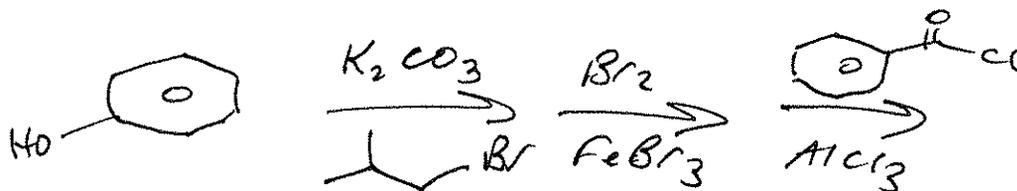
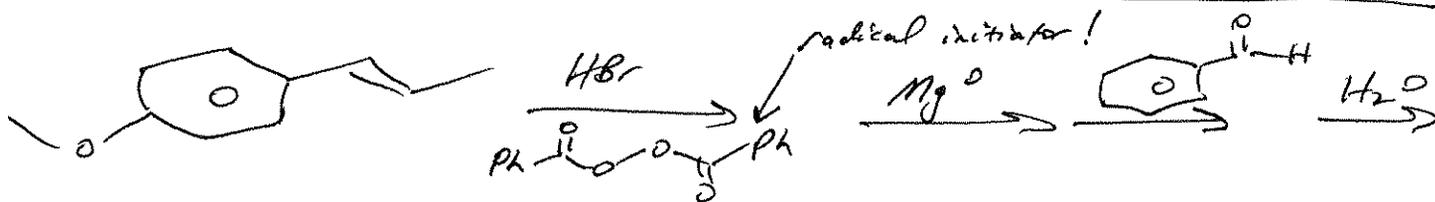
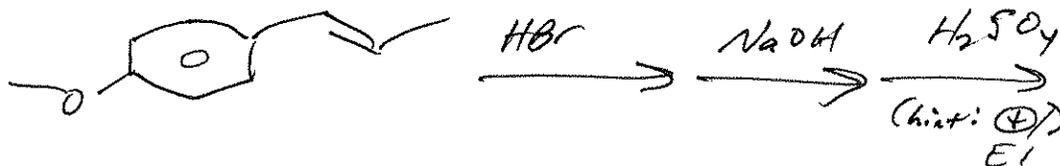


## Problem Set 4

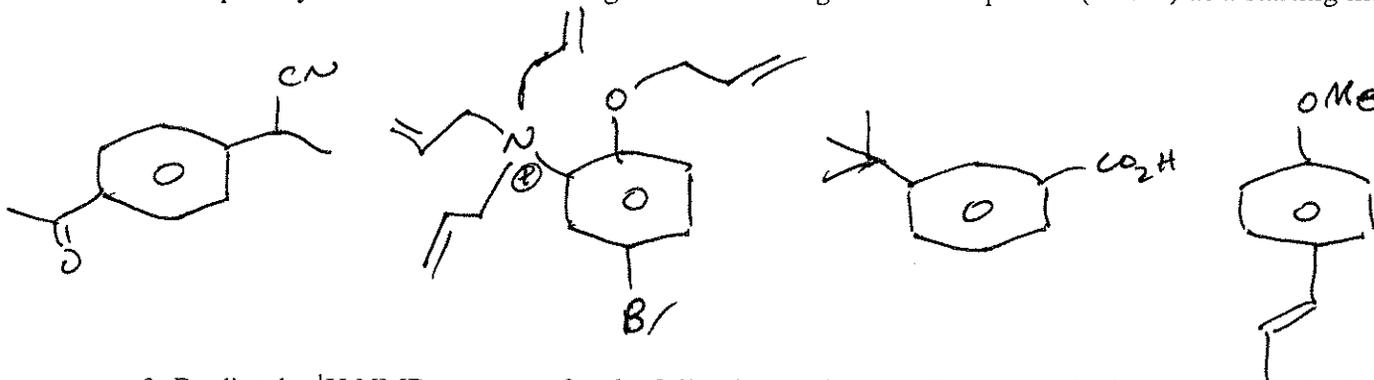
Five points. Due Friday, March 8, by the **start** of class.

Provide answers on a separate sheet(s) of paper, stapling together multiple pages.

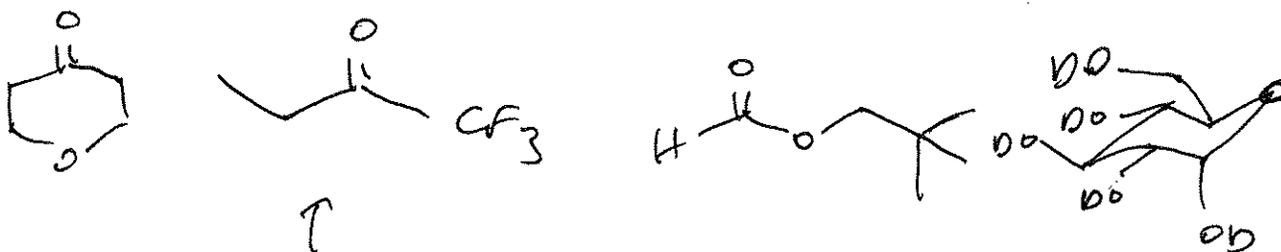
1. Provide mechanisms and products for the following reactions. Pay attention to stereochemistry. No mechanisms are necessary for reactions which use Pd, which use  $\text{KMnO}_4$ , or the generation of Grignard reagents.



2. Propose syntheses of the following molecules using benzene or phenol (PhOH) as a starting material.



3. Predict the  $^1\text{H}$  NMR spectrum for the following molecules. Draw each hydrogen and label all equivalent hydrogens with the same label (i.e. Ha, Hb, etc.). For each equivalent hydrogen, indicate the approximate chemical shift, splitting (singlet, doublet, etc.), and number of hydrogens (integration).



also provide  
 $^{19}\text{F}$  NMR...  
 (don't worry about  $\delta$ )