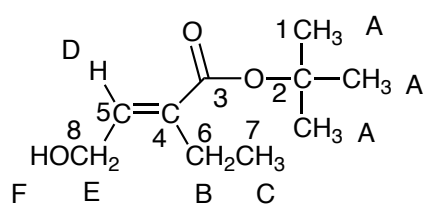


1. For the following molecule, predict (a) the number of carbon signals (b) the number of proton signals and their multiplicities and (c) give three significant IR absorptions and indicate what functional group each absorption each corresponds to. (15 pts)

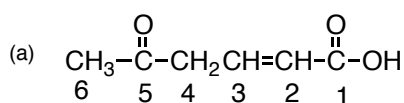


There are six proton signals and 8 carbon signals.

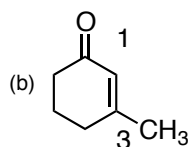
H_A = singlet, 9 H H_D = triplet, 1H
 H_B = quartet, 2H H_E = doublet, 1 H (or doublet of doublets)
 H_C = triplet, 3H H_F = singlet (or triplet)

IR absorbances: OH stretch 3300 - 3500 cm^{-1} ; C=O stretch 1680 - 1750; C-H stretch 2850 - 3000, etc

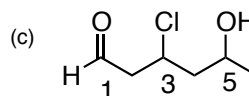
2. Name the following molecules. (15 pts)



5-oxo-2-hexenoic acid

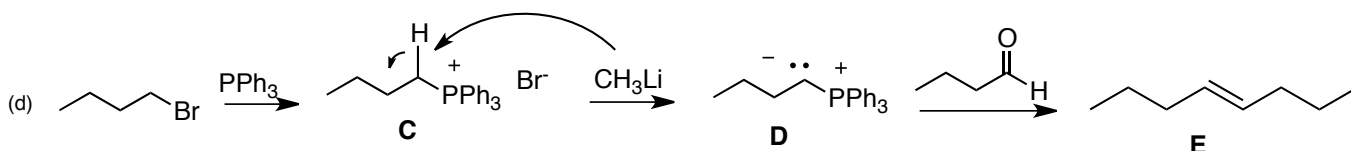
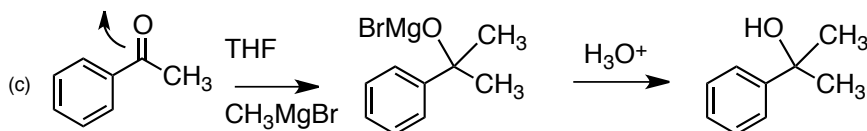
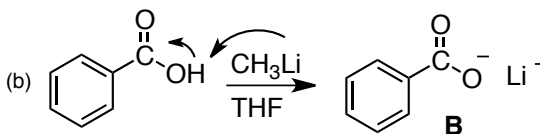
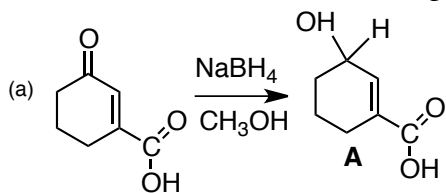


