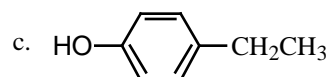
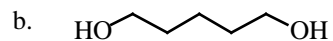
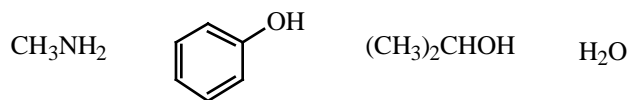


1. Provide Names or Structures for the Following. (10 points total)

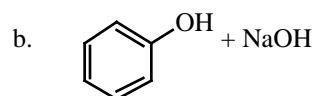
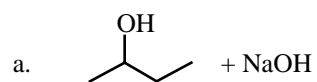
a. (2R,5R)-cis-5-methyl-3-hepten-2-ol



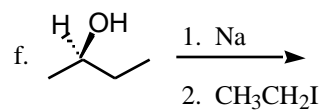
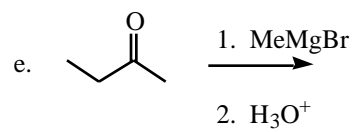
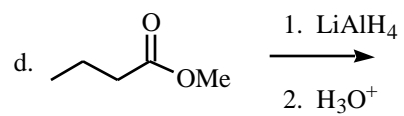
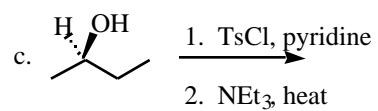
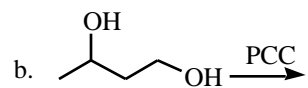
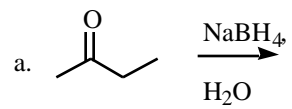
2. Rank the acidity of the following molecules, 1 being most and 4 being least acidic. (3 points)



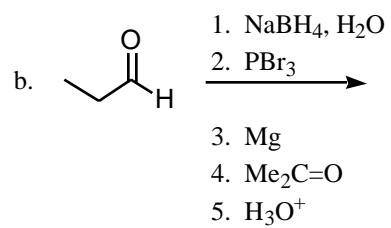
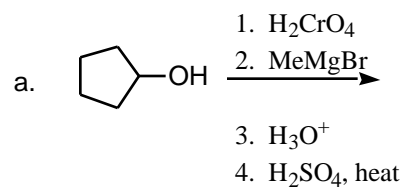
3. Complete the following acid-base reactions, and indicate whether the equilibrium favors the reactants or the products. (3 points each)



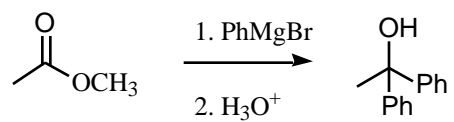
4. Draw the products of the following reactions. (3 points each)



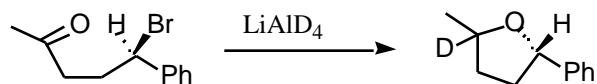
5. Draw the products for the following multistep syntheses. (5 points each)



6. Draw the mechanism for the following reaction. (6 points)

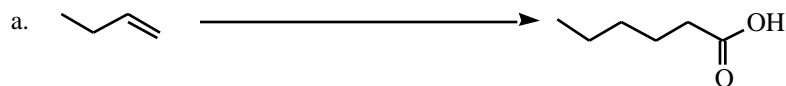


7. Draw the mechanism for the following reaction. Note: This is a slight twist on familiar stuff. The overall transformation appears unfamiliar, but the individual steps are actually familiar. (6 pts)

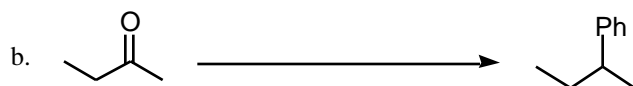


8. Suggest a structure for a compound "A" whose formula is  $C_5H_{12}O$ , that reacts instantly with the Lucas reagent ( $ZnCl_2/HCl$ ), but does not cause an orange to green color change upon mixing with chromic acid. (4 points)

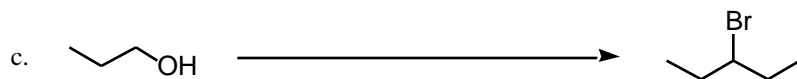
9. Provide reagents for the following transformations. For this problem, you may use absolutely any reactant you please, including carbonyl compounds or organometallics (so long as it does not include more than one functional group). I have indicated the number of steps I envision, to give you an idea if your route is longer or shorter than necessary. (You may design alternate routes longer, or perhaps even shorter, than the ones I have in mind.) (6 points each)



(5 steps, counting  $H_3O^+$ )



(4 steps, counting  $H_3O^+$ )



(4 steps, counting  $H_3O^+$ )

10. Provide a synthesis for the following molecules. Permissible starting materials include alcohols or alkenes of 5 carbons, formaldehyde, ethylene oxide, and any other support reagents you like. (7 points each) (In none of these examples should it take more than 5 steps to get from any starting material to the products.)

