Organic Chemistry c3444y

2nd Hour Exam

Monday, Feb. 28, 2000

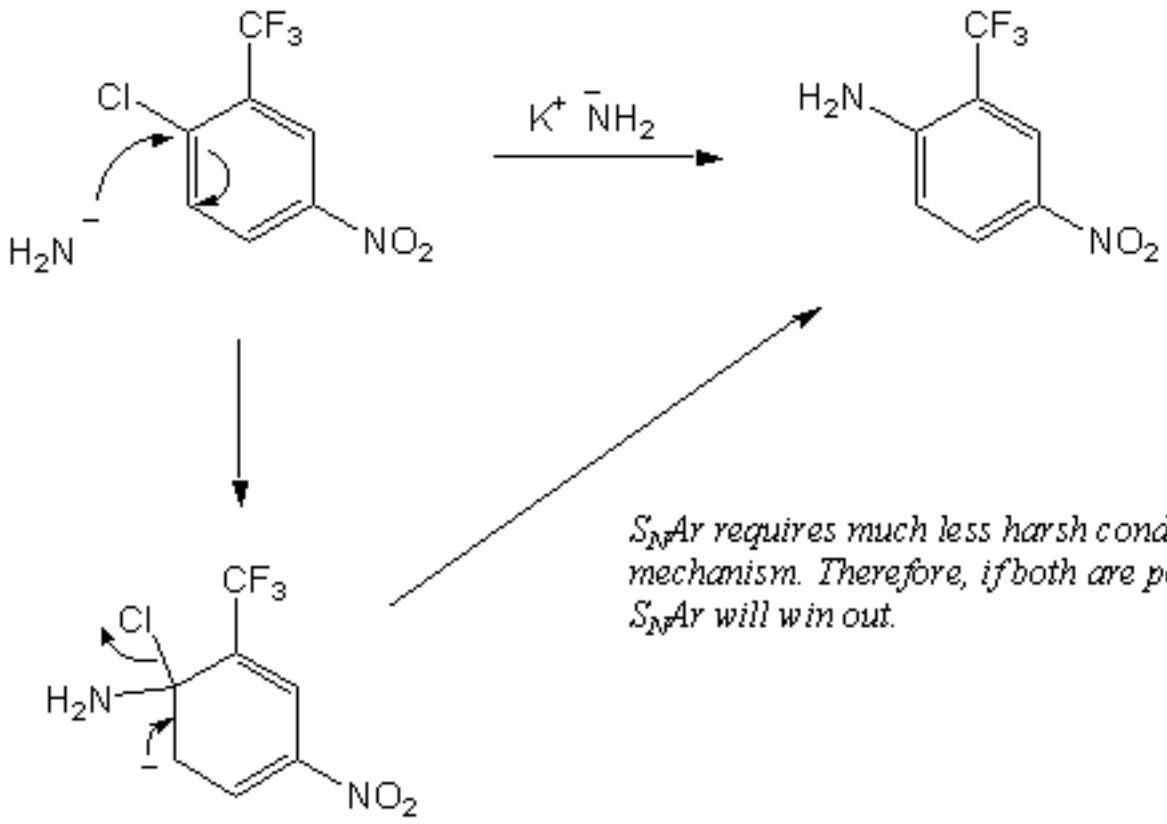
Prof. Leighton

Answer Key

Name: _____

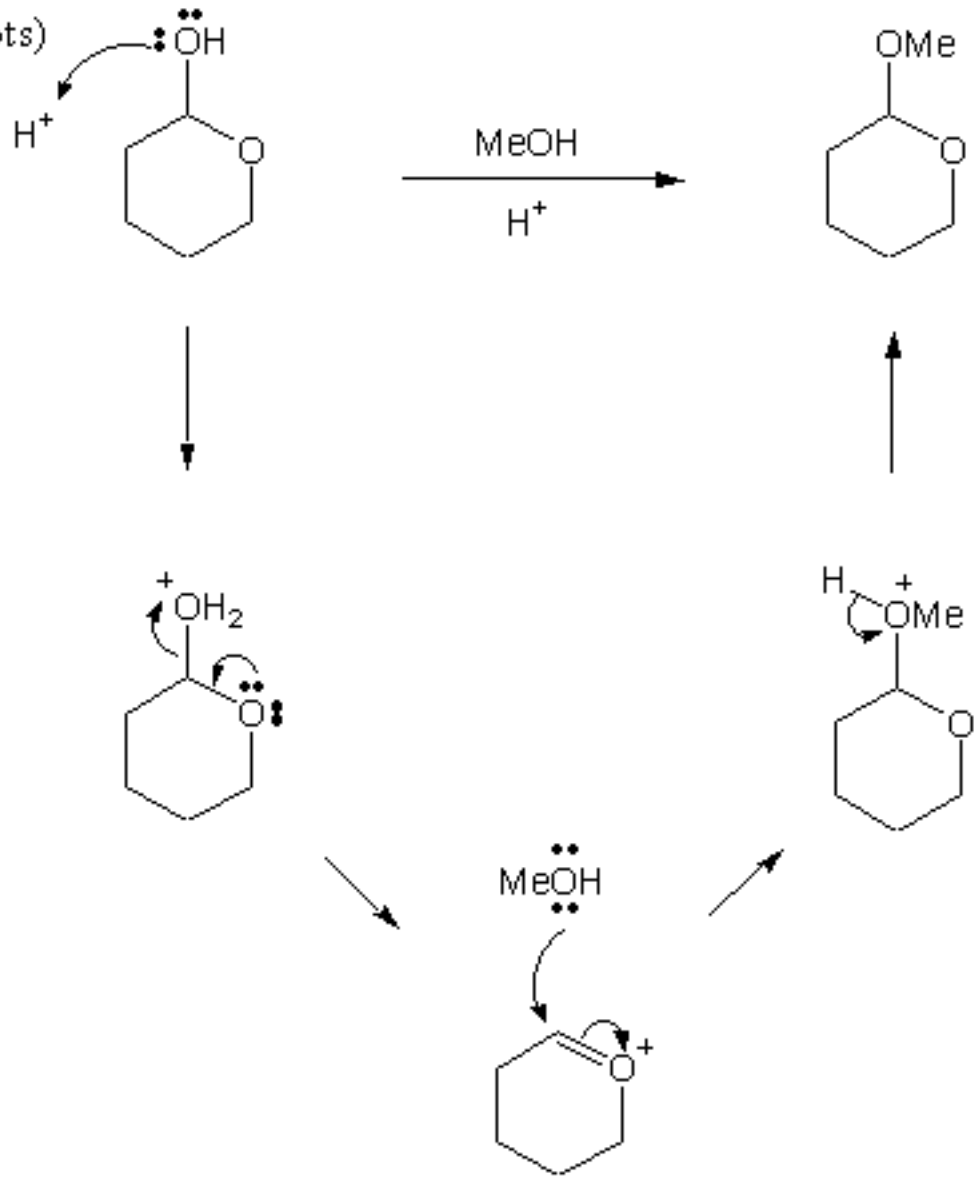
1. Provide detailed mechanisms for the following transformations:

a. (10 pts) (Just a simple mechanism, no long explanations needed here.)



S_NAr requires much less harsh conditions than the benzyne mechanism. Therefore, if both are possible as is the case here, S_NAr will win out.

