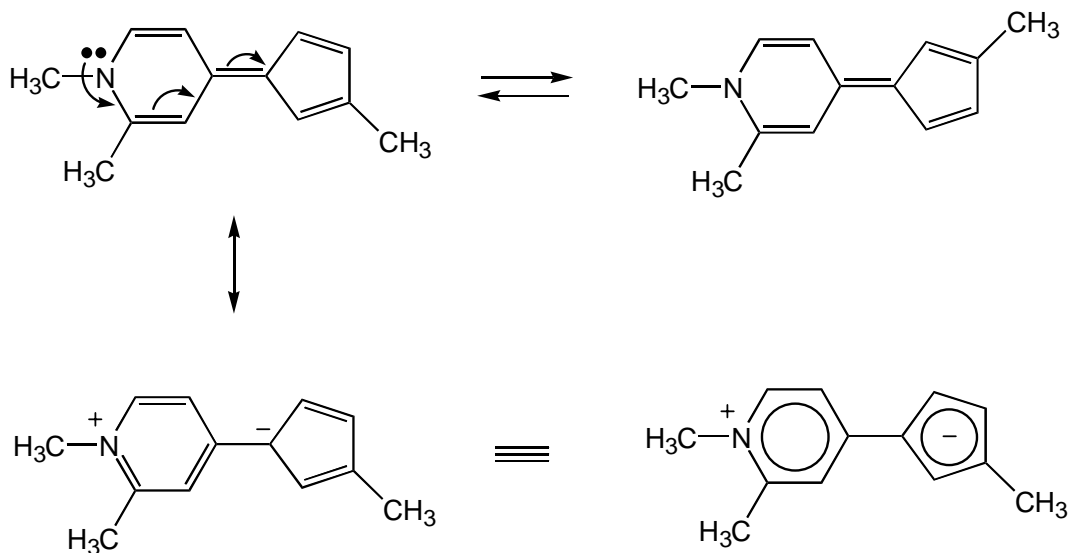


**Organic Chemistry c3444y**  
**1st Hour Exam**

**Answer Key**

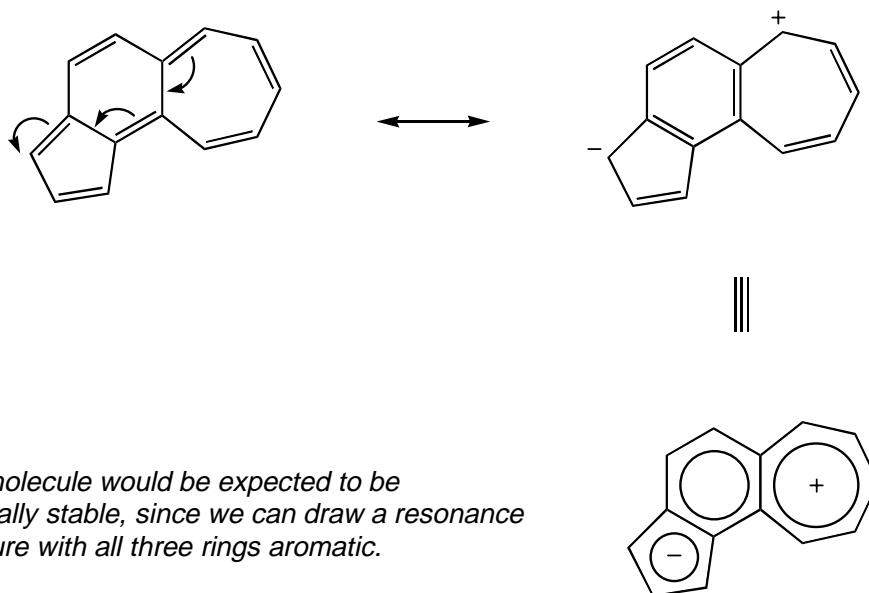
Name: \_\_\_\_\_

1. a. (10 pts) It has been observed that the following molecule undergoes unusually facile rotation about the central double bond, whereas "normal" double bonds will not rotate in such a manner. Using resonance structures, provide a simple explanation for this phenomenon.



