

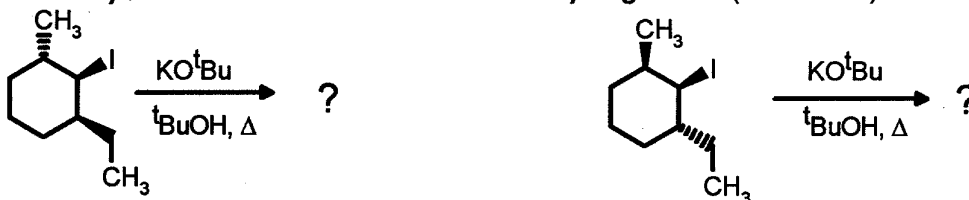
**University of Windsor**  
**Department of Chemistry and Biochemistry**

**Chemistry 59-235**  
**Final Exam**

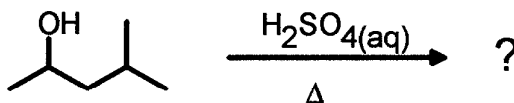
Dec. 13, 1996  
Time: 3 hours

Answer all questions in the exam booklet(s) provided. 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 rapidly 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. Note: Ethyl is a somewhat larger group than methyl, and the iodine acts as if it's not very large at all. (10 marks)

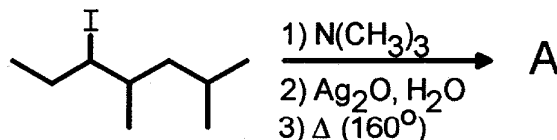


2. Show the complete mechanism for the following transformation. Name the mechanism. Name the type of product (i.e., its regiochemistry) (and draw it) that is formed here. (10 marks)



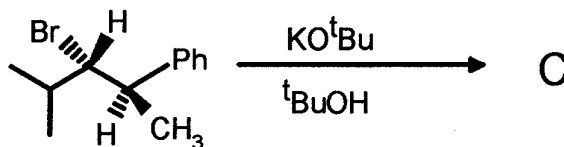
3. Predict the major products of the following transformations. Mechanisms are not necessary, but showing your work may be useful. (5 marks each letter, 50 marks total)

a)

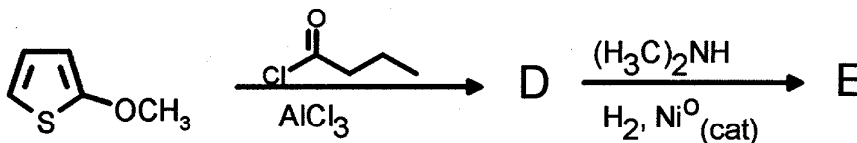


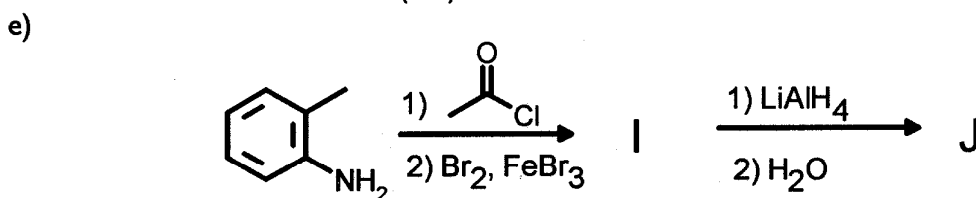
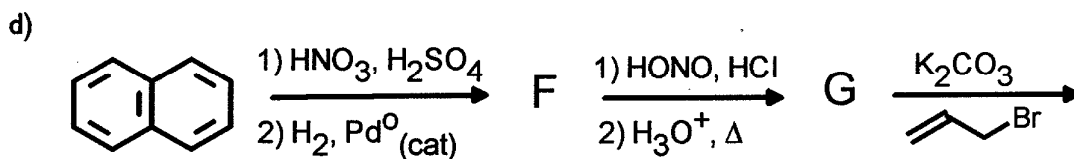
What would happen to the final products if  $N(\text{CH}_2\text{CH}_3)_3$  was used instead in step 1)? Call these products 'B'.

b)

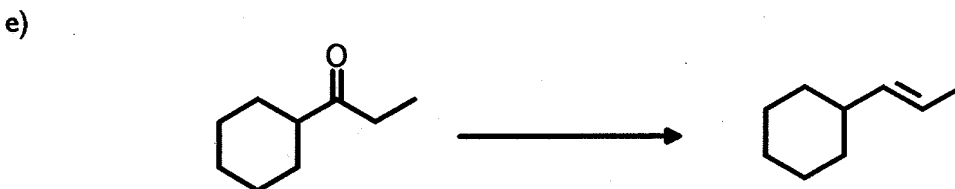
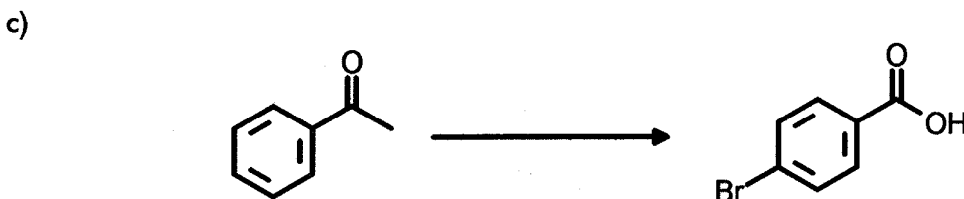
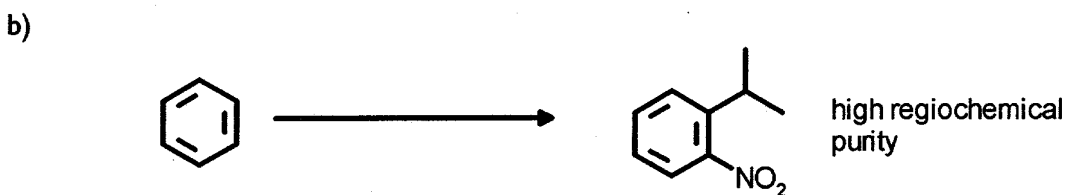
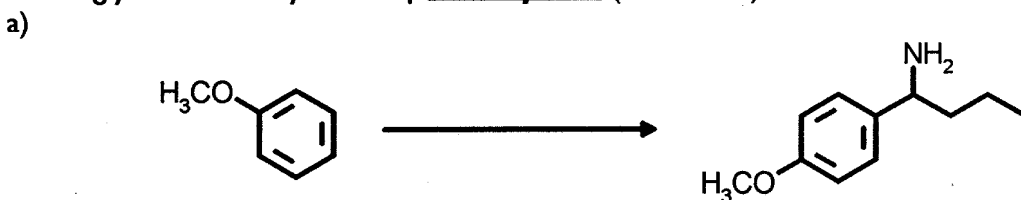


c)

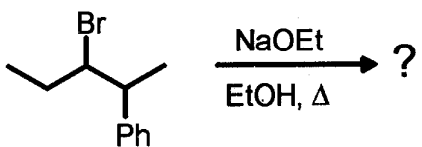
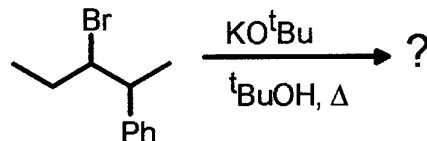
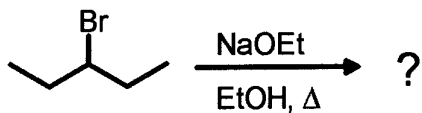




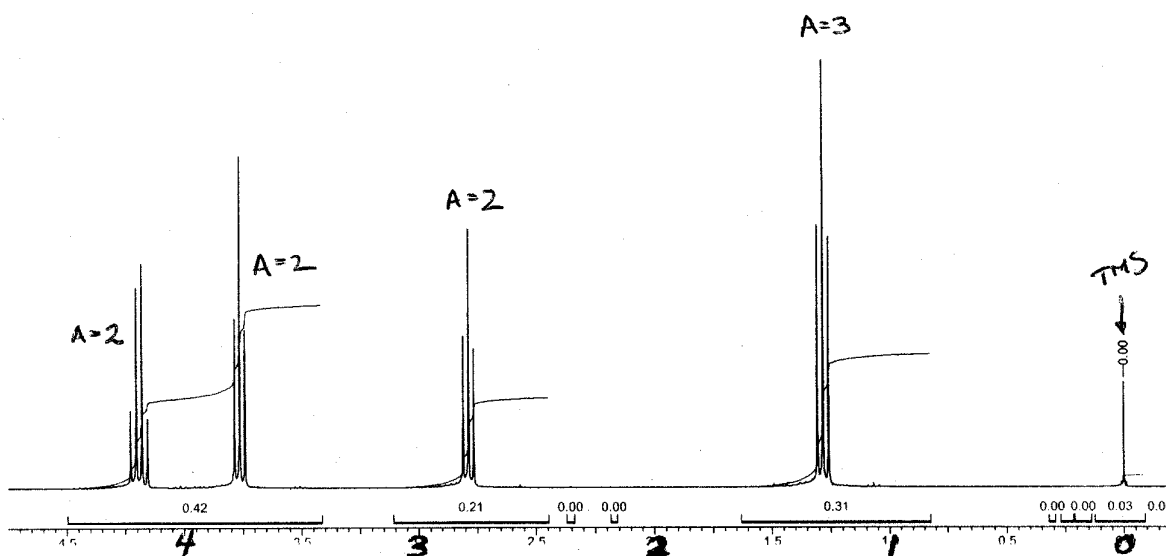
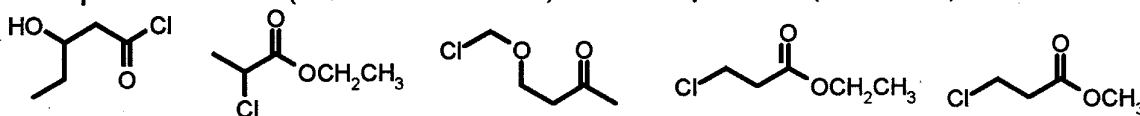
4. Show by equation (in one or several steps) how you could prepare the products illustrated below from the given starting materials. You may use any other reagents you deem fit. Show all reagents, conditions, and isolable intermediates. Mechanisms are not necessary, but showing your work may be a help.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



5. Rank the following reactions in their relative ability to undergo an E2 elimination as opposed to an S<sub>N</sub>2 substitution. Include the reasons for your ordering and the product structures (10 marks).



6. The following compound has been analyzed, revealing a composition of C, 43.97%, H, 6.64%, Cl, 25.96%, O, 23.43%. The IR (infrared) and <sup>1</sup>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 <sup>1</sup>H NMR spectrum, showing the comparison of your calculated chemical shifts with the observed ones. Your answer should also include the assignment of the most important features (i.e., the starred ones) of the IR spectrum. (15 marks)



2983.1 1375.5 1152.1  
1738.7 1299.9 1019.6  
1446.0 1206.2 933.3

