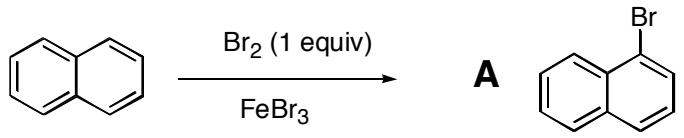
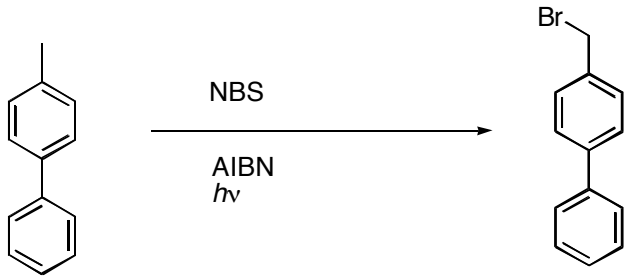
Your Name_____

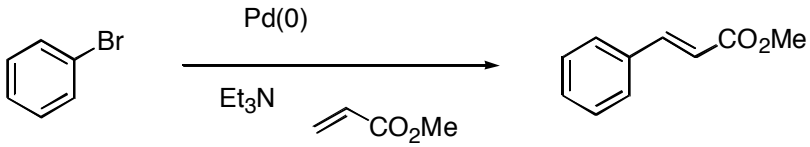
1a. Provide structures of the products. Mechanisms are not needed. (4 points each)



1b. Provide the reagents needed for the following transformations. Mechanisms are not needed.

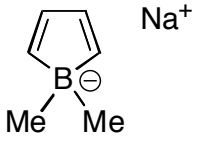
(4 points each)

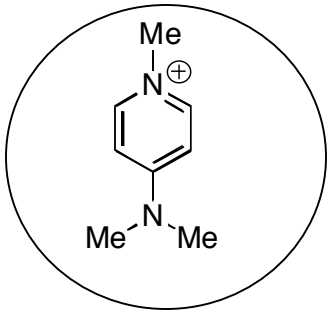


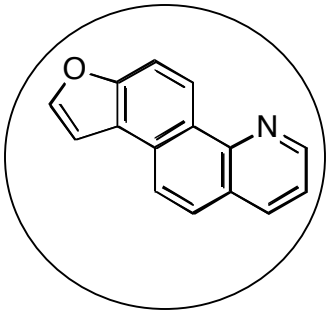


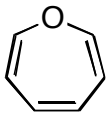
Your Name_____

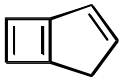
2. Circle the compounds that are aromatic. (3 points each)





