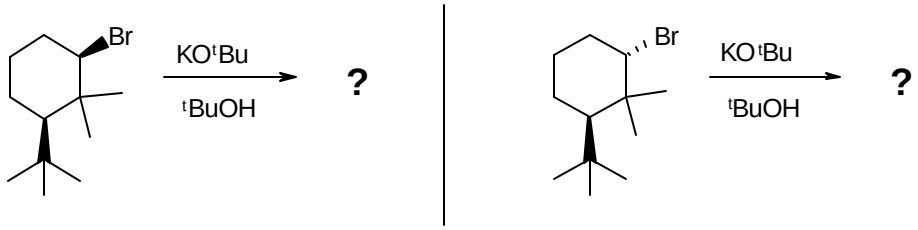
UNIVERSITY OF WINDSOR
Chemistry and Biochemistry

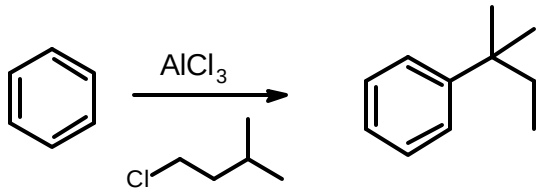
Chemistry 59-235 **Apr. 25, 2001**
Final Exam **Time: 3 hours**

Answer all questions in the exam booklet(s). Use the following values for molecular weights: C, 12.011; H, 1.008; Br, 79.904; Cl, 35.453; O, 15.999; N, 14.007

1. One of the following reactions proceeds more slowly than the other. Indicate which of the reactions is faster (or slower), and clearly explain the reasons why this is the case. Include the structure of both reaction products in your answer.. (**10 marks**)

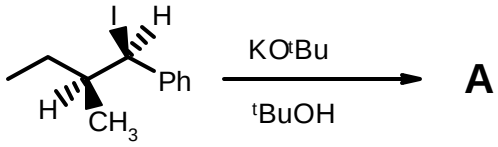


2. The following transformation gave the observed product, which was unexpected by the person conducting the reaction. Give a reasonable complete mechanism for this reaction, which includes the substitution steps, and shows how the alkyl group 'got that way'. As an aside, it would probably not be the *only* compound formed. (**10 marks**).

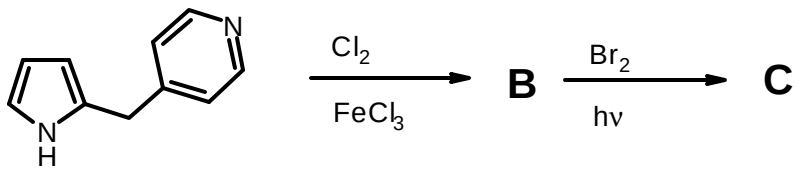


3. Predict the major products of the following transformations. Mechanisms are not necessary, but showing your work may be useful (**5 marks each, 50 total**).

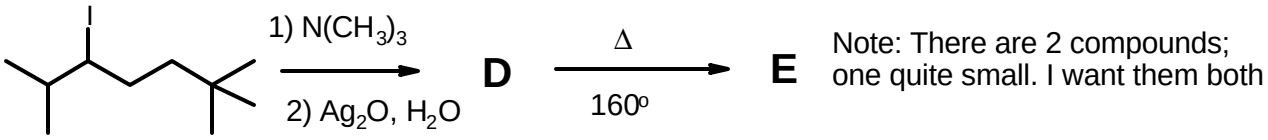
a)



b)

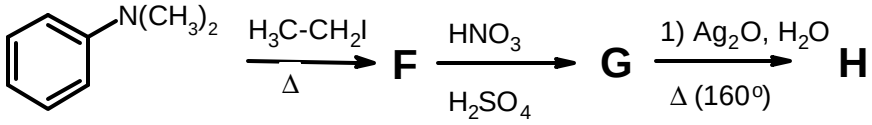


c)