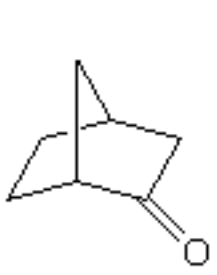
b. (10 pts)

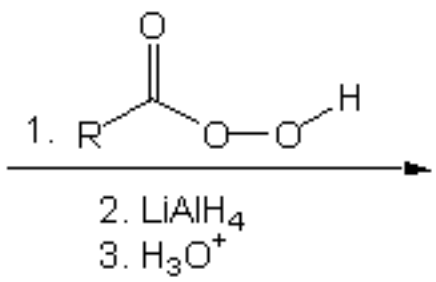


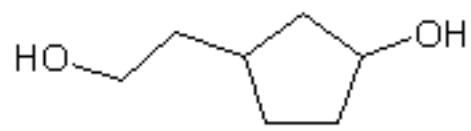
Name: _____

2. Predict the major product of the following reactions:

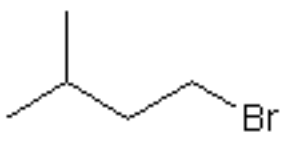
a. (10 pts)

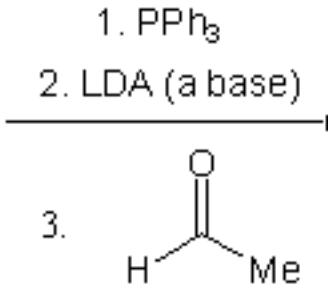


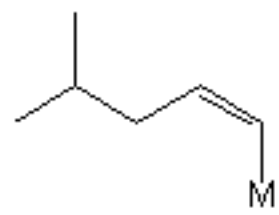




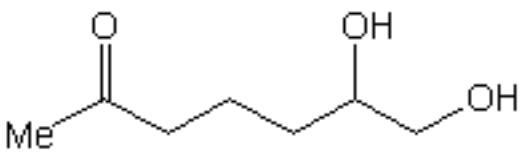
b. (10 pts)