*This resonance structure, with both rings aromatic, is a strong contributor. Therefore, there is a substantial amount of single bond character to the central bond. Thus rotation is possible.*

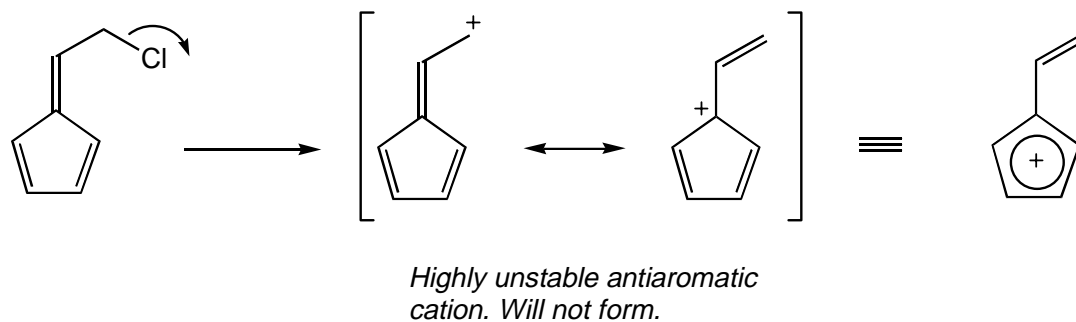
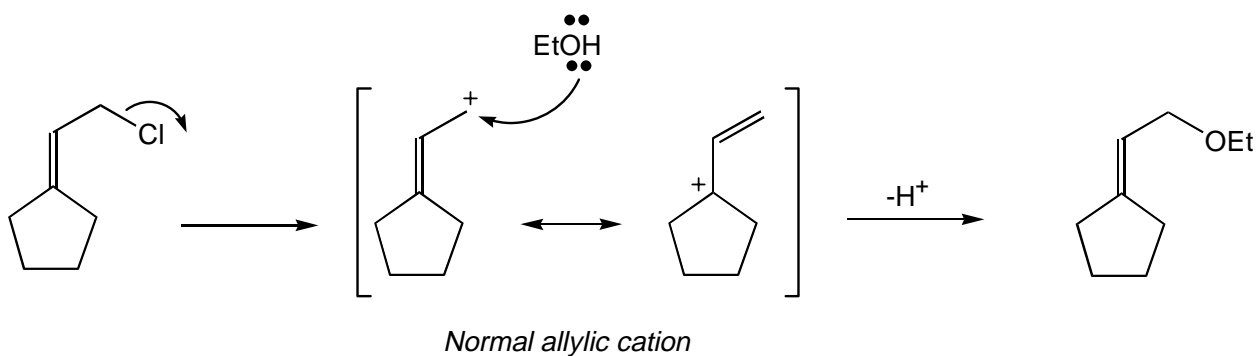
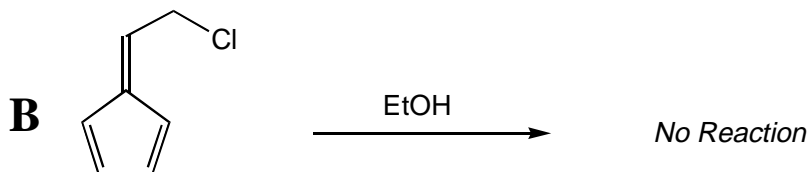
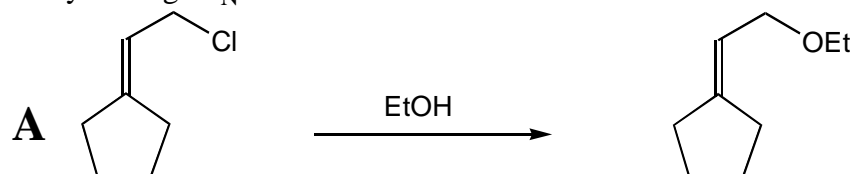
- b. (10 pts) Make a prediction as to the relative stability of the illustrated compound. Would you expect it to be unusually stable, unusually unstable, or about the same as a regular polyene? Use resonance structures to provide a simple explanation for your answer.



*This molecule would be expected to be unusually stable, since we can draw a resonance structure with all three rings aromatic.*

