

University of Windsor  
Chemistry and Biochemistry

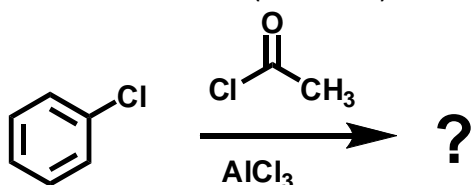
Chemistry 59-235  
First Test

Feb. 7, 2013  
Time: 52 minutes

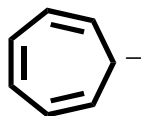
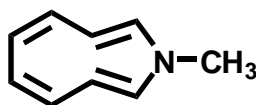
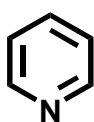
Note: There are questions **on both sides** of this page.

Note: Please write in exam booklets. Tests written in pencil will be marked, but cannot be returned for remarking.

1. Give the **complete** mechanism for the Friedel-Crafts acylation of chlorobenzene. The correct answer will include the formation of the reactive electrophilic species, all reasonable resonance forms of the intermediates from reaction at the ortho-, meta-, and para- positions, and any small molecules ejected in any step. By way of resonance structures, make sure to give clear indication of the reasons for the regiochemical outcome obtained. (15 marks)



2. Indicate whether the following systems are aromatic, antiaromatic, or non-aromatic by Hückel's Rule, **and** give the number of  $\pi$ - electrons in the conjugated cyclic system (5 marks)

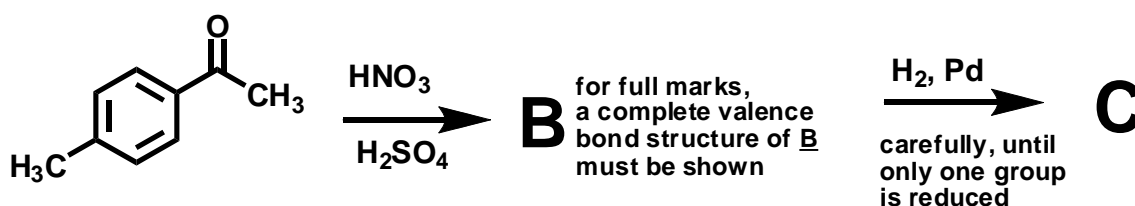


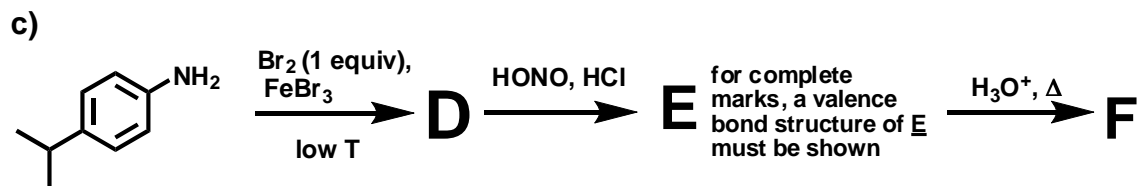
3. Predict the most reasonable structure of the major product(s) from each of the following reactions. Mechanisms are not necessary, but showing your work is likely to be a help. Note: If there is >1 significant product, show them all and take the **major** one on to any further step. Note 2. In complex substituents such as sulfonic acid, nitro groups and diazonium salts, the correct valence bond structure must be drawn (at least) one time. (5 marks for each letter, 30 marks total).

a)



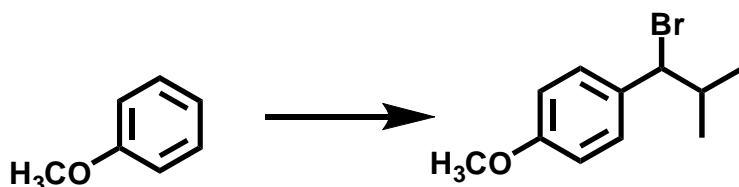
b)



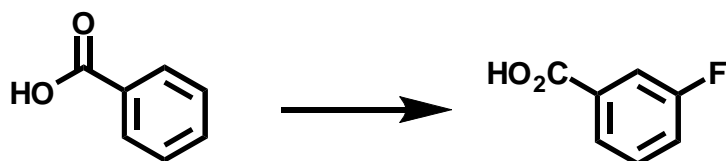


4. Show by equation (in one or several steps) how you could prepare the illustrated products from the given starting material. You may use any other reagents which you deem fit. Show all reagents, conditions, and intermediates which could be isolated. I also wish to see an appropriate valence bond structure for complex substituents such as sulfonic acids, at least one time. Mechanisms are not necessary, but may be a help (10 marks each, 20 marks total).

a.



b.



Note: Carboxylic acids are not easily reduced by catalytic hydrogenation