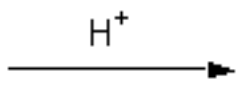


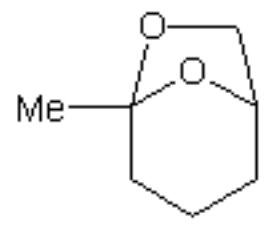




c. (10 pts)



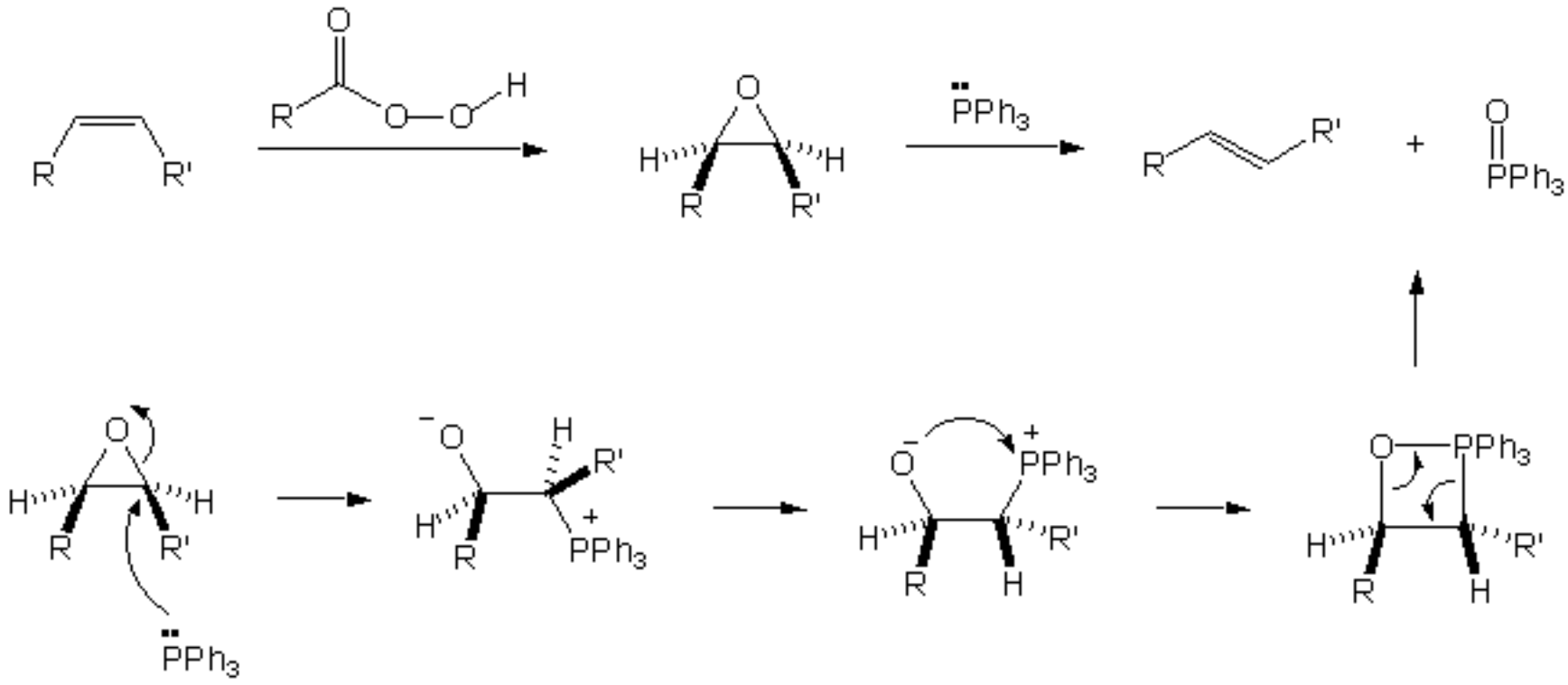




Name: _____

3. (10 pts) Given that the Wittig reaction produces *cis* alkenes preferentially, it would be useful to have a method for the conversion of *cis* alkenes to *trans* alkenes. One such method is shown below. In the first step the *cis* alkene is epoxidized with a peracid. In the second step, the epoxide is treated with PPh_3.