Name: \_\_\_\_\_

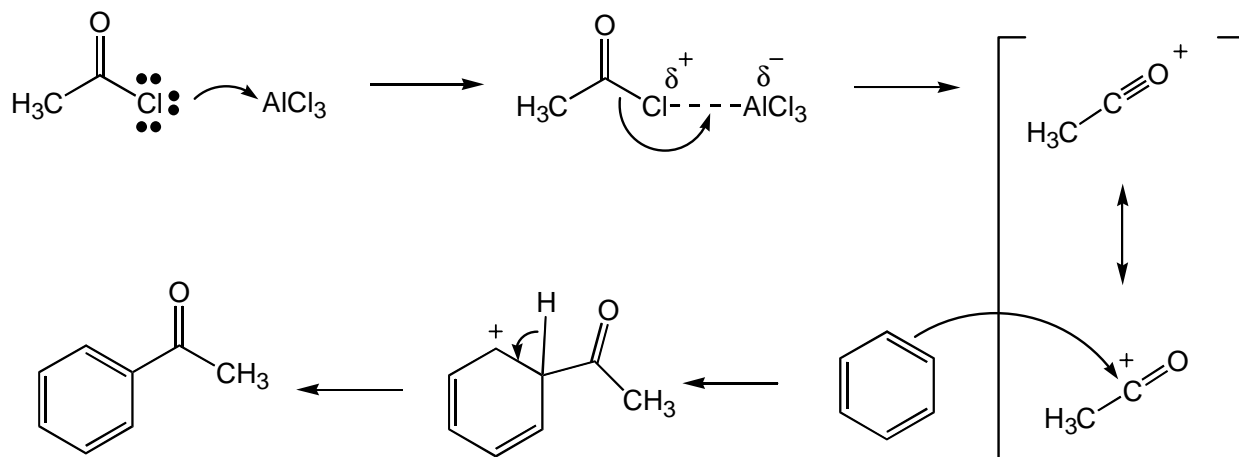
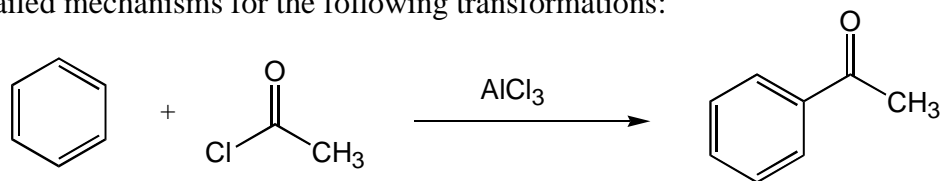
2. (10 pts) Consider the  $S_N1$  reactions of the illustrated allylic chlorides. As expected, compound **A** reacts quite readily. However, under the same conditions compound **B** is quite inert. Recalling that the rate-determining step in the  $S_N1$  reaction is the loss of chloride to form a cation, explain why compound **B** does not readily undergo  $S_N1$  reaction.



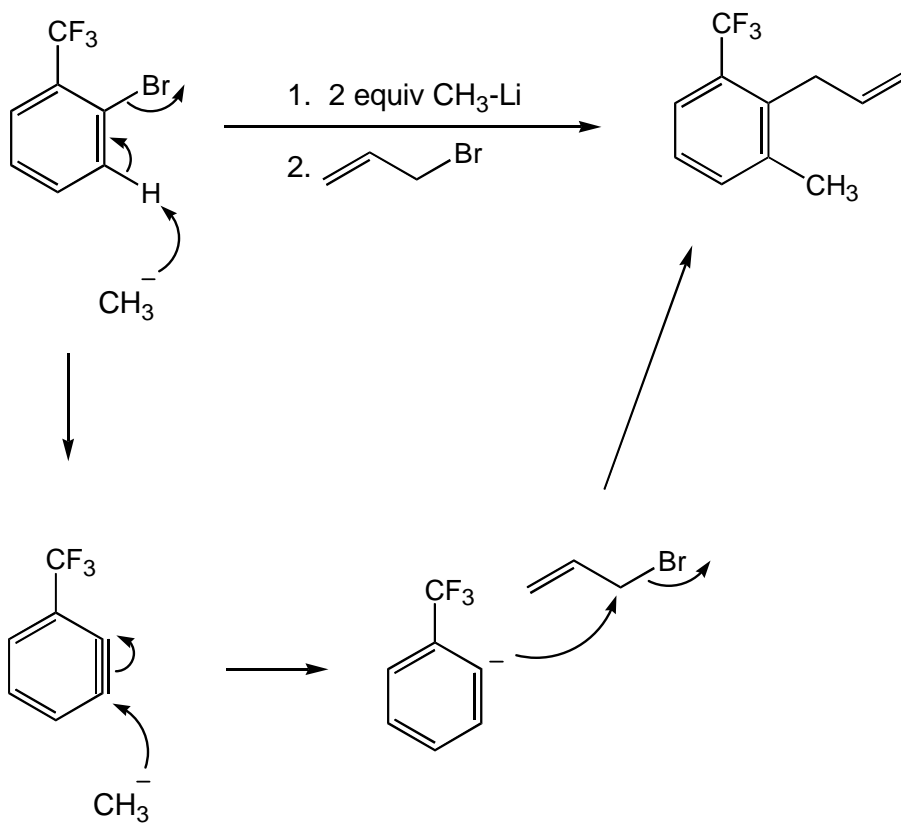
Name: \_\_\_\_\_

3. Provide detailed mechanisms for the following transformations:

a. (10 pts)