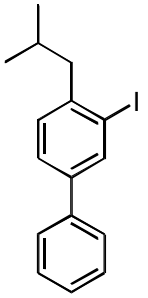




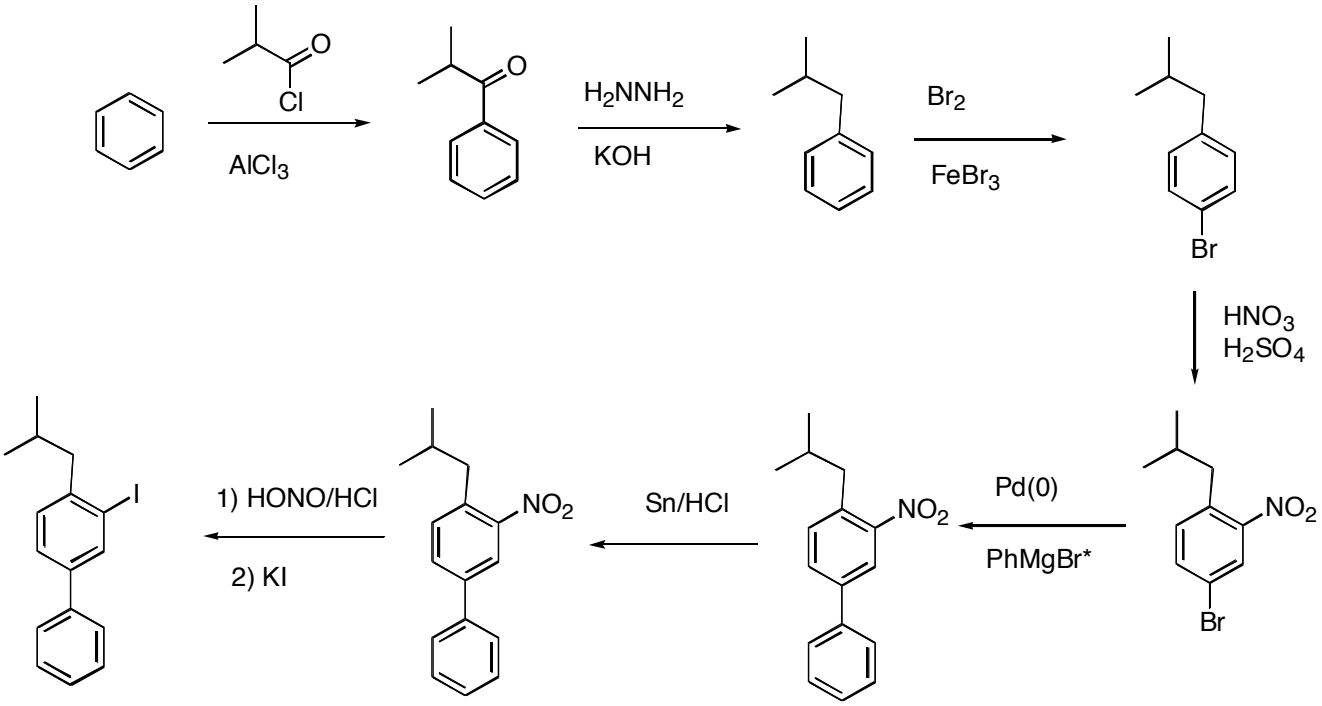


Your Name_____

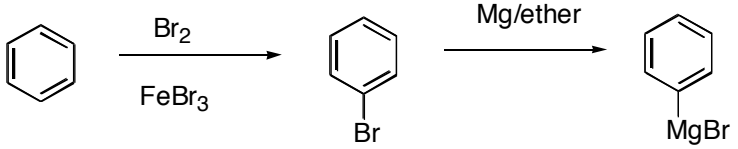
3. Suggest a multstep synthesis, using **benzene** and any other materials that contain **5 carbons or less**. Reagents that do not end up in the product (e.g. PPh_3) may contain more than 5 carbons. (23 points)



