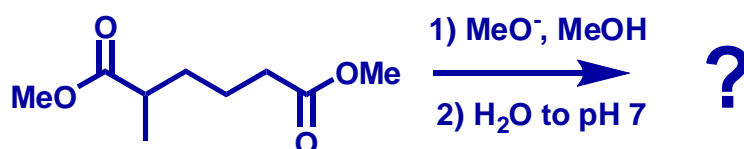


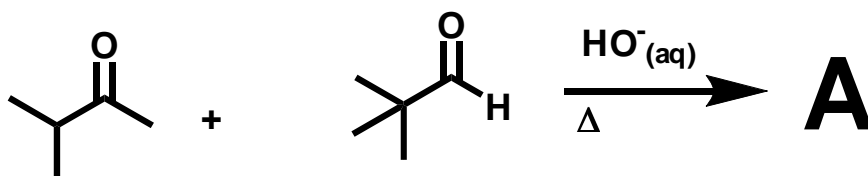
Answer all questions in the test booklet(s) provided. Answers written in pencil will be marked, but cannot be returned for remarking.

1. Give the **complete** mechanism for the following two step Dieckmann condensation. Please show **all** steps and **all** intermediates, and all small molecules given off or used during the reaction. Please also indicate which steps are reversible and which are (essentially) irreversible. (10 marks)

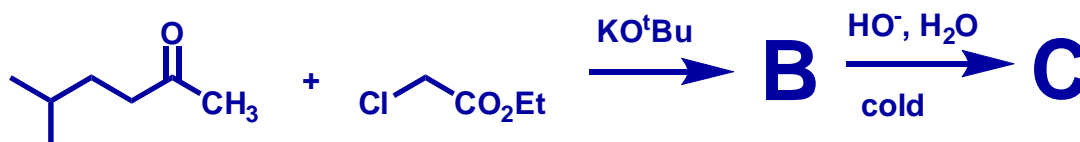


2. Indicate the structure of the expected major product from each of the following reactions. Include stereochemistry where it is relevant. Mechanisms are *not* necessary, but showing your work is likely to be a help. (5 for each letter, 40 marks total)

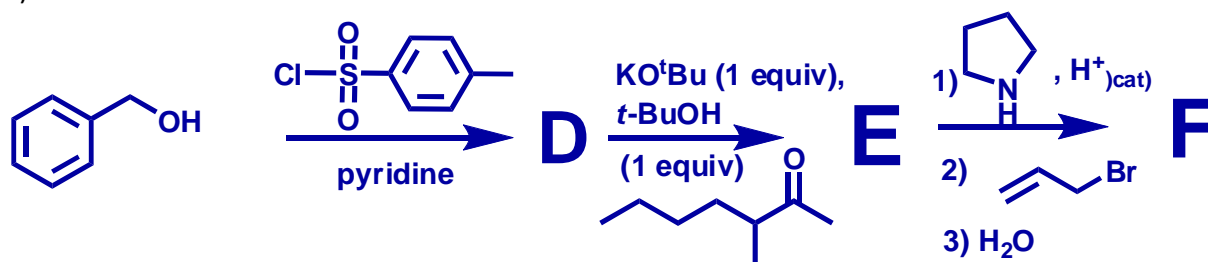
a)



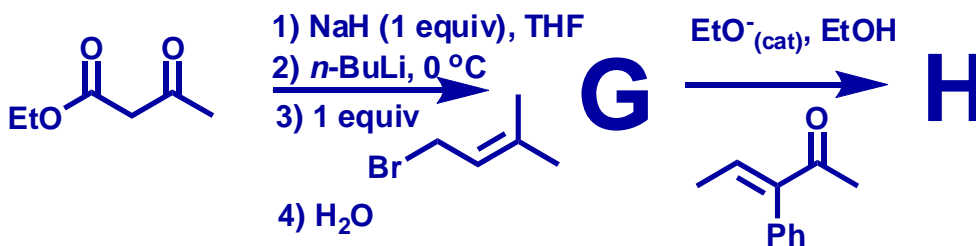
b)



c)

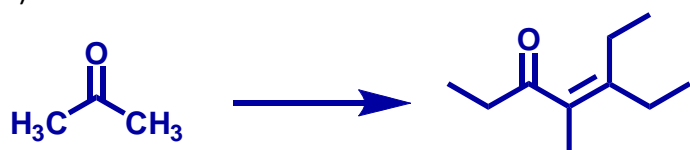


d)

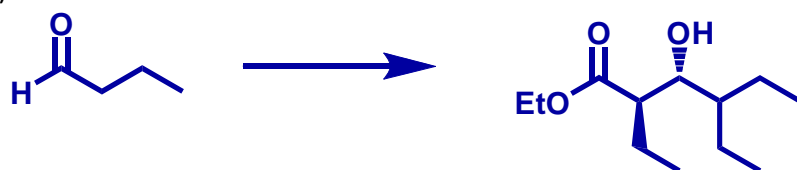


3. Show by equation how you would prepare the products illustrated below from the indicated starting material. You may use *any* other reagents you deem to be fit. Show all reagents, conditions, and *intermediates that could be isolated*. Mechanisms are not necessary, but showing your work may be a help. (10 marks each, 30 total)

a)

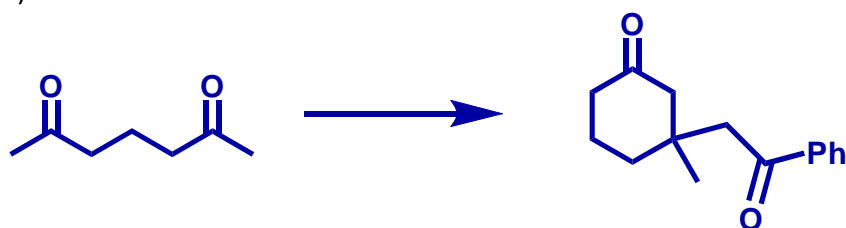


b)



Note: Esters give (E)- enolates under kinetic deprotonation conditions

c)



Bonus. In bicyclo[2.2.1] derived ketones, enolate alkylation is easy on one 'side', whether it be kinetic or thermodynamic conditions. On the other side, though, it is essentially impossible, regardless of sets of conditions. Why is this latter side reaction so impossible?