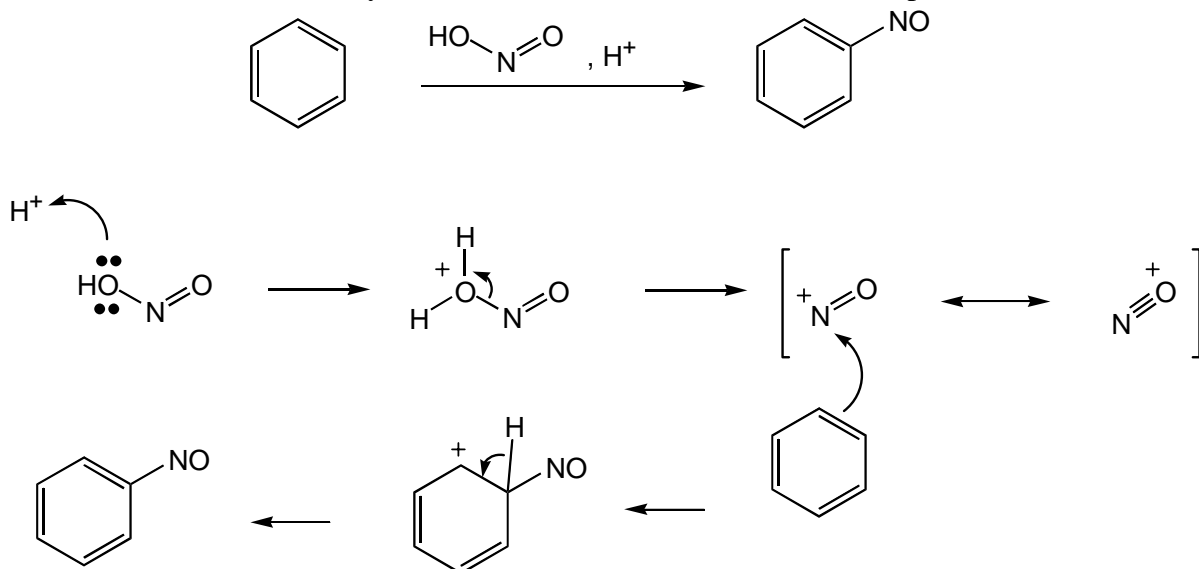


b. (10 pts)

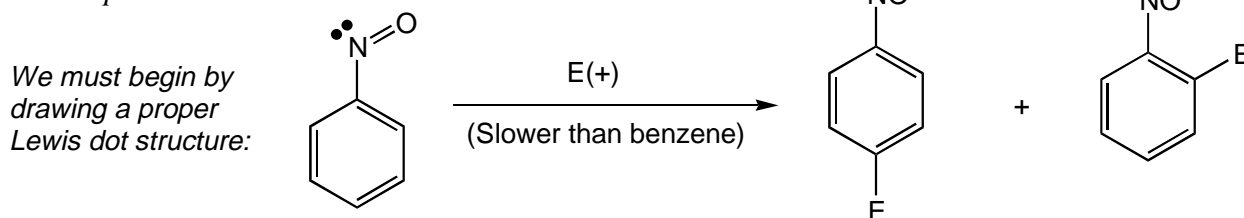


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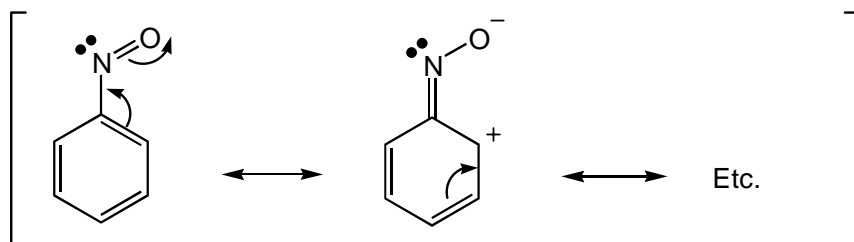
4. a. (10 pts) There is another type of electrophilic aromatic substitution called *nitrosation*. Provide a mechanism for this reaction. First, you must decide what is the actual electrophile here, and how it is formed.