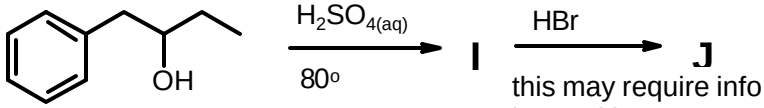


Note: There are 2 compounds; one quite small. I want them both

d)



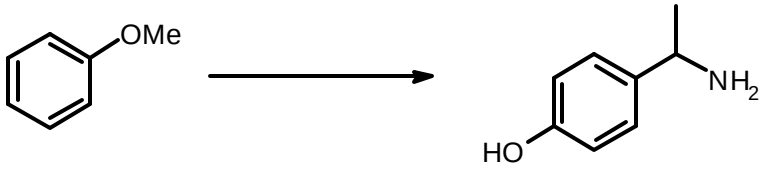
e)



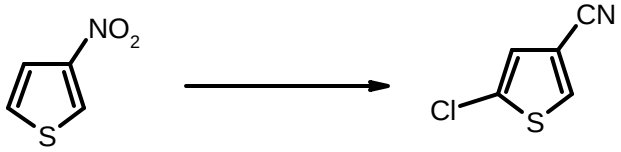
this may require info learned in 230

4. Show by equation (in one or several steps) how you could prepare the products illustrated below from the given starting materials. You may use any other reagents you deem fit. Show all reagents, conditions, and isolable intermediates. Mechanisms are not necessary, but showing your work may be a help. **<u>Do any four</u> (40 marks).**

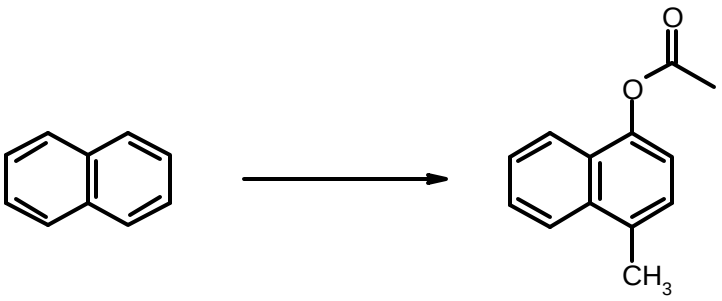
a)



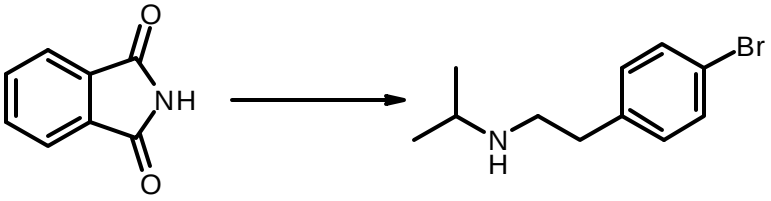
b)



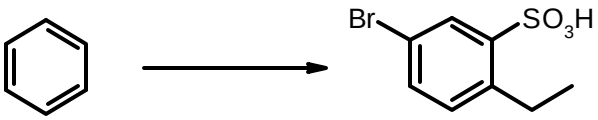
c)



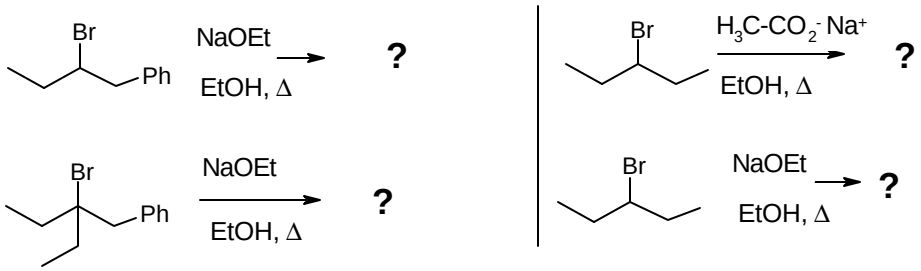
d)



