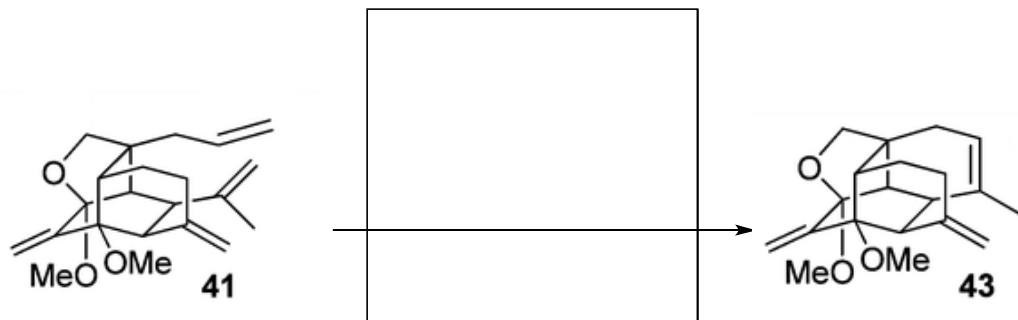
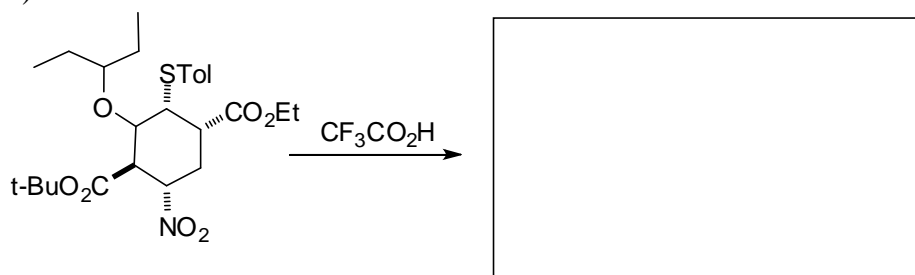


1. Provide the necessary information, products or reagents, to complete the following reactions. Undergraduates must complete ten of the twelve boxes and graduate students must complete all twelve. (10 pts.)

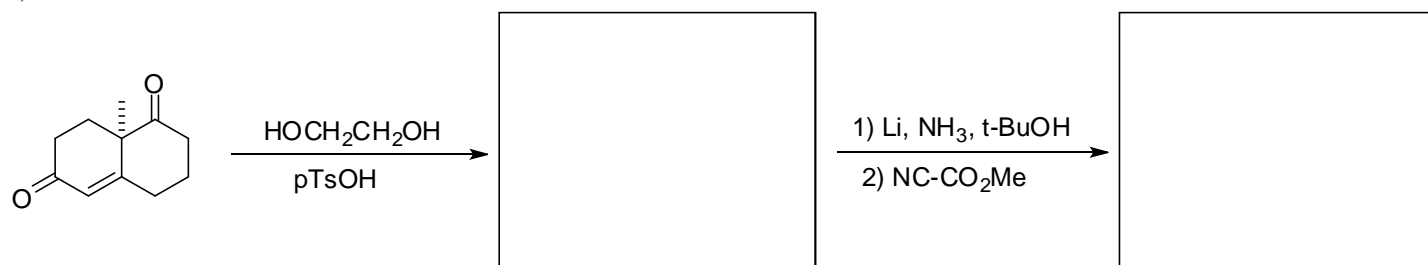
a)



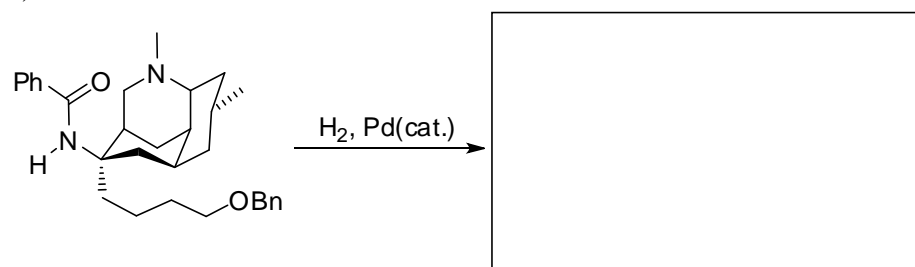
b)



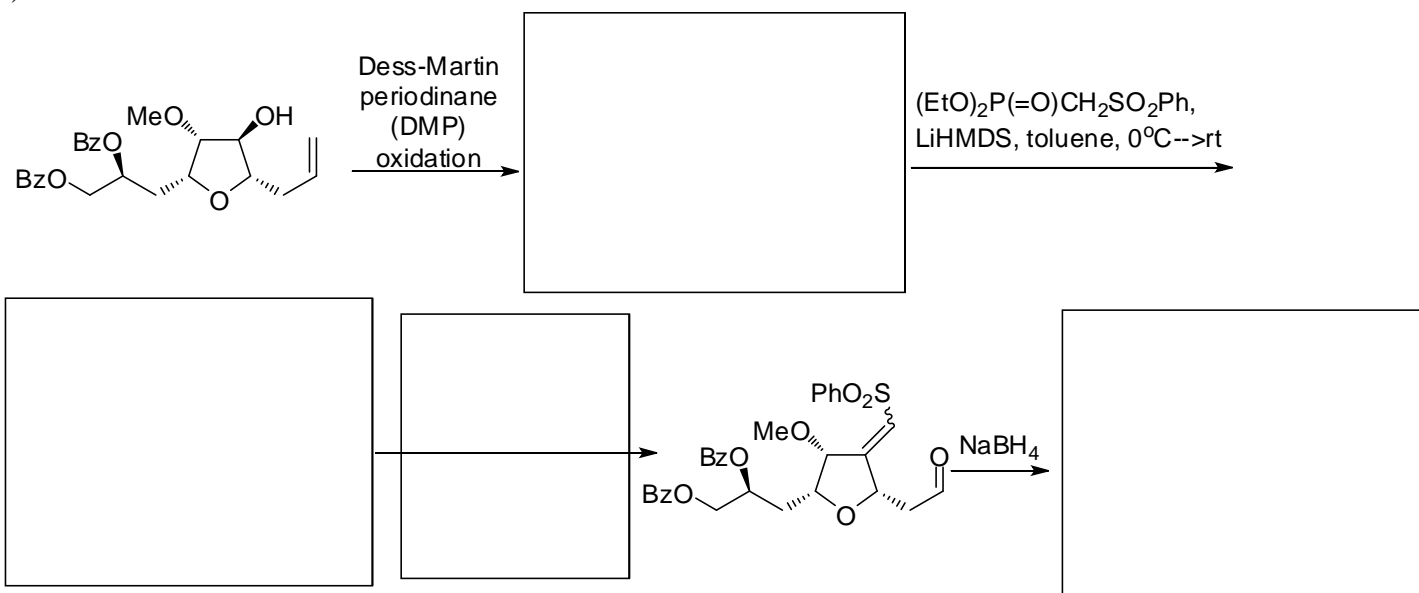
c)



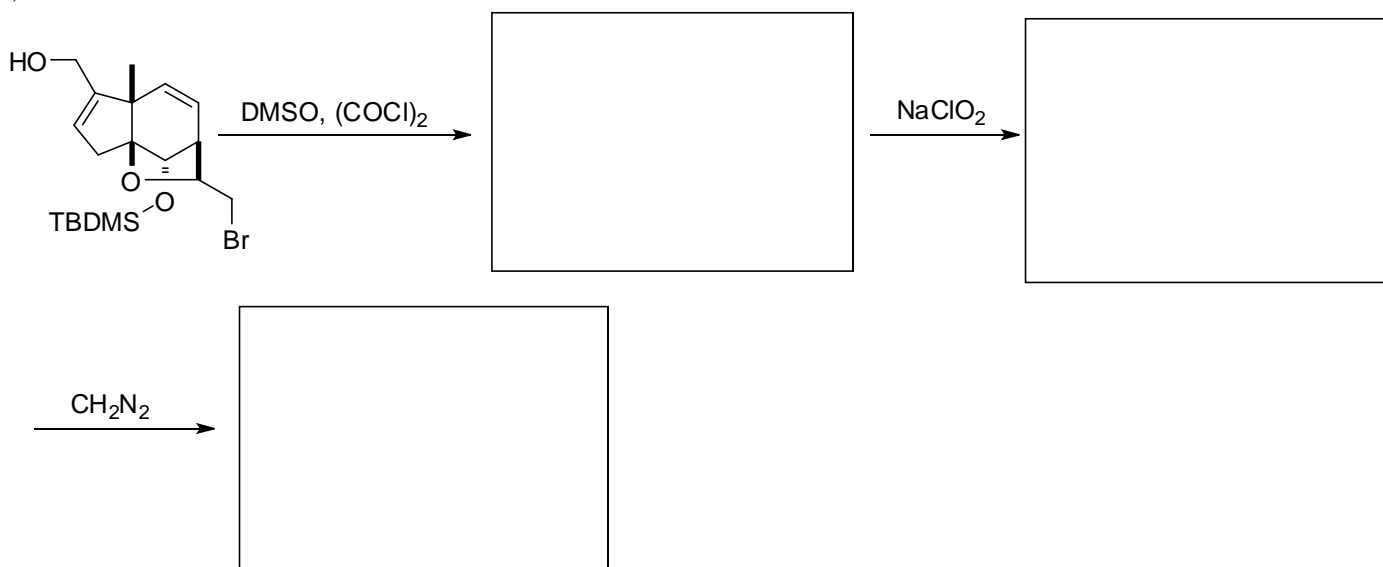
d)



e)



f)

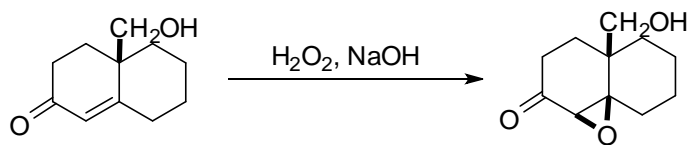


2. Mechanistic questions. Undergraduates must complete two of three questions and graduate students answer all three. (5 pts.)

a) Explain the regioselectivity of the reaction in question 1a.

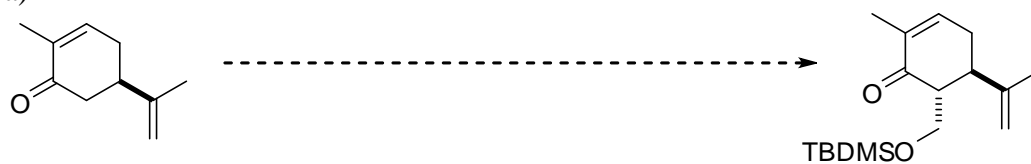
b) Explain the regioselectivity or chemoselectivity of the reaction in question 1c (first box).

c) Provide a mechanism for the following reaction and suggest a reason for the reaction diastereoselectivity.



3. Synthesis questions. Undergraduates choose one question and graduate students do two. (5 pts.)

a)



b)

