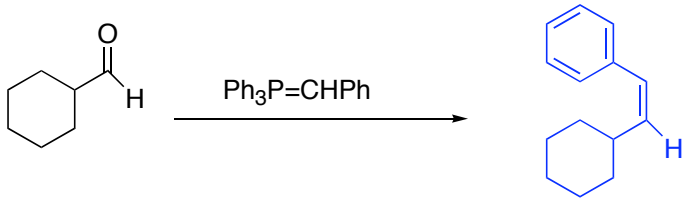
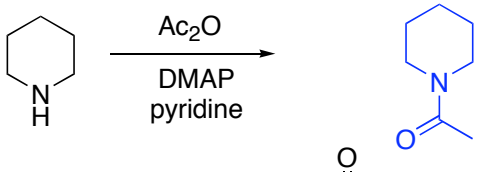
(1) Predict the major product from each reaction. If you expect no reaction, indicate.

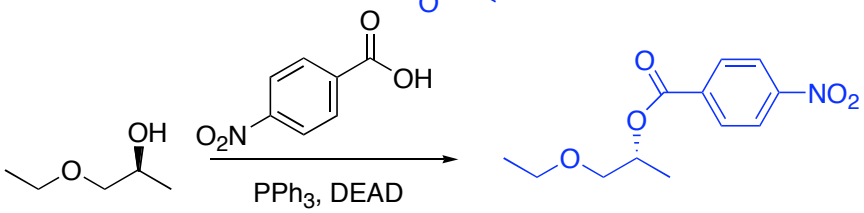
(a)



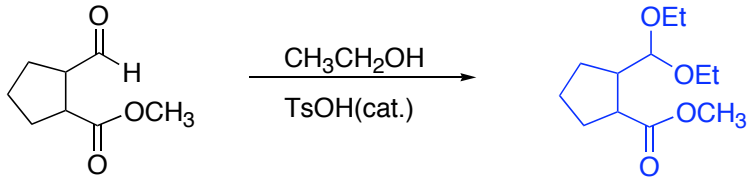
(b)



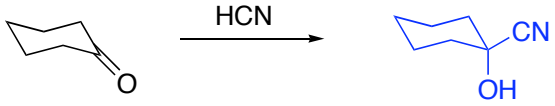
(c)



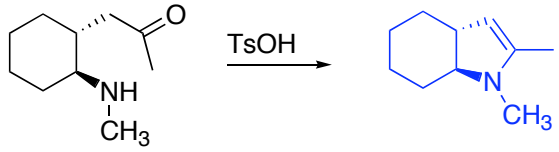
(d)



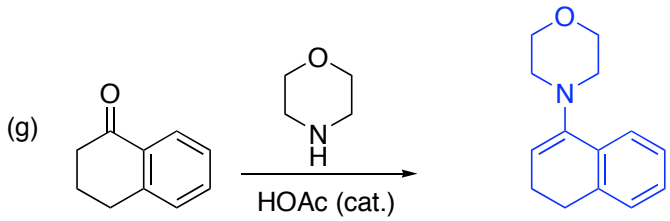
(e)



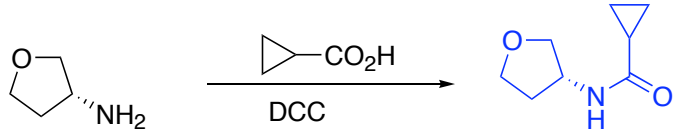
(f)



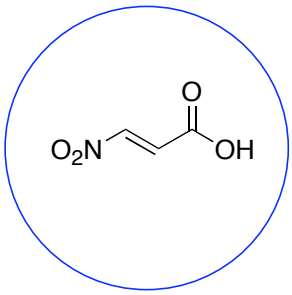
(g)

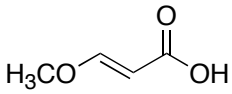


(h)

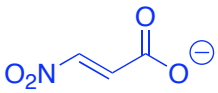


(2) Which of these two compounds is more acidic and why?