Provide a mechanism for the second step and explain (briefly!) why a *trans* alkene is produced.



The first step is an S_N2 with stereochemical inversion. Upon rotation to close the oxaphosphatane ring, the R and R' groups end up *trans*, thus providing the *trans* alkene.

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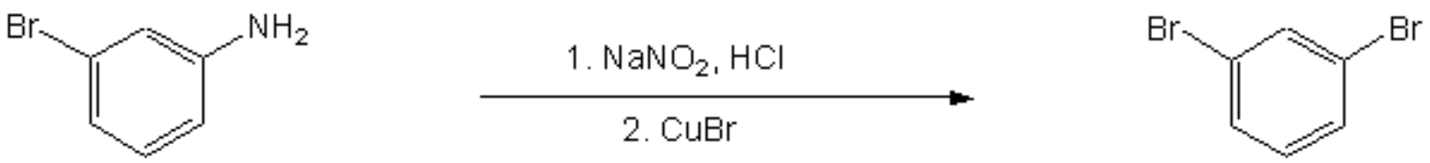
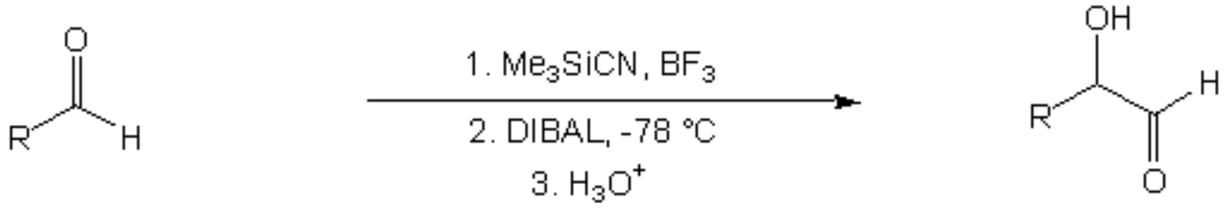
4. Provide the reagents necessary to accomplish the following transformations:

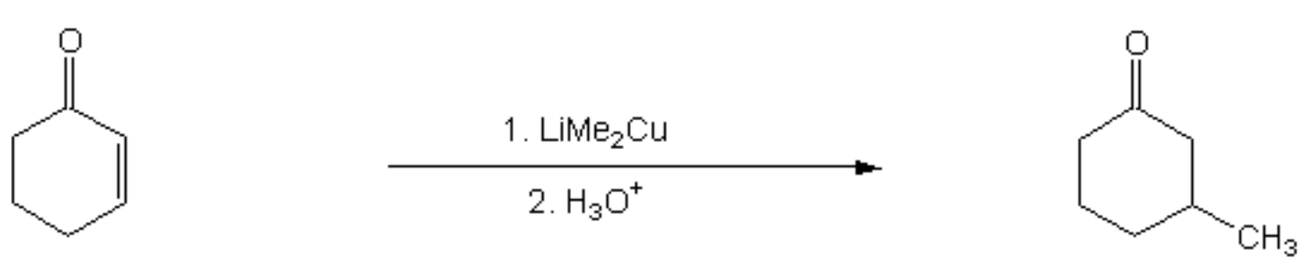
a. (8 pts)



b. (8 pts)

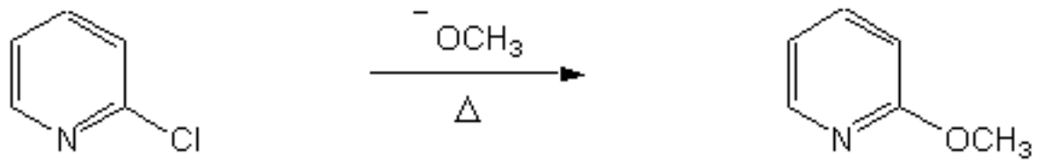


c. (8 pts)

