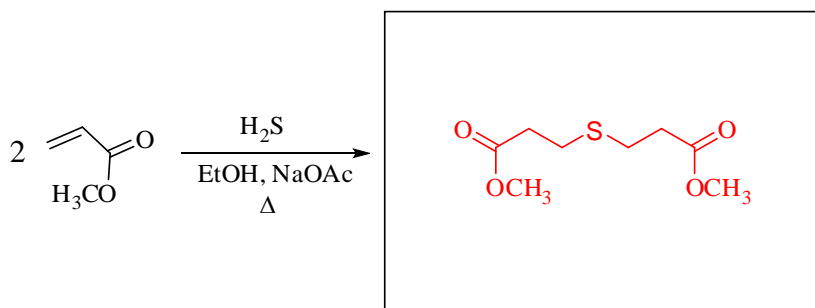
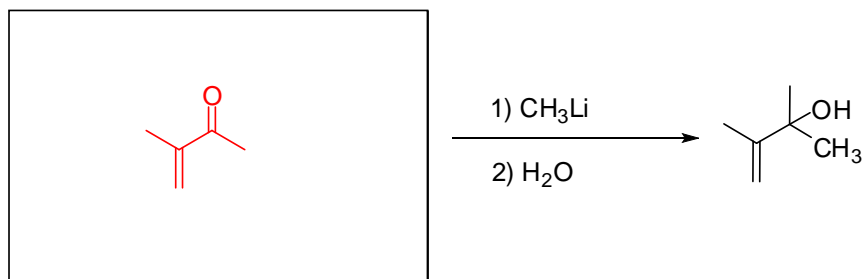


1. Provide the necessary information, product(s), reagents or starting materials, to complete the following reactions.

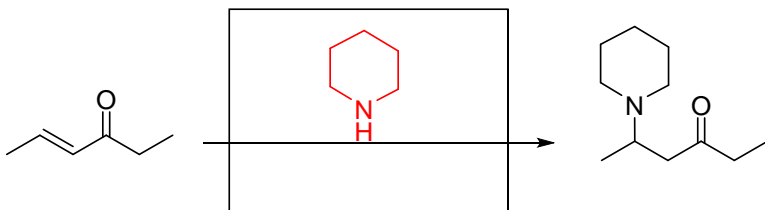
a)



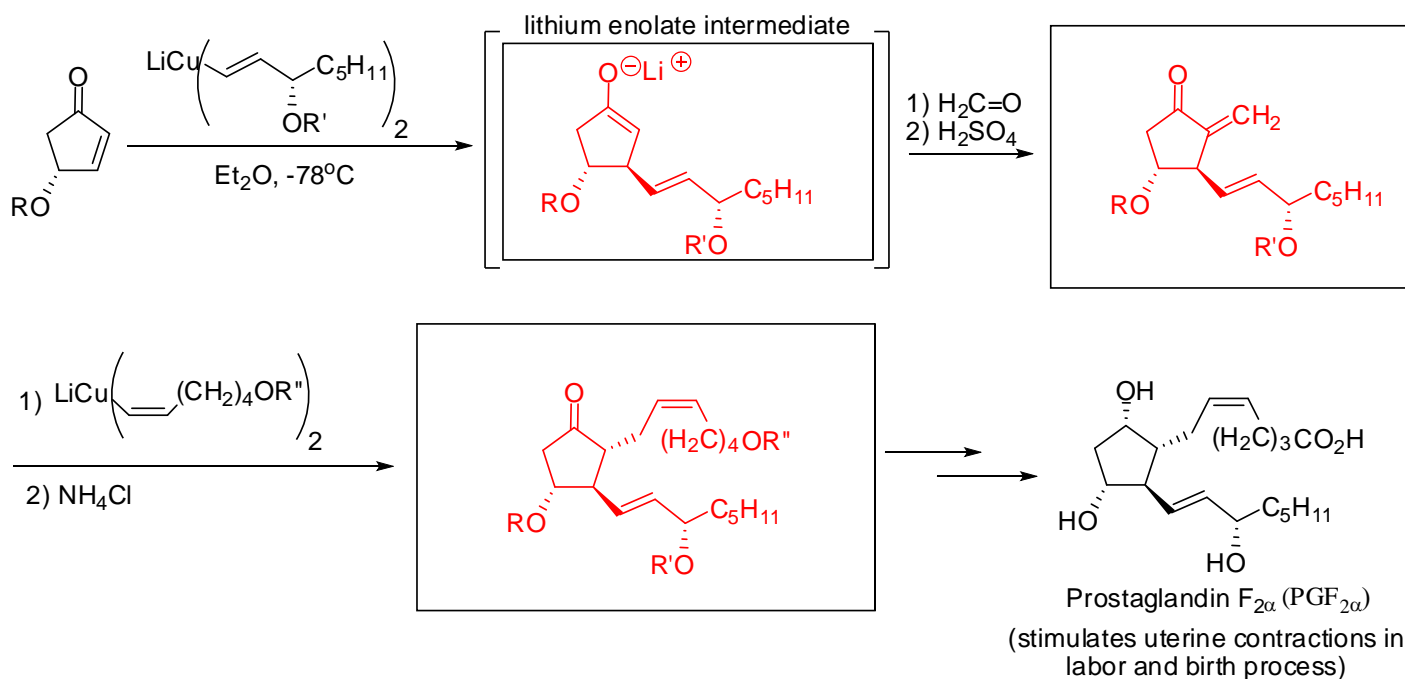
b)



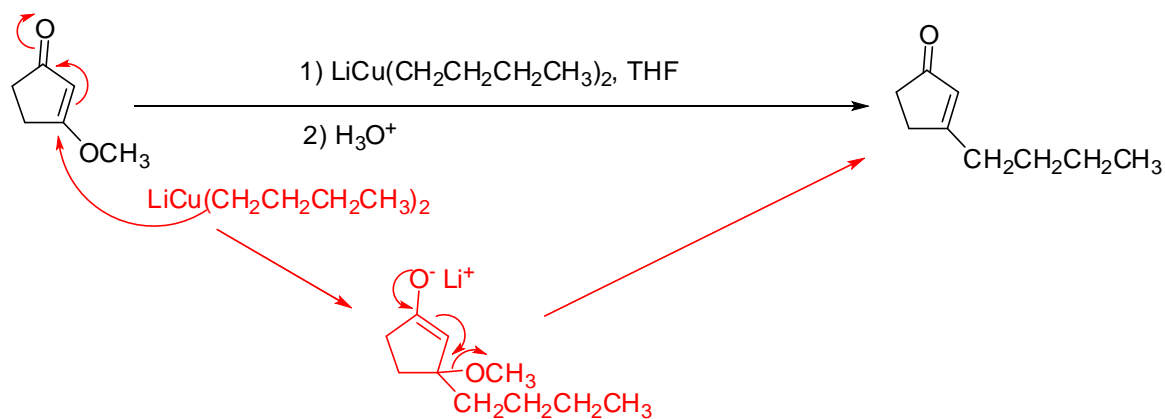
c)



2. Prostaglandins are important biological molecules that have powerful physiological effects. Consequently, chemists have been very interested in developing methods to efficiently synthesize these molecules. One such synthesis, devised by Prof. Gilbert Stork and colleagues of Columbia University, is shown below. Provide the necessary structures in the boxes to complete the synthetic sequence.



3. Suggest a mechanism for the following reaction.



4. Complete the following syntheses by converting the starting material on the left to the product on the right. You may use any organic or inorganic reagent. All transformations can be conducted in three steps or less.