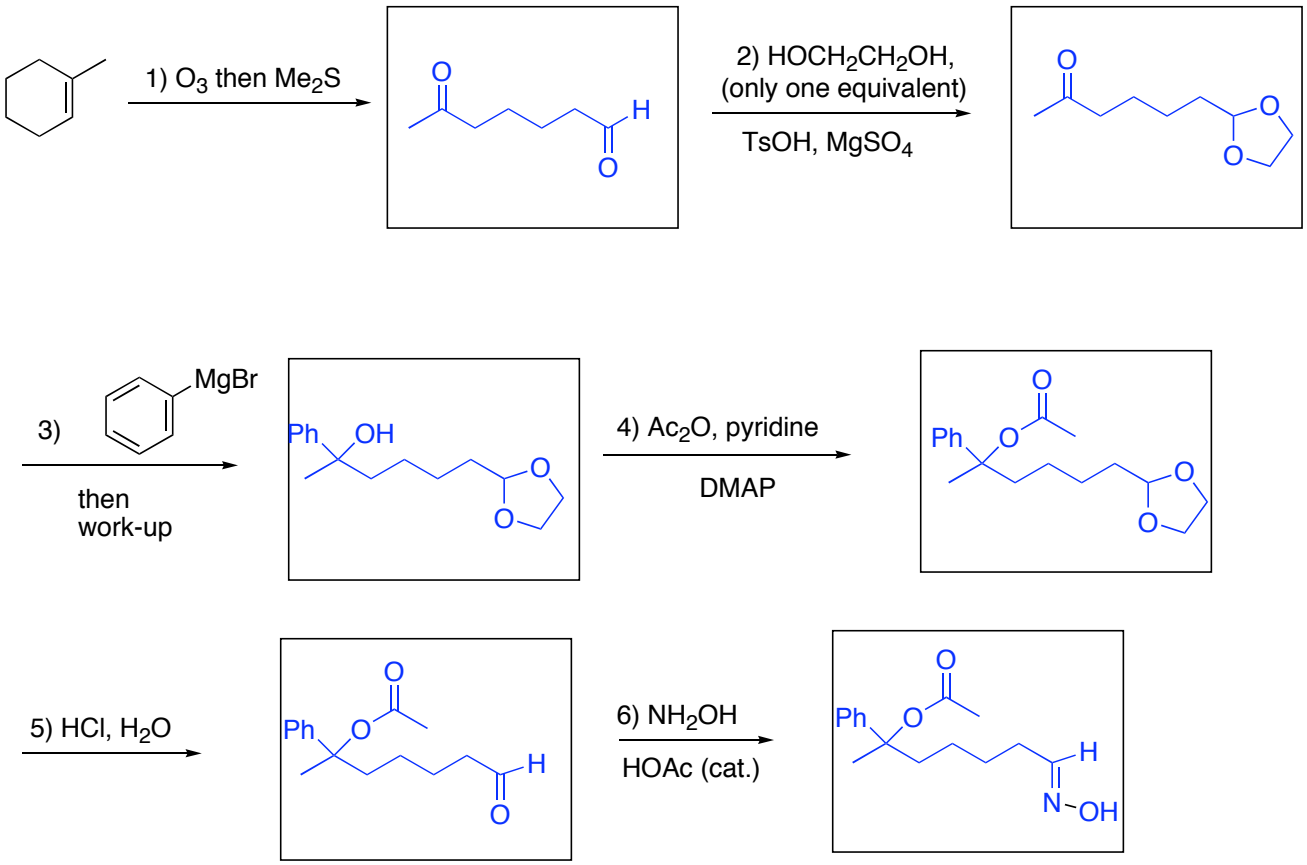




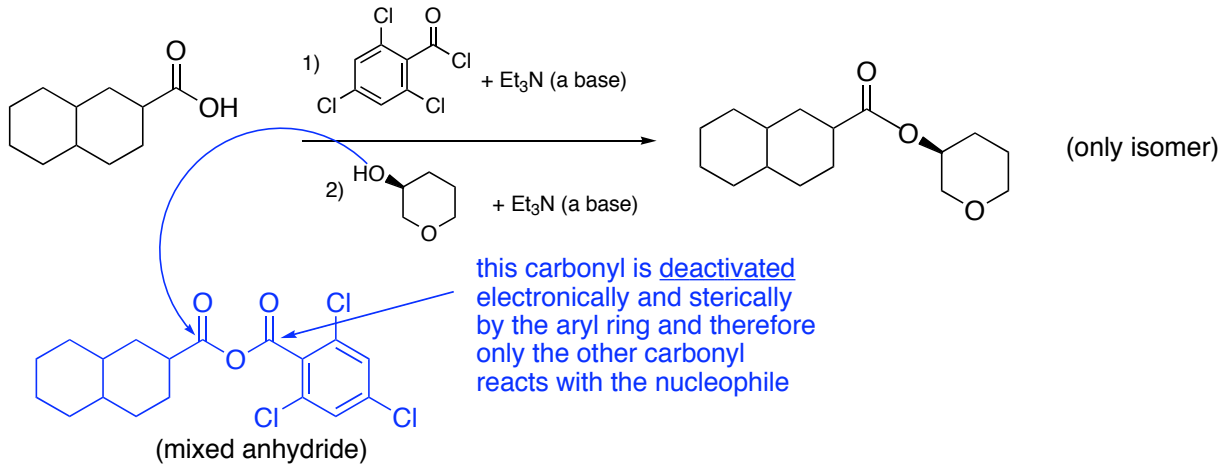
The nitro group is electron withdrawing and helps stabilize the conjugate base (carboxylate)



