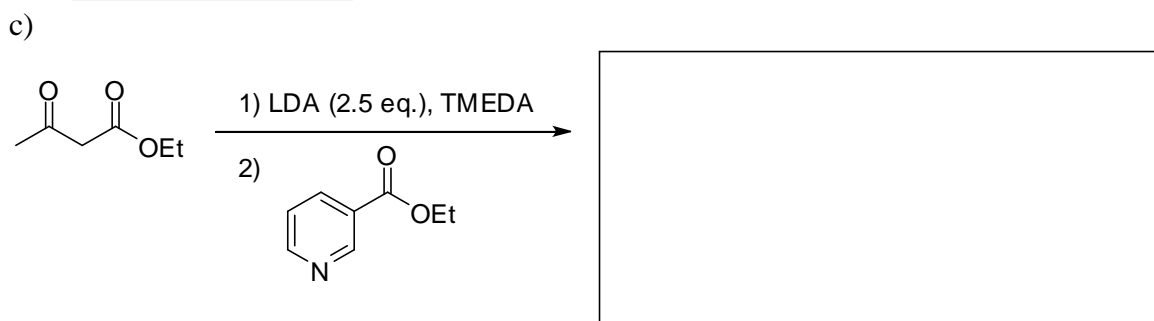
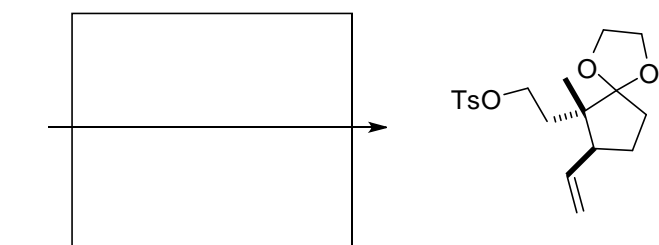
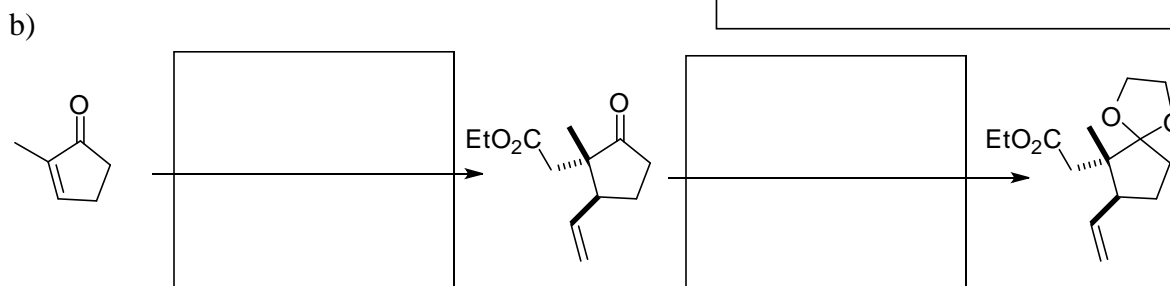
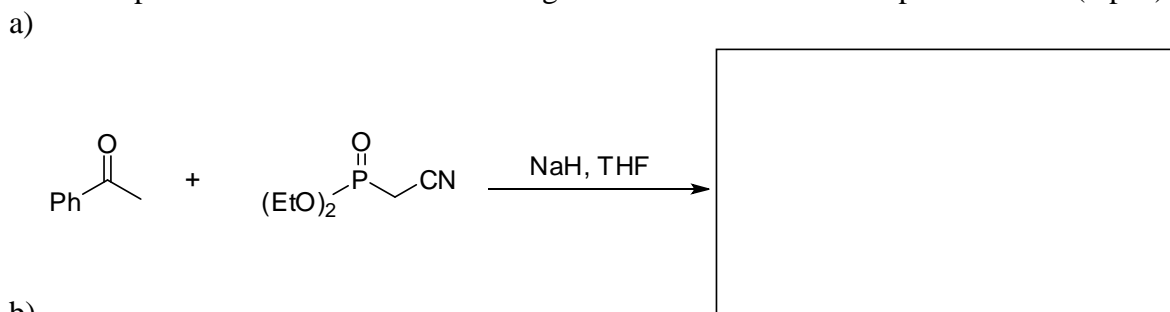
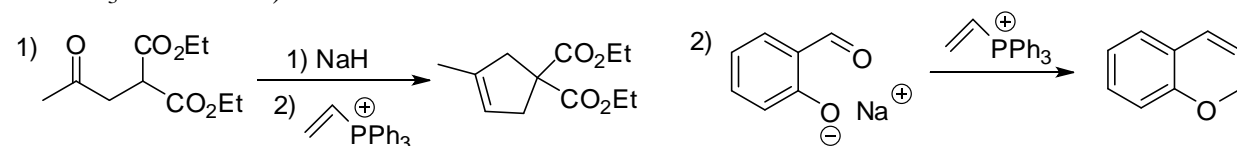


1. Provide the necessary information, products or reagents, to complete the following reactions. Undergraduates must complete four of the five boxes and graduate students must complete all five. (6 pts.)

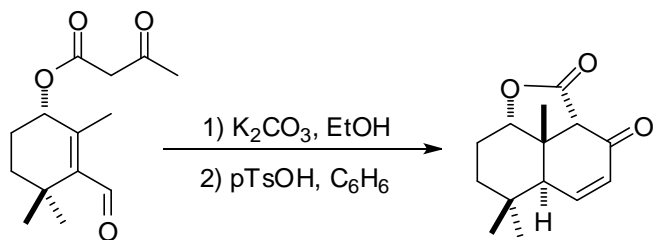


2. Mechanism questions. Choose one question (both undergraduates and graduate students). Two bonus points will be awarded for a second correct answer. (6 pts.)

a) Vinyltriphenylphosphonium halides are Wittig reagents that have been successfully applied in cyclization reactions such as the ones shown below. Suggest a mechanism for these cyclization reactions. (Hint: consider the PPh_3 as an EWG).

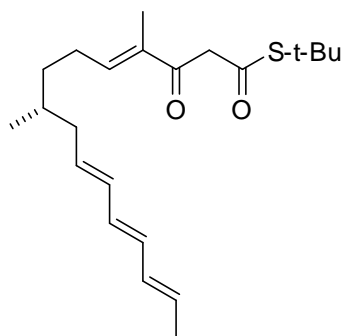


b) The product of the following reaction is the biologically active diterpene forskolin. The reaction shown below was a key step in the generation of the forskolin skeleton. Suggest a mechanism for this reaction.



3. Synthesis questions. Undergraduates choose one question and graduate students do two. (8 pts.)

a) The structure shown below was a key precursor to a synthesis of equisetin, a fungal metabolite with antibiotic, HIV, and anti-cancer activity. Choose two alkenes and show reagents that could be combined to form these alkene bonds. The best solution will attempt to control alkene stereochemistry.



b) Show two steps that will convert the starting material on the left to the product on the right.

