

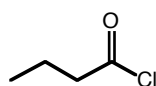
Chem. 218 Problem Set 10

Recommended Problems from the book: 22.4-22.5, 22.10-22.31, 22.42-22.50, 22.53-22.57, 22.58, 22.60-22.64, 22.66-22.69, 22.85-22.86, 28.13-28.15, 28.19-28.20, 28.53-28.60.

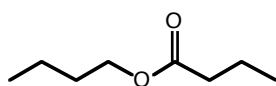
(1st ed: 22.5-22.6, 22.11-22.31, 22.41-22.51, 22.53-22.57, 22.59, 22.61-22.69, 22.84-22.85, 28.13-28.15, 28.19-28.20, 28.52-28.59.)

1. Show how butanoic acid can be converted into each of the following compounds. More than one step may be necessary in some cases.

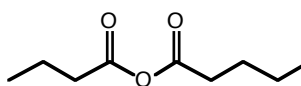
a.



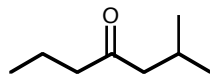
b.



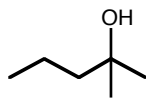
c.



d.

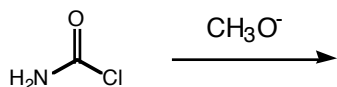


e.

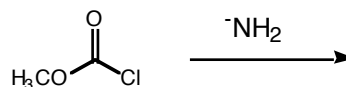


2. Predict the products:

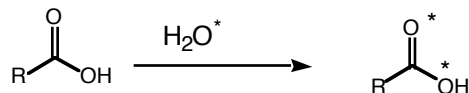
a.



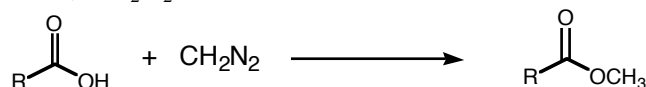
b.



3. When a carboxylic acid is dissolved in isotopically labeled water, the label rapidly becomes incorporated into both oxygens of the carboxylic acid. Explain how.



4. One frequently used method for preparing methyl esters is by reaction of carboxylic acids with diazomethane, CH_2N_2 :

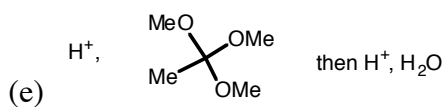
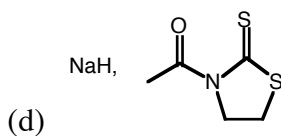
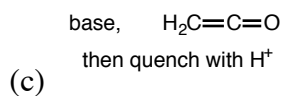
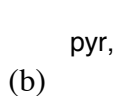
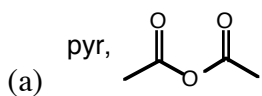


The reaction occurs in two steps: (1) protonation of diazomethane by the carboxylic acid to give the diazonium ion CH_3N_2^+ plus a carboxylate anion, and (2), reaction of the carboxylate with the diazonium ion.

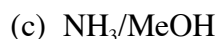
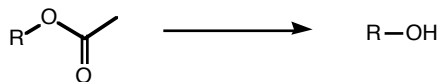
(a) Draw two resonance forms of diazomethane to account for step 1.

(b) What kind of reaction occurs in step 2?

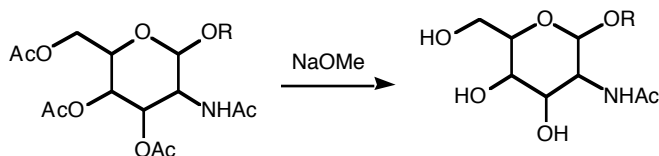
5. Acetate groups are commonly used as protecting groups for alcohols. The following methods have all been used to install an acetate protecting group on an alcohol. Draw all of the products that are formed in addition to the acetate, and draw the mechanism for each reaction.



6. The following methods have been used to remove acetate protecting groups. Draw all of the products and mechanism for each reaction.



7. It is possible to remove an acetate protecting group from an alcohol in the presence of an amine. Explain why.



8. When lactic acid (2-hydroxypropanoic acid) is heated with one equivalent of thionyl chloride, a product with MF $\text{C}_6\text{H}_8\text{O}_4$ is formed. Draw the product and the mechanism for its formation. Hint: it is cyclic.

9. Propose a synthesis of the following molecule using the starting materials given:

