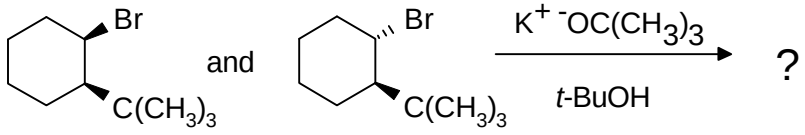
**University of Windsor**
**Department of Chemistry and Biochemistry**

**Chemistry 59-235** **Dec. 15, 1995**
**Final Exam Time: 3 hours**

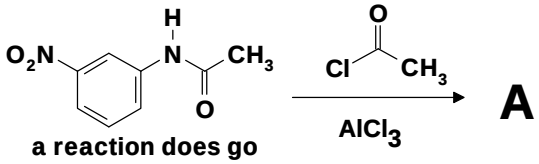
**Use the following values for molecular weights: C, 12.011; H, 1.008; Br, 79.904; O, 15.999; N, 14.007.**

**1. One of the following substrates is much more reactive than the other to reaction with potassium *tertiary* butoxide. Which one is it? Include the reasons for your decision, with enough stereochemical drawings to illustrate those reasons. What is the type of mechanism for the reaction (10 marks)?**

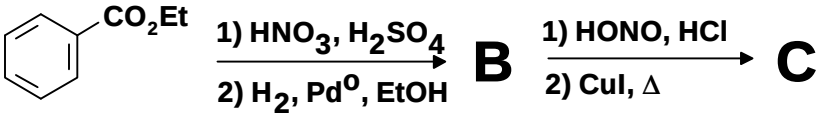



**2. Predict the major products of the following transformations. Mechanisms are not necessary, but showing your work may be useful. (50 marks)**

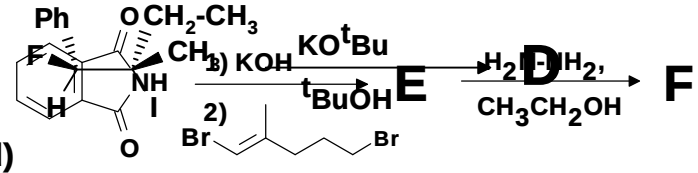
**a**




**b)**

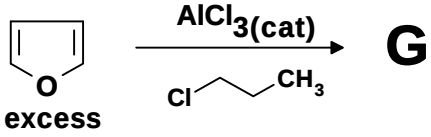



**c)**

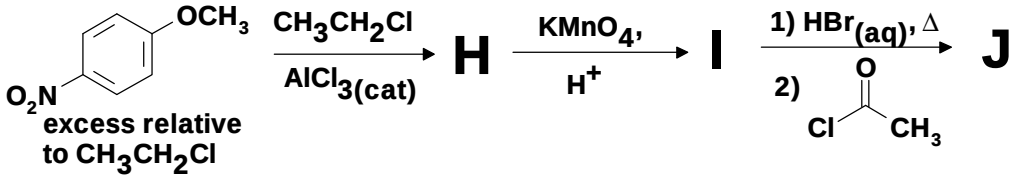



**d)**

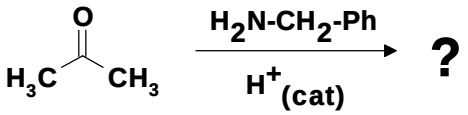
**e)**



**f)**

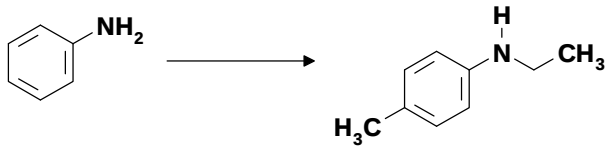



**3. Show the complete mechanism for the following acid catalyzed reaction of acetone with benzylamine. The name of the type of functional group of the product (along with its structure) will be included in the complete answer. (10 marks)**



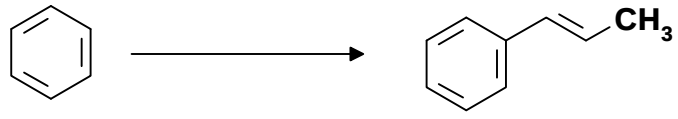

**4. Show by equation (in one or several steps) how you could prepare the products illustrated below from the given starting materials. You may use any other reagents you deem fit. Show all reagents, conditions, and isolable intermediates. Mechanisms are not necessary, but showing your work may be a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

**a)**

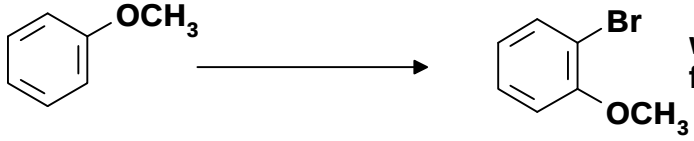



**b)**


**c)**

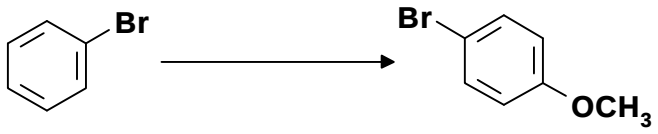



**d)**

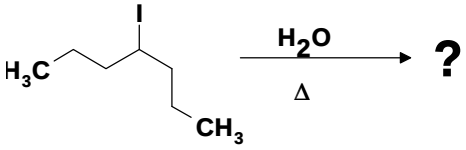


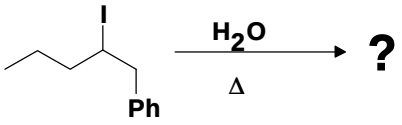

**with little or no contamination from the *para* isomer**

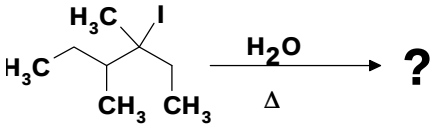
**e)**



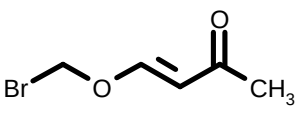

**5. Rank the following reactions in their <u>relative</u> ability to undergo elimination by an E1 mechanism as opposed to an E2. Include your reasons for your ordering (10 marks). Include product structures.**