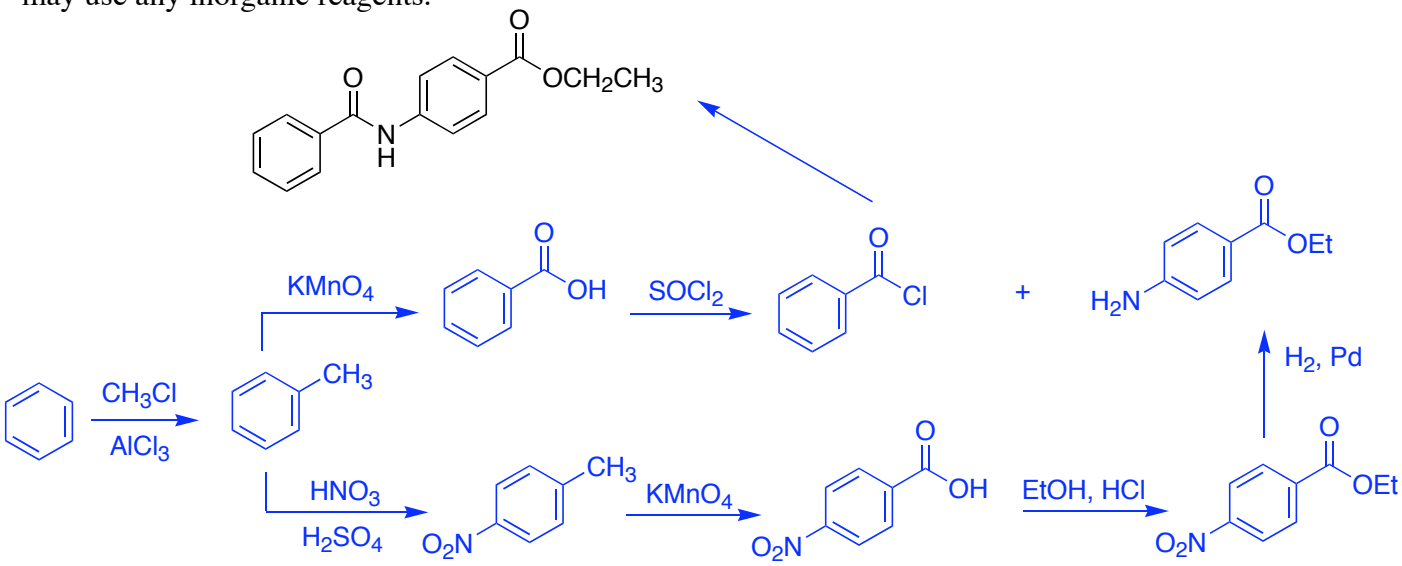
(3) Fill in the compounds in the following roadmap (only show the major product for each step)



