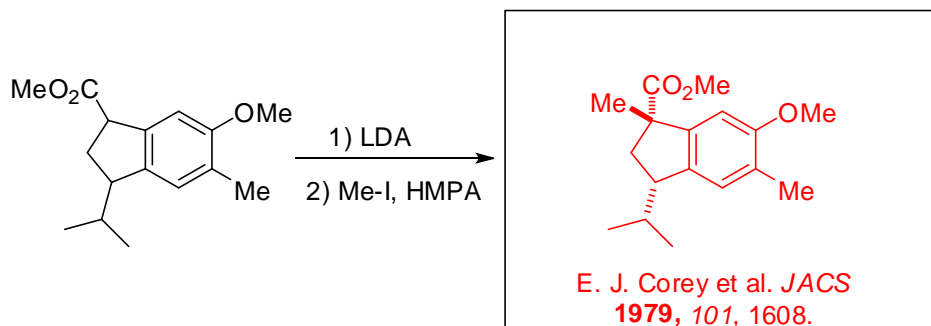
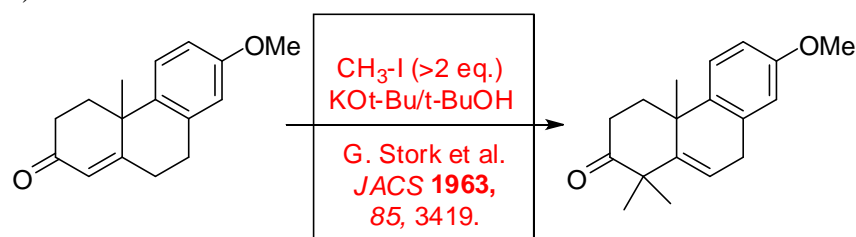


1. Provide the necessary information, products or reagents, to complete the following reactions. (7 pts.)

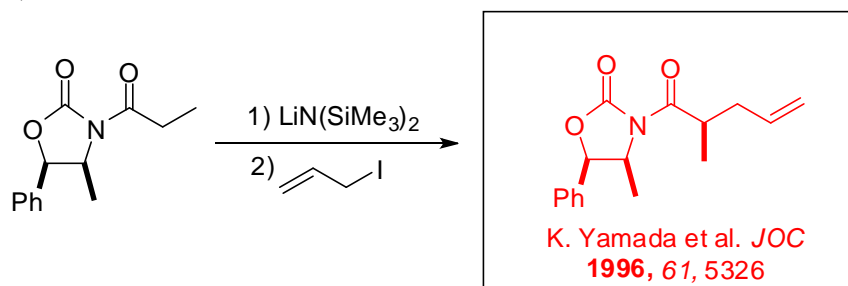
a)



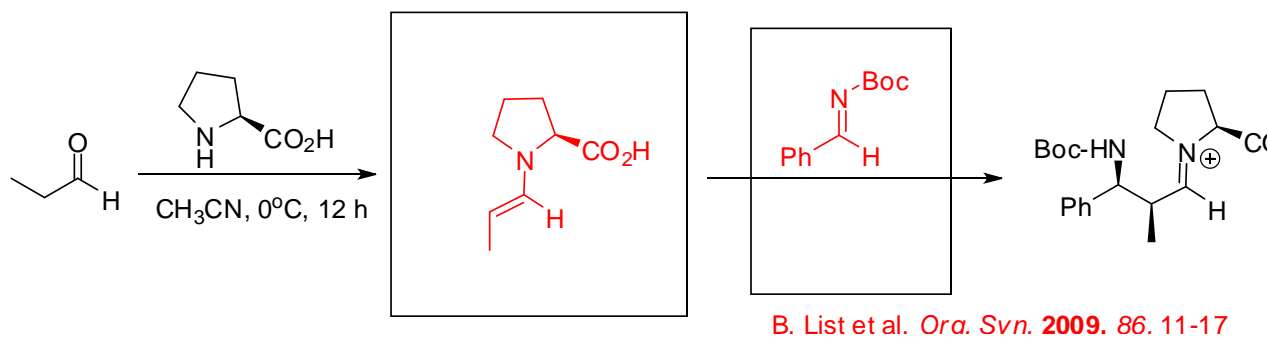
b)



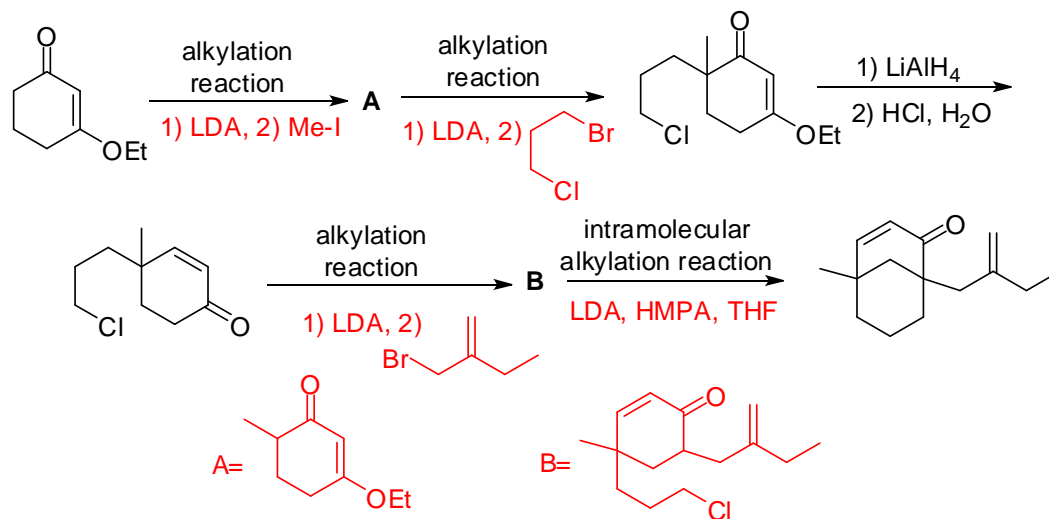
c)