3-methylcyclohex-2-enone

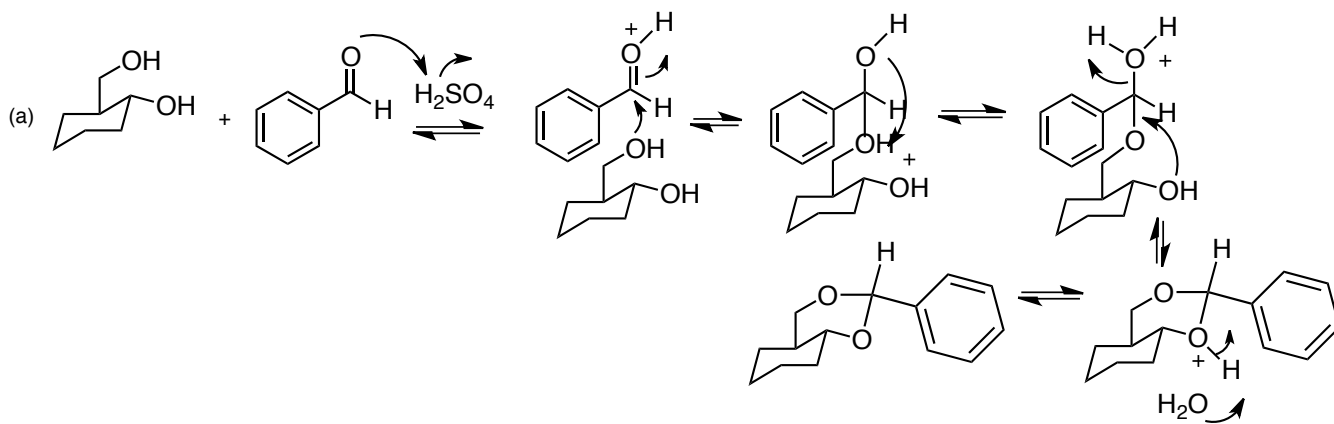


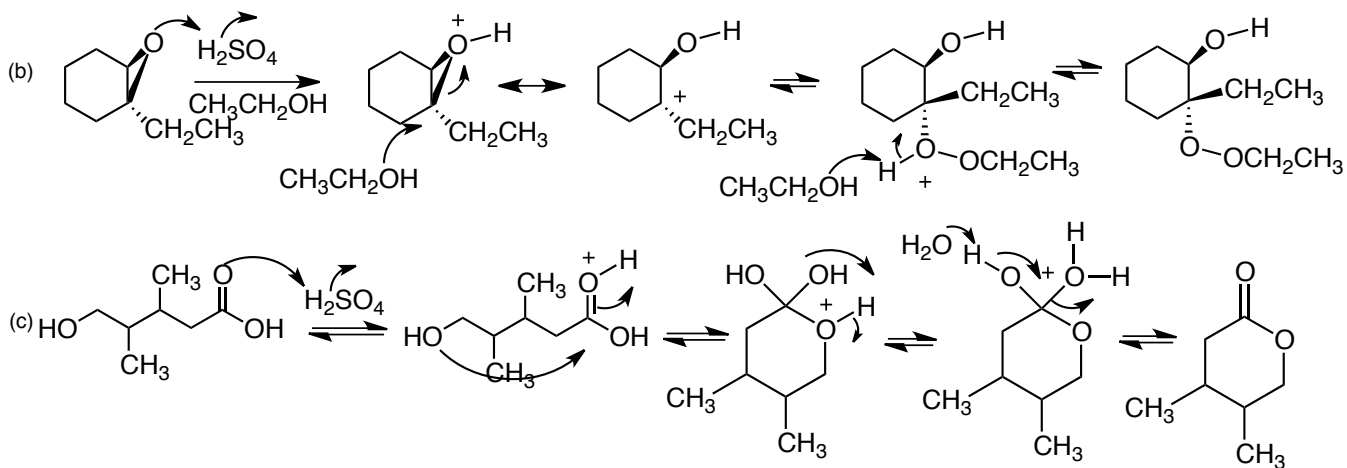
3-chloro-5-hydroxyhexanal

3. Give the product of the following reactions. It is not necessary to show the reaction mechanism but do show all intermediates formed. (30 pts, 5 pts each)

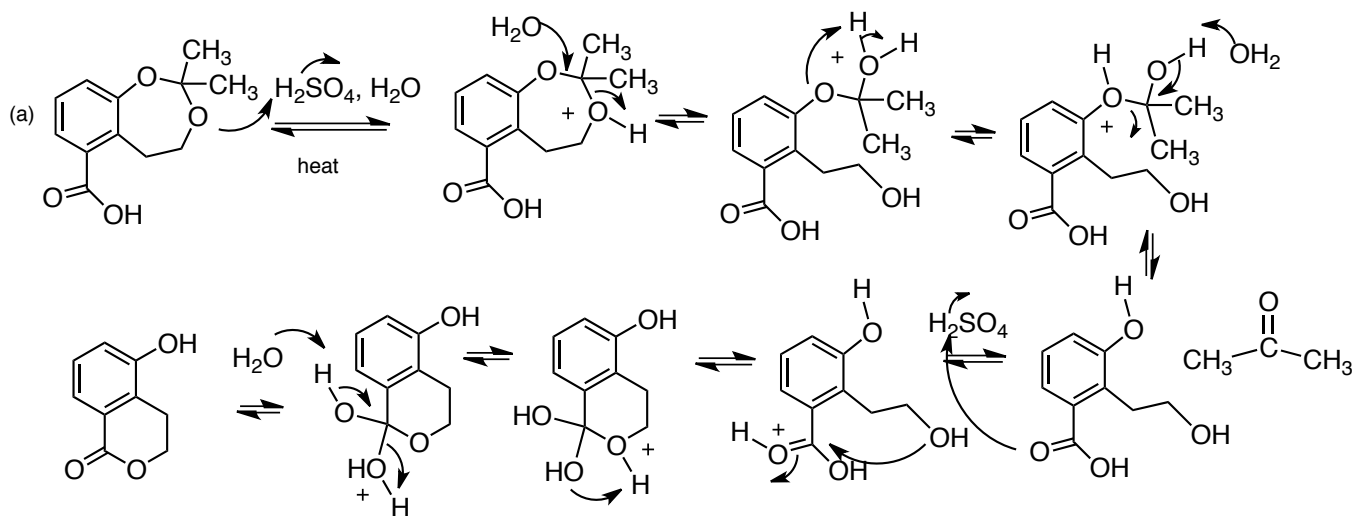


4. Give the product of the following reactions and in each case show the complete reaction mechanism, giving all of the steps. (45 pts, 15 pts each)





5. Show how the following transformation occurs, giving all of the steps of the mechanisms. No other reagents are needed except that given. (15 pts)



6. Synthesize **two** of the following **three** molecules from the starting materials given on the left as shown. Do all **three** for extra credit. (30 pts)