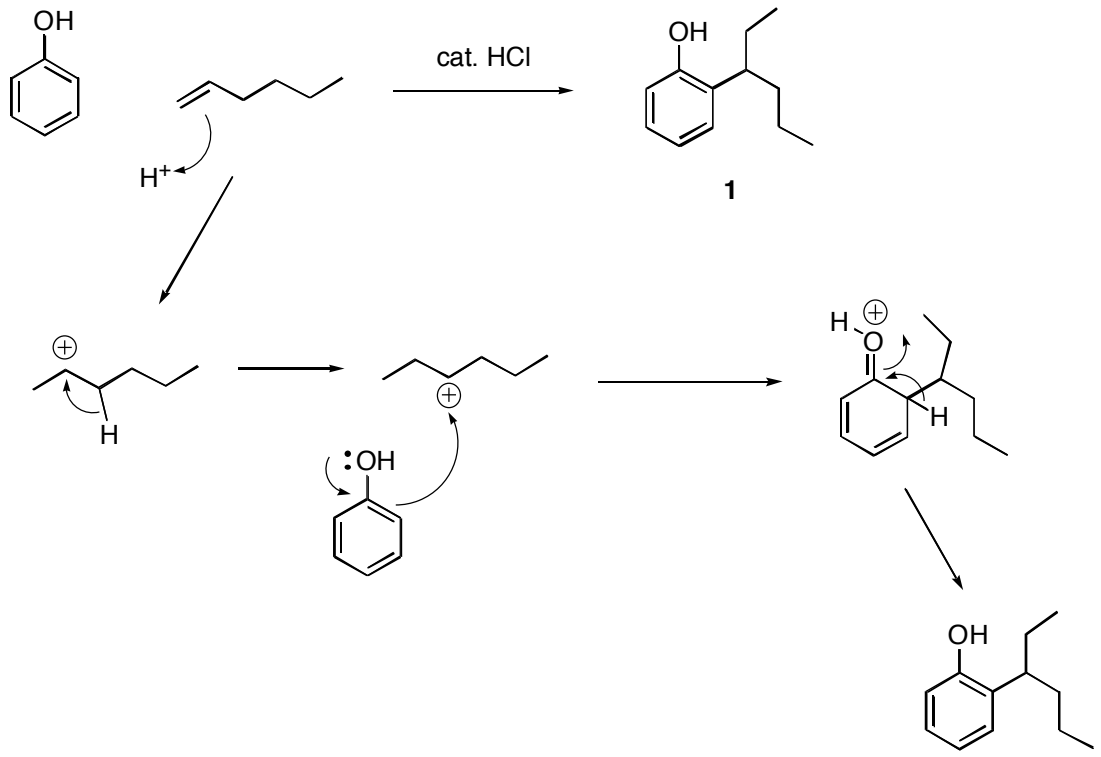
several answers were acceptable



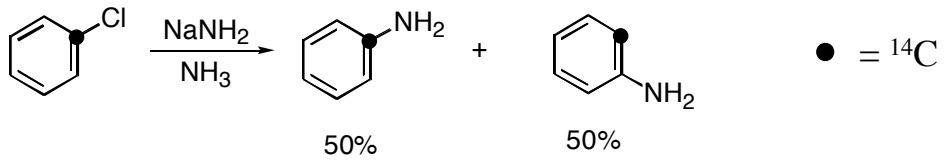
*Synthesis of PhMgBr



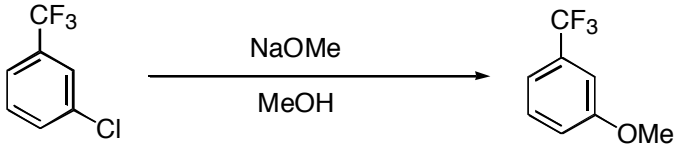
4. Provide a detailed arrow pushing mechanism for the formation of **1**. (note: other products are formed as well, but you only need to account for the formation of **1**) (23 points)



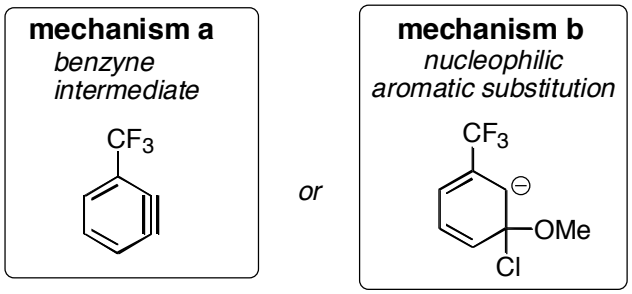
5. Recall the **^{14}C labeling experiment** by Jack Roberts that provided evidence for the intermediate benzyne in the mechanism below:



Now consider the reaction shown below.