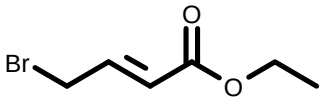


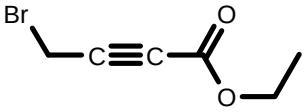



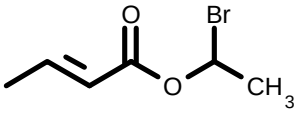



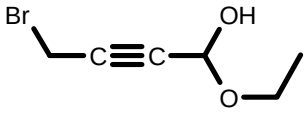

**6.a) The following compound was analyzed, revealing C, 37.33%; H, 4.70%; Br, 41.39%; O, 16.58%. The compound also gave infrared (IR) and $^{1}$H NMR spectra as follows. Which of the following structures is the most reasonable candidate for the compound, and why? Assign the $^{1}$H NMR spectrum, showing the comparison of the calculated chemical shifts with the observed ones. Your answer should also include the most important features in the IR spectrum (i.e, the starred ones), and what they mean.(15 marks)**

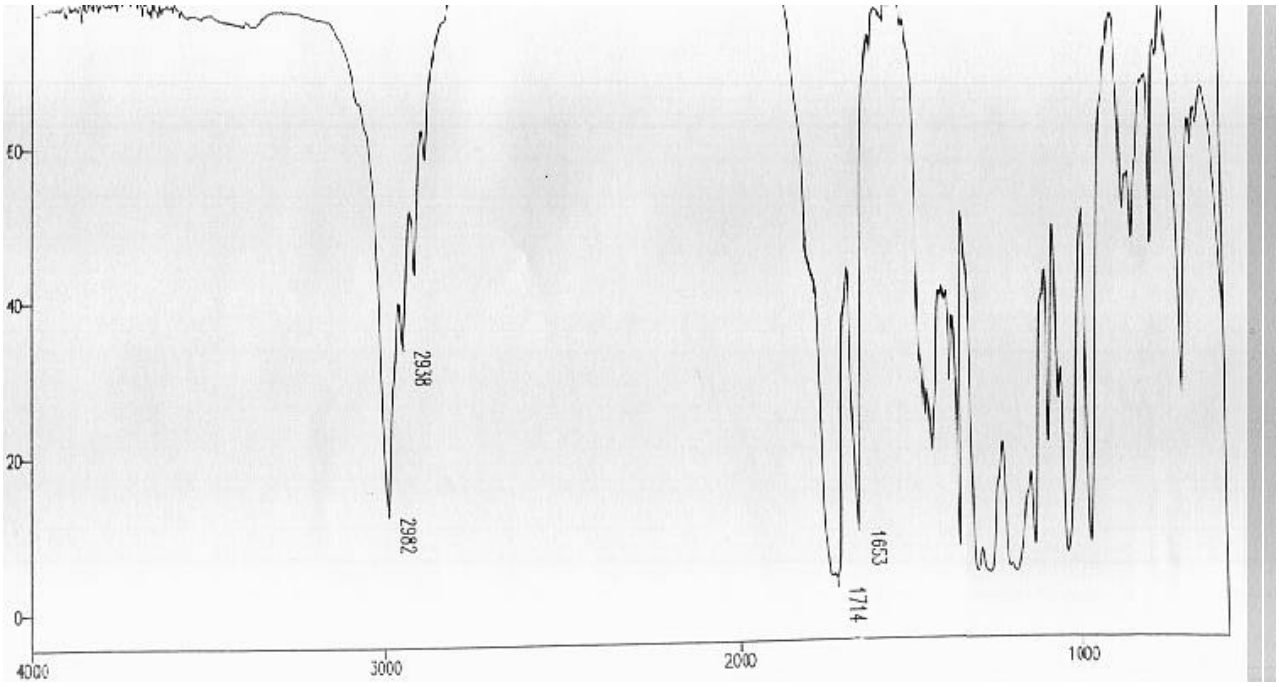


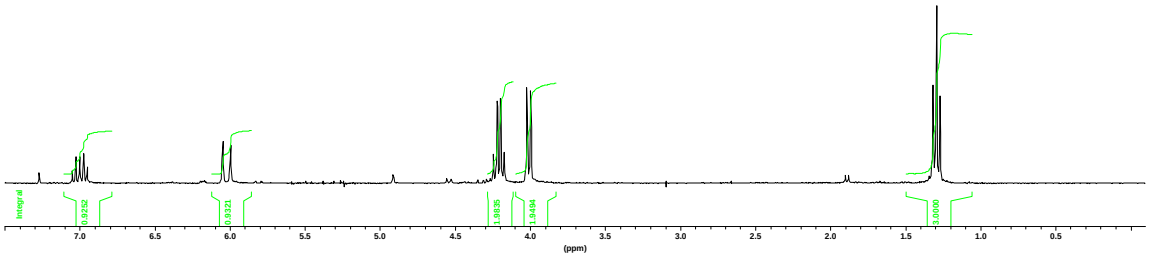






**Bonus: Aromatic rings, being electron rich species, are very good at undergoing electrophilic substitution. They are usually horrible at undergoing nucleophilic substiution, like alkyl halides can. There are ways around this. Can you design a way to what appears to be a simple nucleophilic substitution of an aryl halide?**