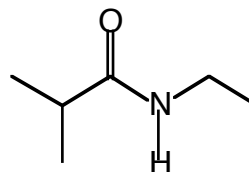
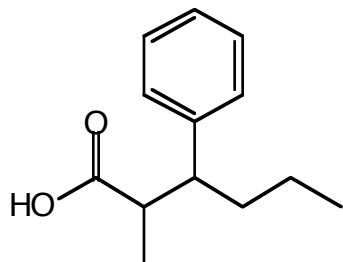
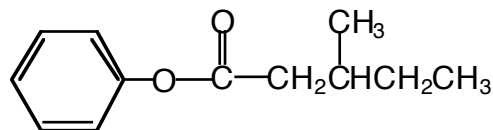
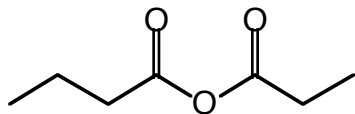
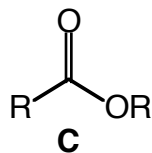
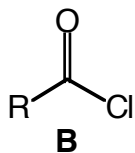
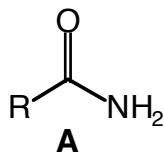


1. Provide an unambiguous name (IUPAC or common) for each of the following molecules. (16 points)

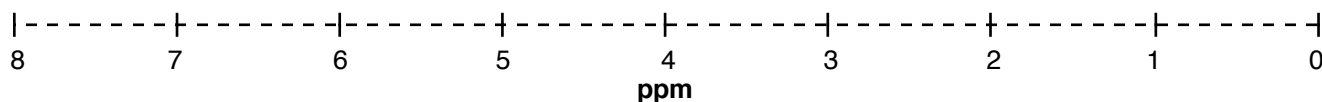
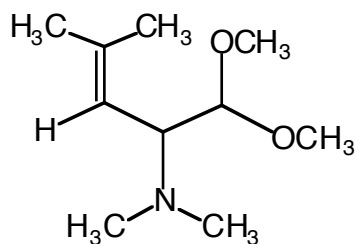


2. Recall that carbonyls absorb IR irradiation between  $1700 - 1800 \text{ cm}^{-1}$  and that the exact position is dependent on the strength of the  $\text{C}=\text{O}$  bond. Match the following carboxylic acid derivatives with their predicted IR absorption frequency *and* provide an explanation for your decision. You must use pictures *and* words for full credit. (14 points)

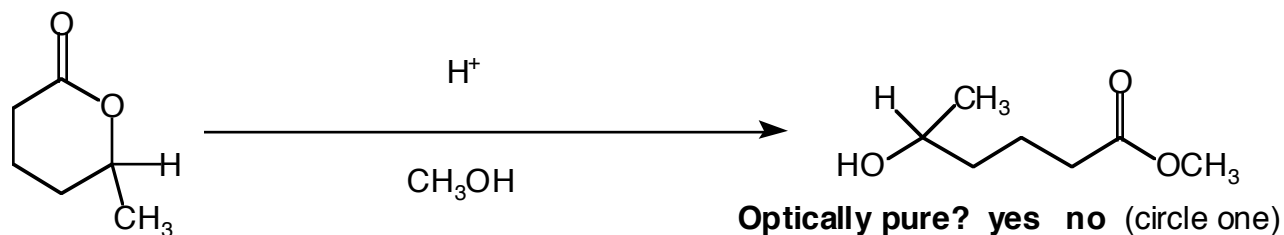


\_\_\_\_\_  $1800 \text{ cm}^{-1}$   
\_\_\_\_\_  $1750 \text{ cm}^{-1}$   
\_\_\_\_\_  $1695 \text{ cm}^{-1}$

