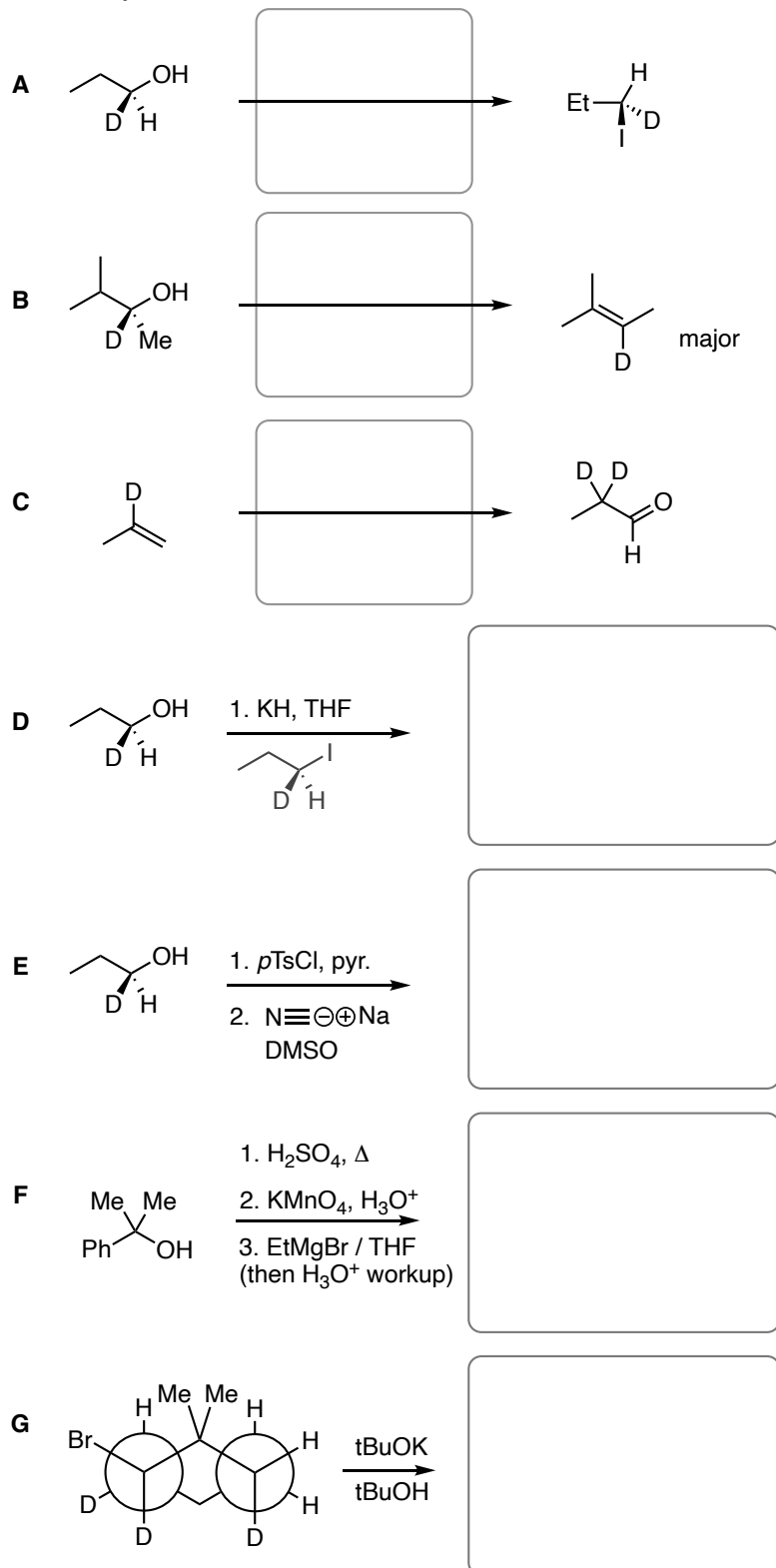


Name: _____

21 pts. 1. Fill in the reagents or draw the structure of the missing product in the boxes below. You must include dashes/wedges to show stereochemistry. You can use any reagents & any source of carbon in your answers.

