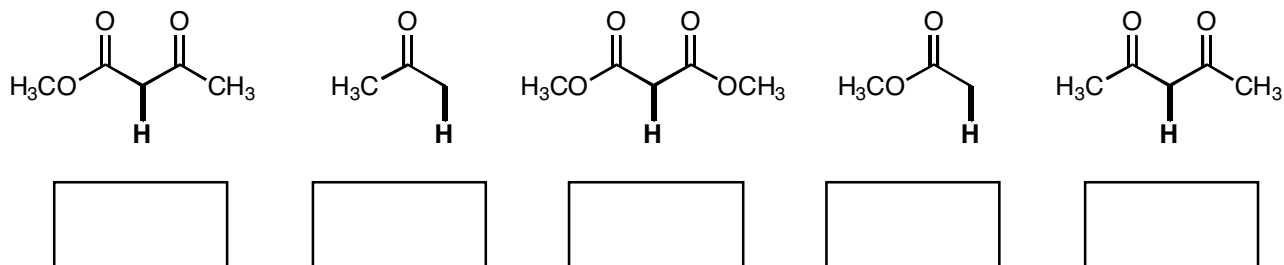
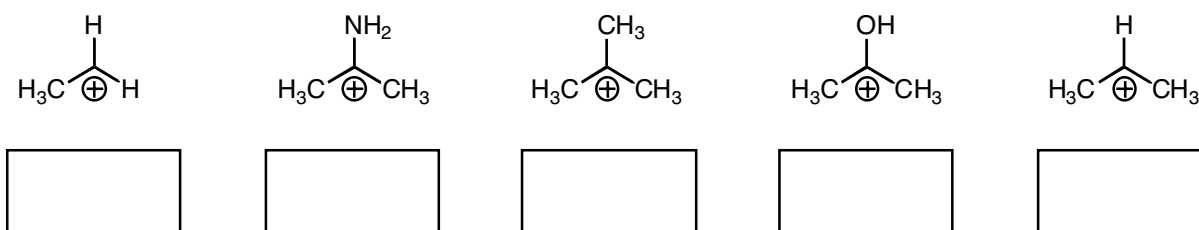


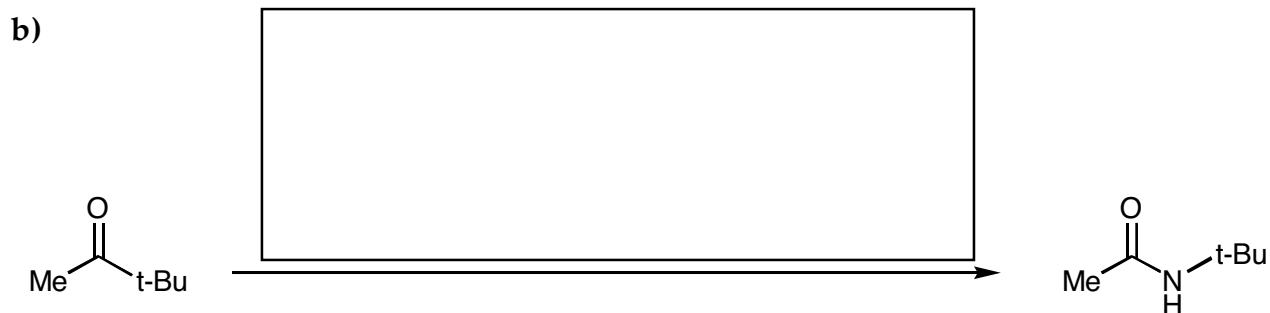
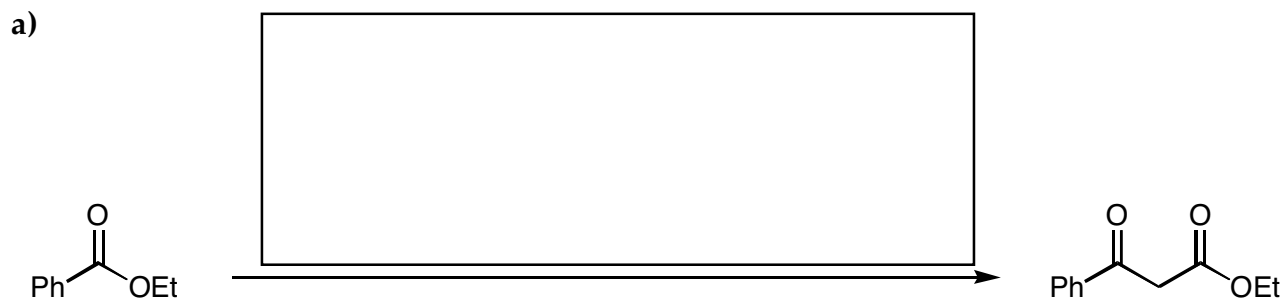
1. a) Rank the following carbonyl compounds based on the acidity of the indicated  $\alpha$ -proton. (1 = most acidic, 5 = least acidic)



- b) Rank the following carbocations based on stability. (1 = most stable, 5 = least stable)

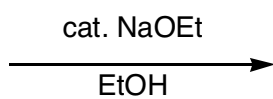
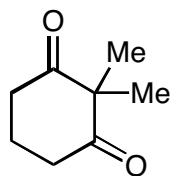


2. In the boxes, please provide the reagents for the illustrated transformations. Include work-up steps and be specific about quantities of reagents where relevant. More than one step may be required.