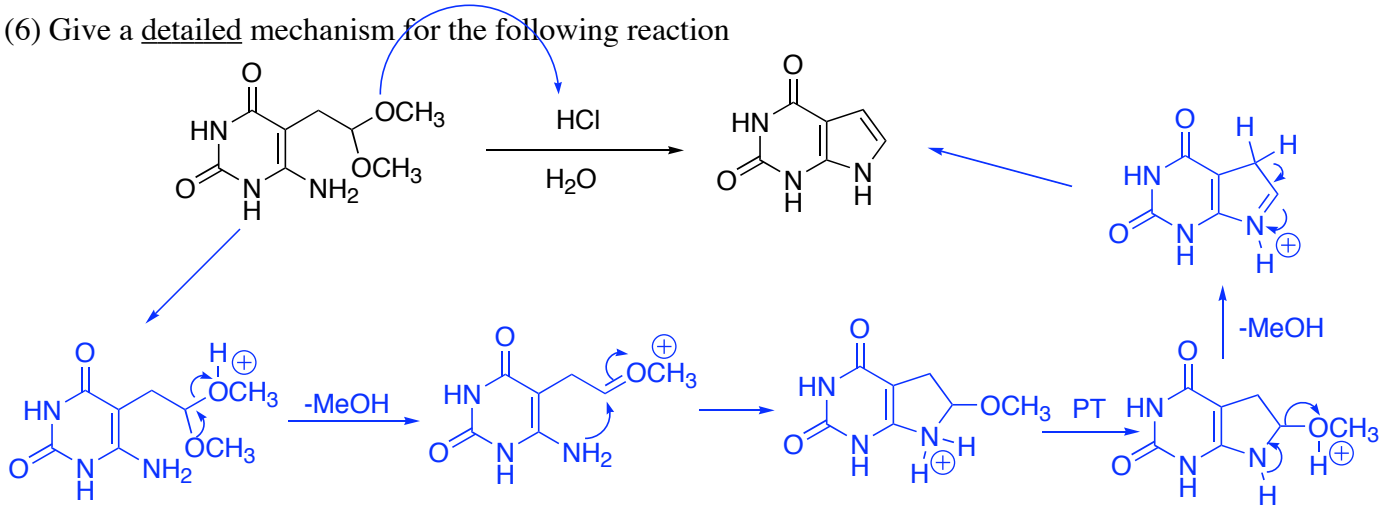
(4) The following reaction is known as a Yamaguchi coupling and is very selective for the formation of the compounds below (no other products are formed). Can you explain this selectivity? (hint: a species known as a mixed anhydride is involved)



(5) Using benzene and ethanol as your only carbon source, synthesize the following molecule. You may use any inorganic reagents.

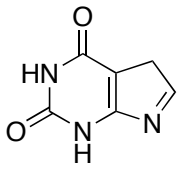


(6) Give a detailed mechanism for the following reaction



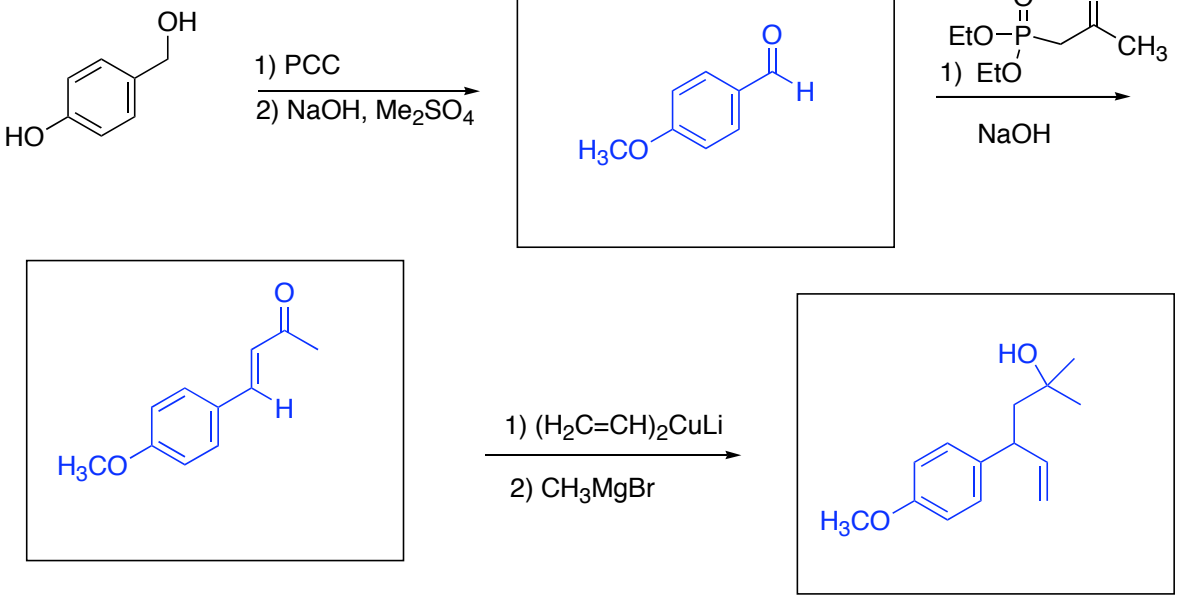
* several other reasonable variations

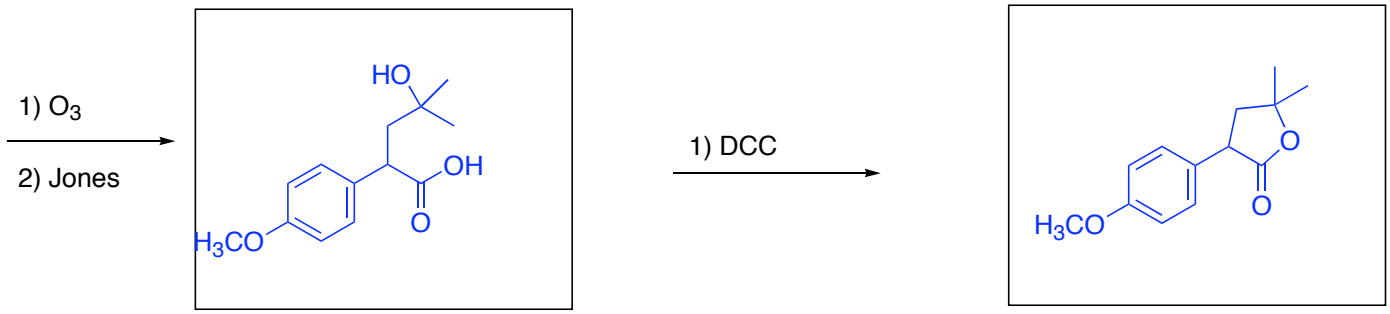
(7) In the last question, why isn't the imine below the product ?



The enamine isomer has an aromatic ring and hence it is more stable

(8) Fill in the compounds in the following roadmap (only show the major product for each step)





(9) List the reagents (in order) needed to accomplish the following transformations