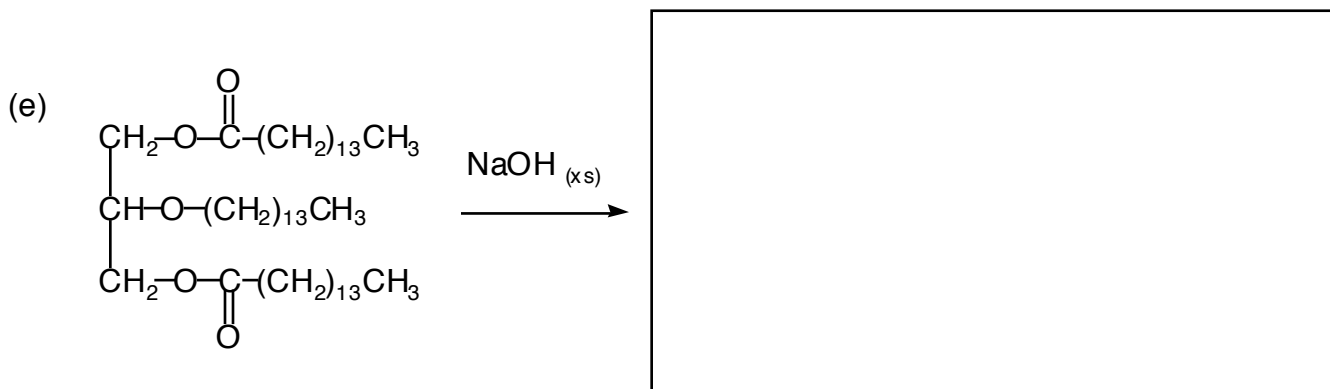
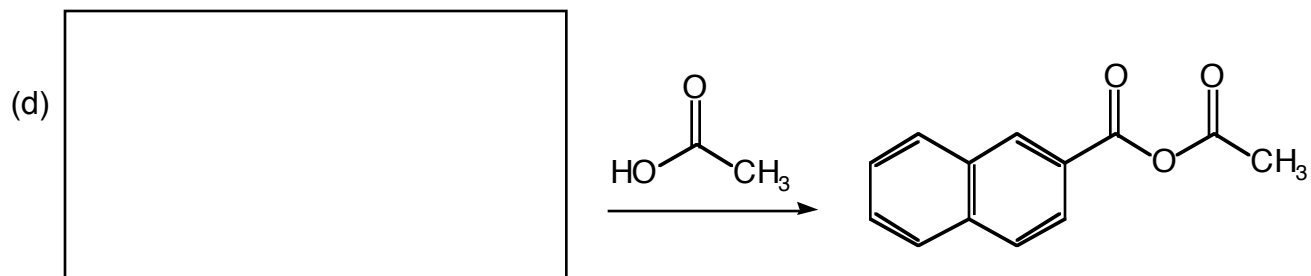
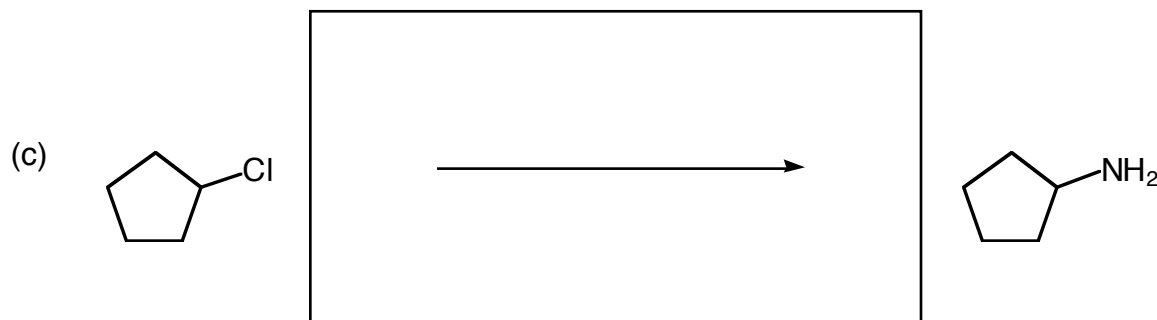
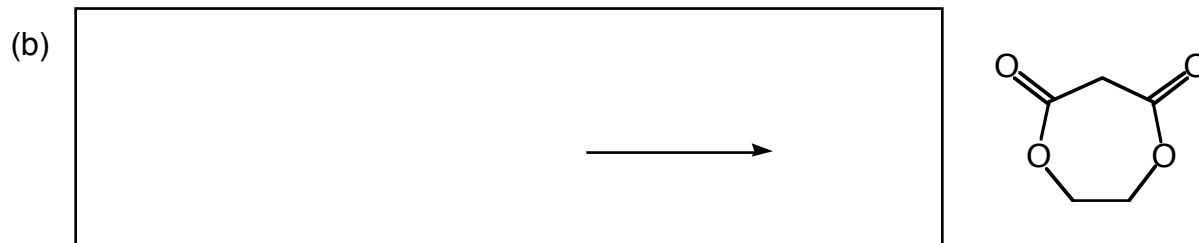
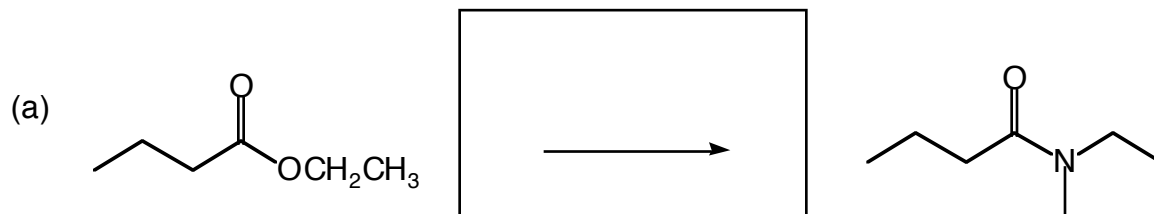
3. Predict the proton NMR of the following molecule. For full credit, you must assign your peaks *and* consider the relative heights in all peaks that show splitting. (12 points)



4. Suppose an *optically pure* sample of the lactone below were placed in acidic methanol as shown. Would the product be optically pure? Suggest a mechanism for this reaction that supports your conclusion. Be sure to show all intermediates & charges for full and partial credit. (12 points)



5. Fill in the boxes below. Be sure to show all reagents and solvents where appropriate. (30 points)



6. A compound with the molecular formula  $C_6H_{10}O_3$  gives the following spectra. Provide a structure for the compound. For full credit, you must assign peaks in each of the 3 spectra! *Circle your answer.* (16 points)