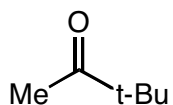


3. Please provide the products of the following reactions. If no reaction is expected, write "NR".

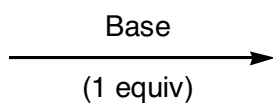
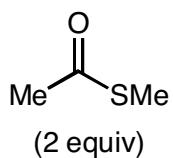
a)



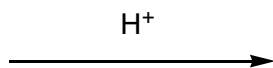
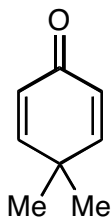
b)



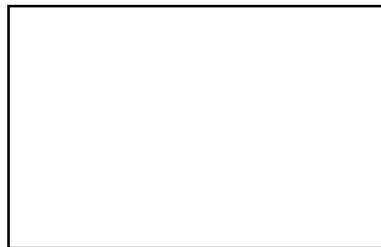
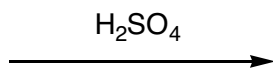
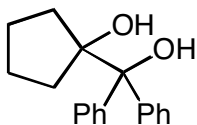
c)



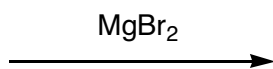
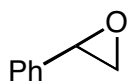
d)



e)

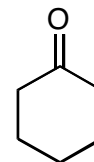
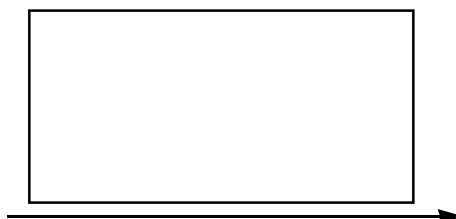
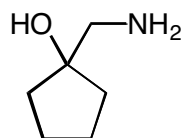


f)

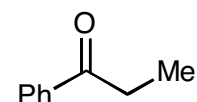
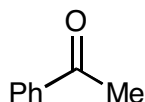


4. Please provide the reagents for the following transformations. Be specific about quantities of reagents where relevant.

a)

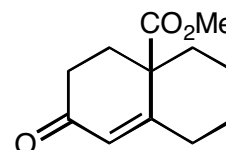
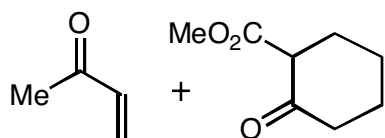


b)

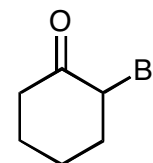
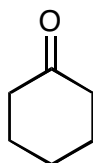


**without  
over-alkylation**

c)

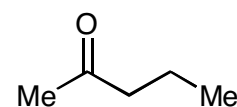
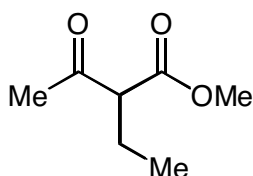


d)

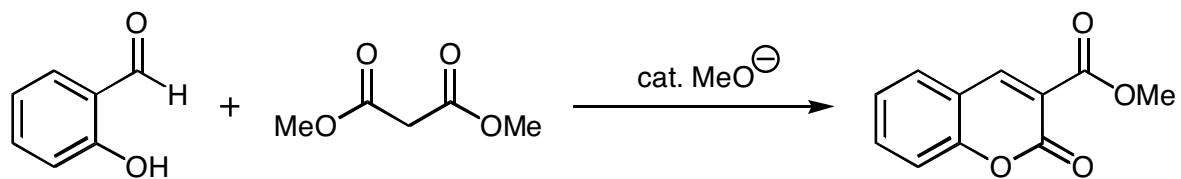


**without  
over-bromination**

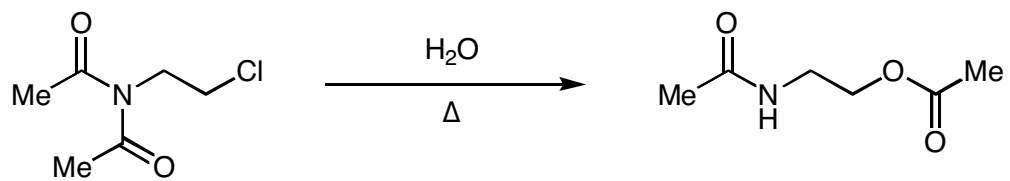
e)



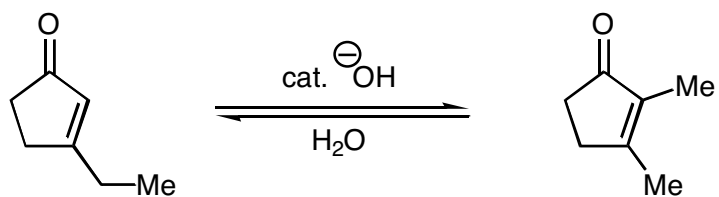
5. Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



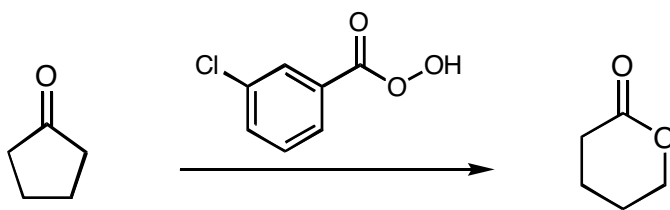
6. Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



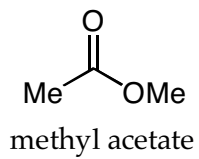
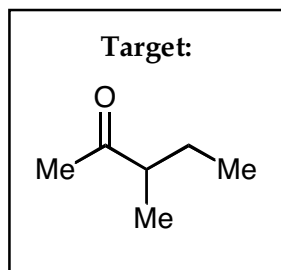
7. Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



8. Please provide a detailed mechanism for the following transformation. Show all arrow pushing.



9. Please provide a synthesis of the indicated compound. All of the carbon atoms should be derived from methyl acetate.





10. Please provide a synthesis of the indicated compound. All of the carbon atoms should be derived from isopropanol.