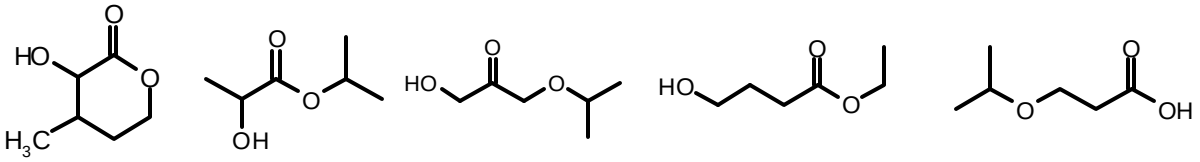
e)

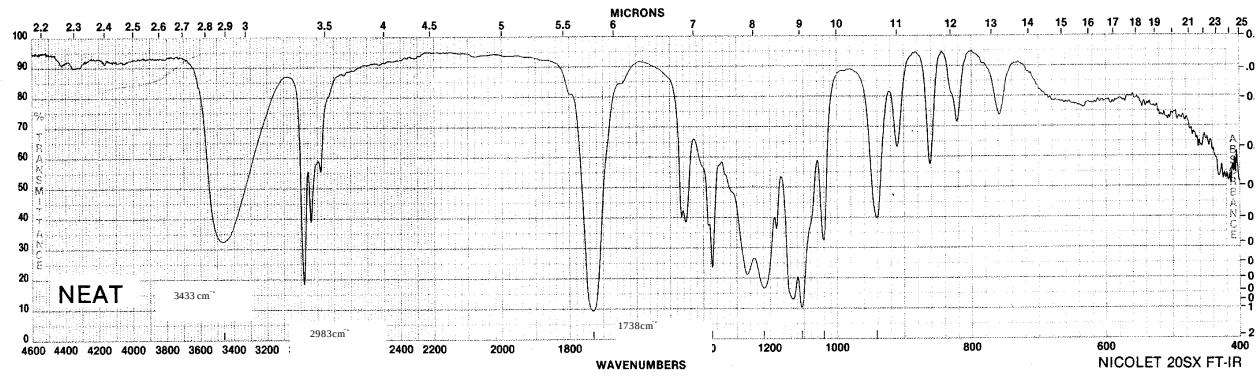


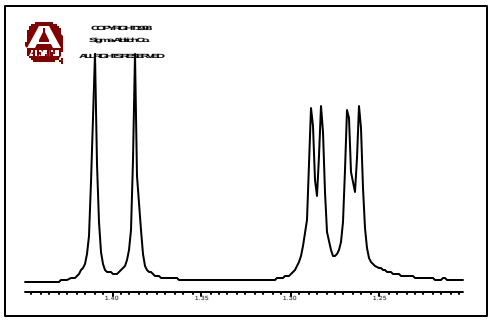
5. Rank *all four* of the following reactions in their *relative* ability to undergo E2 elimination as opposed to an S_N2 substitution. Include the reasons for your ordering and the product structures You'll need both substitution and elimination products *except* in *the most* highly substituting and *the most* highly eliminating cases. (**10 marks**).



6. The following compound has been analyzed, revealing a composition of C, 54.53%, H, 9.15%, O, 36.32%. The IR (infrared) and ^{1}H NMR spectra are also included below. Which of the following structures is the most reasonable candidate for the compound in question, and why? Assign the NMR spectrum, showing the comparison of your calculated chemical shifts with the observed ones. Your answer should include the assignment of the most important features (i.e., the starred ones) of the IR spectrum. (**15 marks**)







Expanded regional around
1.2 –1.5 ppm

Bonus: A student who had forgotten that nucleophilic substitution reactions of benzenes are not easy tried to carry out the reaction of *o*-chloro(isopropyl)benzene with lithium diisopropylamide (LDA). Oddly enough, the major product had the right chemical composition, but the wrong substitution pattern. Propose a reasonable mechanism for what transpired.