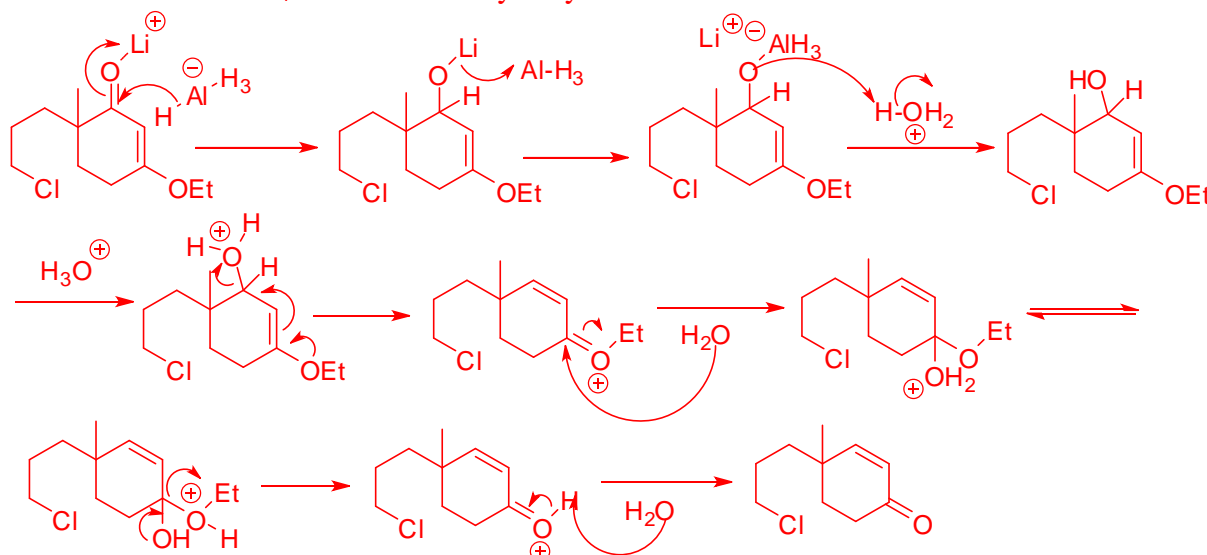
d)



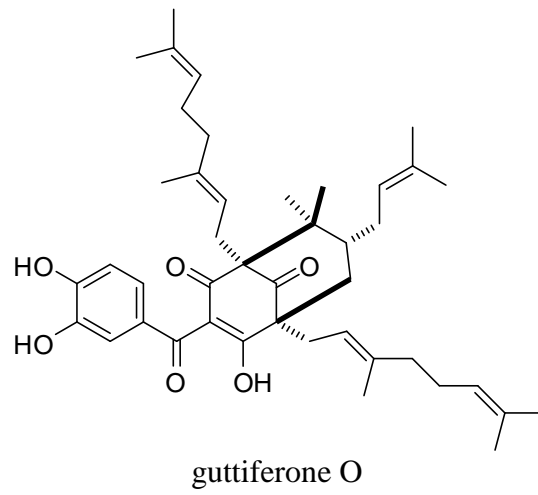
2. Provide the alkylation reagents and the structures of intermediates **A** and **B** in the following scheme. Additionally, graduate students must show the mechanism of the LiAlH₄ reduction and hydrolysis reaction (a classic reaction in the repertoire of synthetic organic chemists). Undergraduates who are feeling particularly brash can earn bonus points for the mechanism. (6 pts.) (A. G. Schultz et al. *JOC* 1983, 48, 2318)



Mechanism of LiAlH_4 reduction and hydrolysis:



3. Natural product synthesis requires an ability to recognize key bond disconnections that can create the requisite carbon framework of a complex molecule. The molecule shown below, guttiferone O, was recently reported in the *Journal of Natural Products* (ASAP Article; DOI: 10.1021/np900246t; Publication Date (Web): August 14, 2009). Furthermore, it was shown to inhibit protein kinase, which is a common anti-cancer target.
- a) Show three (undergraduates) or four (graduate students) distinctly different enolate reactions, alkylations or aldol condensations (okay, you may use Claisen condensations also), which create C-C bonds in guttiferone O and therefore could constitute key reactions in a total synthesis. You do not need to show any base reagents or solvents. Simply show the two starting materials for an enolate reaction, i.e. the enolate and an electrophile. You may abbreviate for convenience, but be sure the necessary structural information is present. (4 pts.)
- b) Evaluate your three or four different enolate reactions and select the one (undergraduates) or two (graduate students) best options. Describe the characteristics of your enolate and electrophile in the one or two best options that suggest the reaction would work well. Comment on aspects of the enolate and electrophile in the one or two best options that might be problematic and suggest you might be acting like a high stakes gambler in Vegas or a College student on Spring Break in Cancun. (3 pts.)



The good for A:
 -activated alkyl halide (allylic)
 -good enolate stabilized by two ketones

The bad for A:
 -creating a sterically congested quaternary center
 -enolate is not easily made in ring bridgehead position

The good for B:
 -good enolate stabilized by two ketones
 -intramolecular alkylation

The bad for B:
 -tertiary alkyl bromide is very hindered and might eliminate