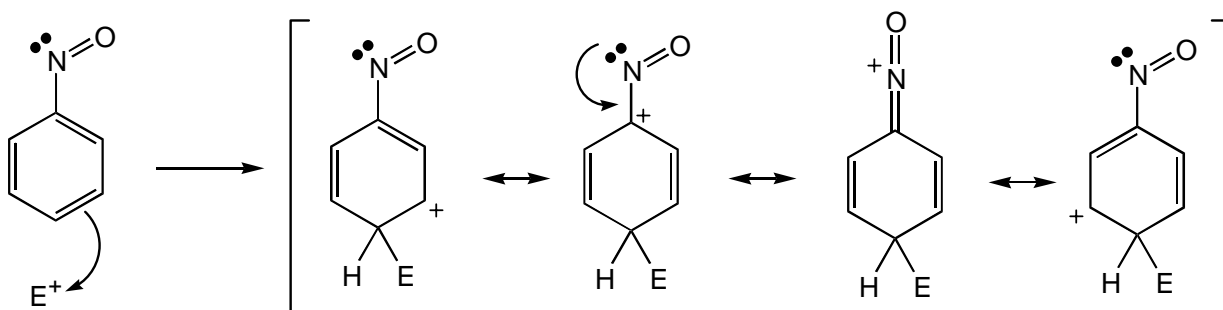
- b. (10 pts) Provide an explanation for the fact that the nitroso group (NO) is a deactivator, but an *ortho/para* director.



The NO group is a deactivator because it is an electron withdrawing group, just like a carbonyl or a nitro:



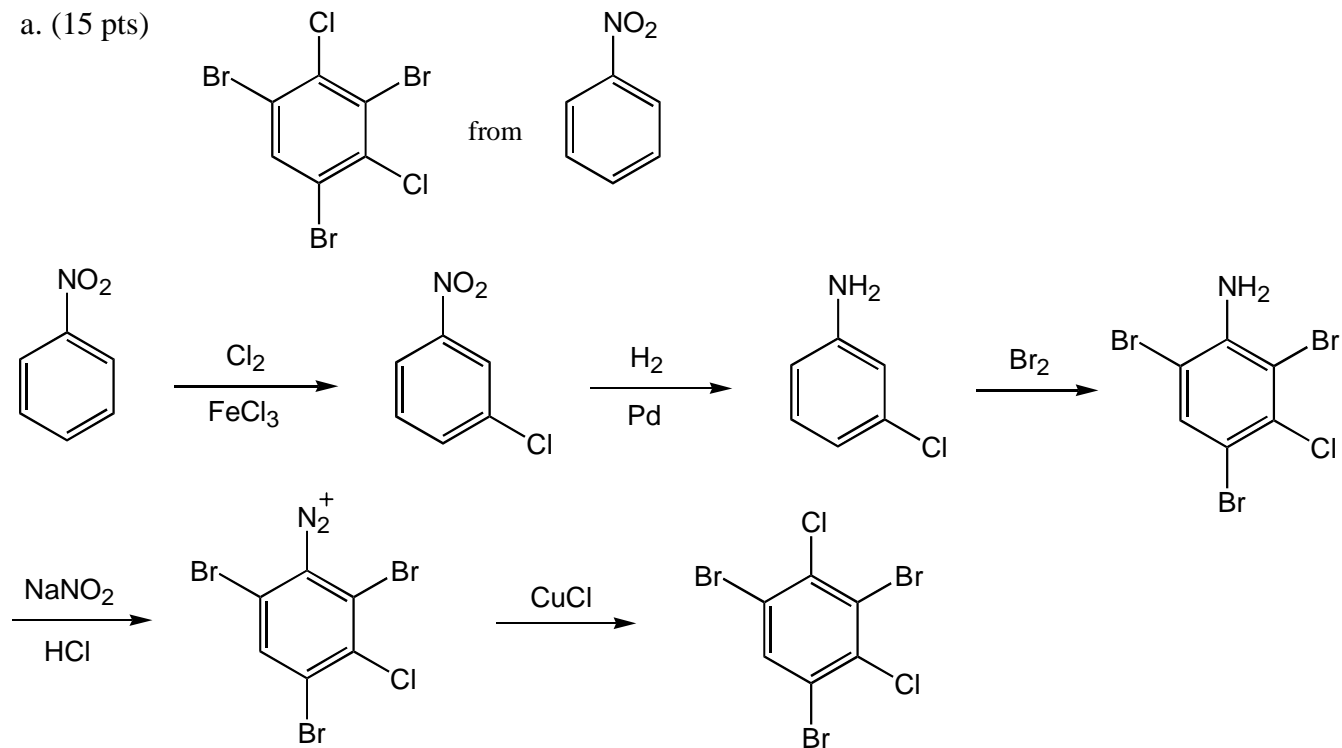
Like the halogens, however, if it is forced to react it will choose *ortho/para* to take advantage of the extra resonance structure that we can draw using the lone pair on the N:



Name: \_\_\_\_\_

5. Propose syntheses of the following compounds from the given starting materials.

a. (15 pts)



b. (15 pts)