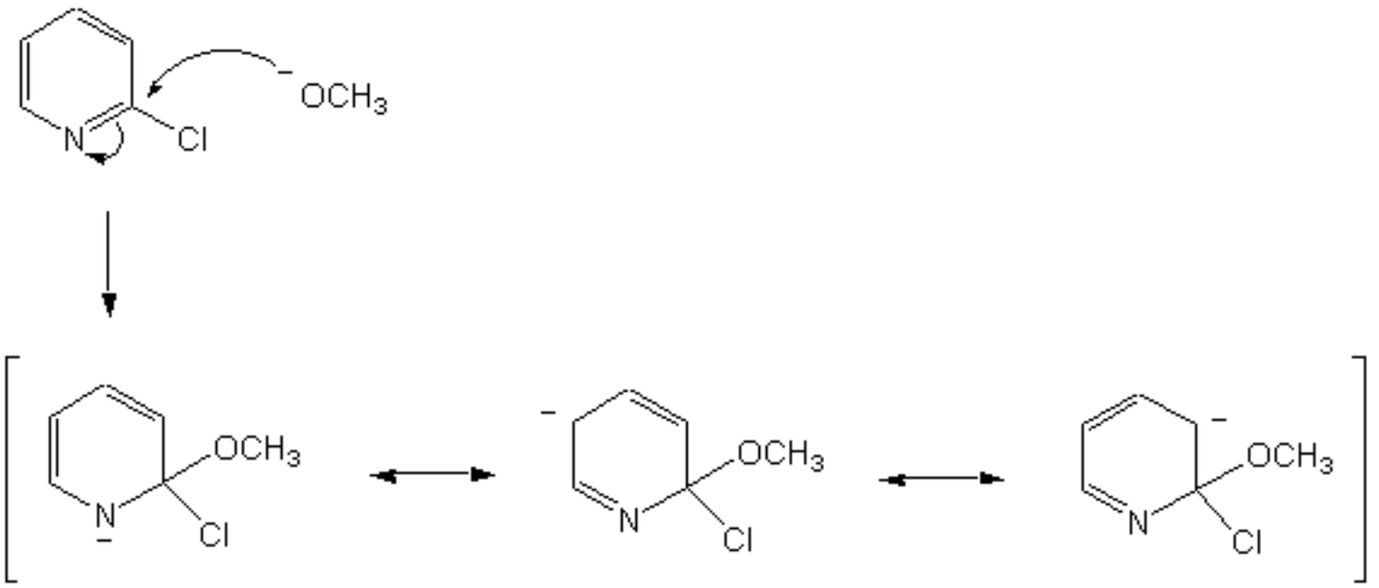


Name: _____

5. Recall that 2-chloropyridine undergoes smooth S_NAr reactions:

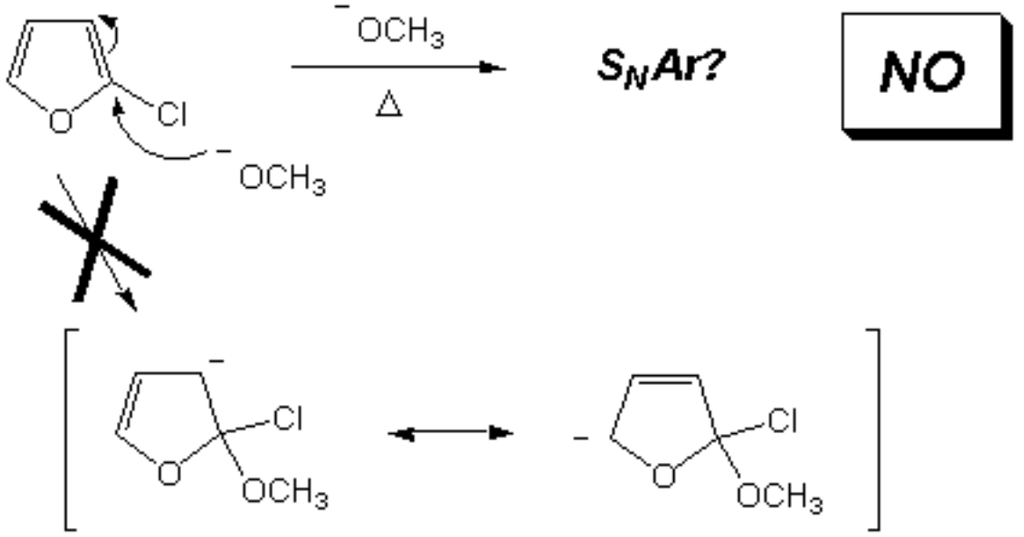


a. (8 pts) This reaction can occur because the intermediate anion that is generated enjoys special stability. Explain with structures what is the nature of this special stability.



This is a particularly strong contributor, with the anion on the relatively electronegative nitrogen.

b. (8 pts) Would you expect 2-chlorofuran to undergo smooth S_NAr reactions? (We will look at your work, but you must clearly write "yes" or "no.")



No special stability for this anion. Thus we would not expect it to form.