For this reaction, mechanisms involving two different intermediates are plausible:
(a) a benzyne mechanism or (b) a nucleophilic aromatic substitution mechanism. The plausible intermediates are shown below

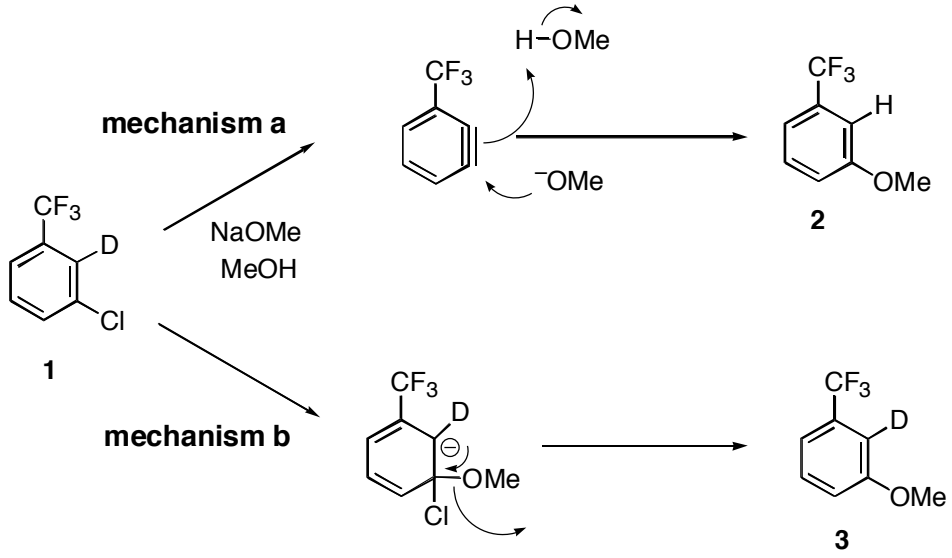


Suggest a way to distinguish the two mechanisms with a **deuterium labeling experiment** (that is, an experiment in which hydrogen is substituted by deuterium)
Note, *I am not asking you to tell me which mechanism is occuring. Rather, I want you to describe an experiment that could be used to tell the difference.* Explain in detail exactly what you would expect to observe for each mechanism. (23 points)

5. (continued)

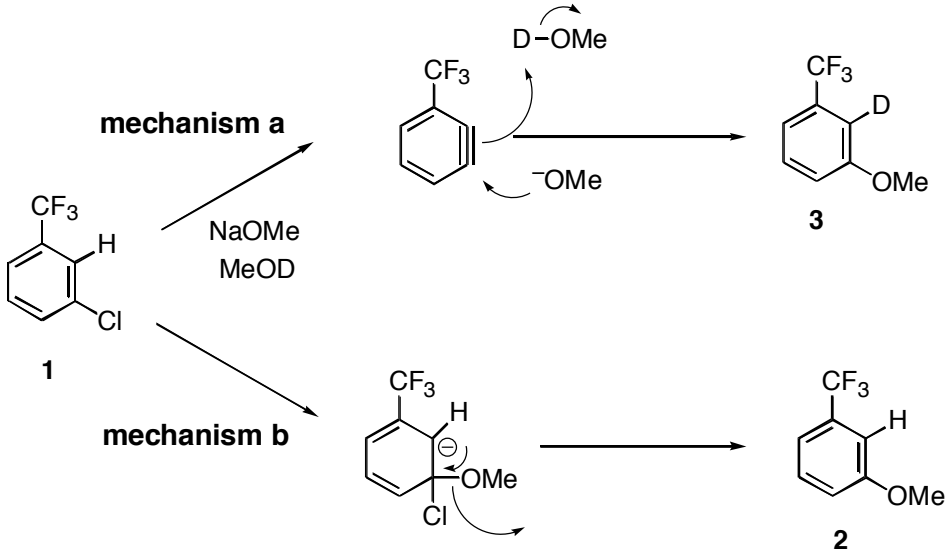
acceptable answer #1: run the experiment with D-labeled compound **1**

if mechanism a is in operation, then only **2** will form. If mechanism b is in operation, then only **3** will be observed.



acceptable answer #2: run the reaction in MeOD instead of MeOH

if mechanism a is in operation, then only **3** will form. If mechanism b is in operation, then only **2** will be observed.



Scratch paper

Scratch paper