used as the adding group, the product can be hydrolyzed and decarboxylated to obtain the alkylated acid. Show such a sequence using **ethyl propenoate**.



Intermediate IM 1 from Michael addition. Saponification yields intermediate IM 2. Decarboxylation.