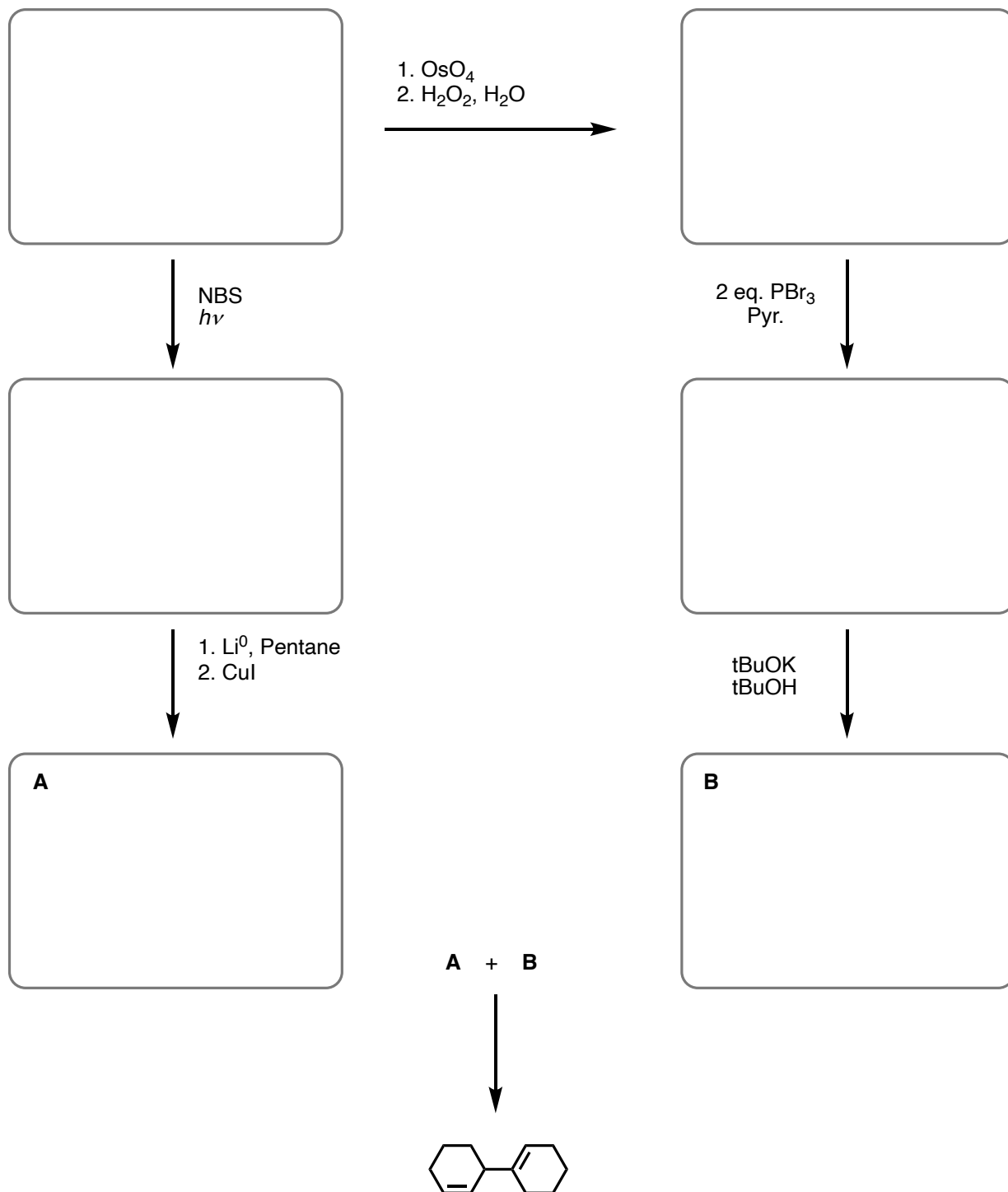


You do not need to show the Newman projection here



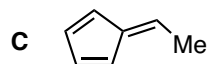
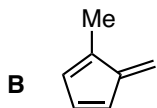
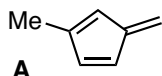
Name: _____

12 pts. 2. The compound shown at the bottom of the page can be synthesized starting from one hydrocarbon that has two degrees of unsaturation. Fill in the boxes with the corresponding structure that leads to the final product.

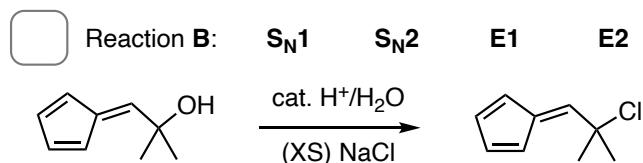
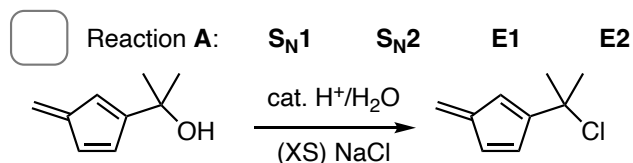


Name: _____

7 pts. 3a. One of the three compounds below contains a hydrogen that is significantly more acidic than the other two compounds. **Circle the most acidic compound** and **explain** your rationale:

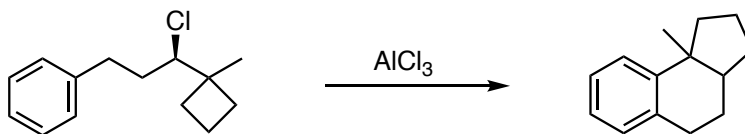


9 pts. 3b. When treated under the same conditions, one of the reactions below is significantly faster than the other. **Identify the type of mechanism** and **circle your answer** in the options below. Mark an **X** in the box corresponding to the **faster reaction you expect** and **provide an explanation using structures** to aid your answer.



Name: _____

10 pts. 4. Draw the mechanism for the reaction below.



16 pts. 5a. The molecular orbital (MO) wavefunctions (ψ) for three compounds are shown below, and are randomized with respect to their relative energy.

Circle each wavefunction that contains only two electrons in the lowest energy MO drawings shown below (i.e. only electrons in bonding orbitals).

Do not circle the ψ 's that contain only one electron (i.e. do not circle non-bonding orbitals).

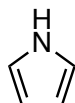
In the boxes on the left, mark an X corresponding to the label that best describes the properties of the compounds shown (aromatic, antiaromatic, or non-aromatic). In the boxes on the right, fill in the missing orbitals of the remaining ψ .

These are the 5 ψ 's of Pyrrole:

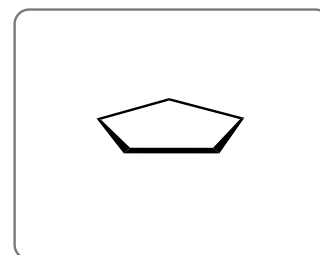
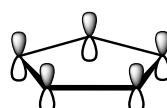
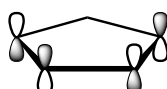
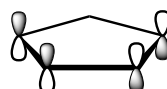
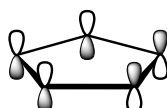
Aromatic ☐

Antiaromatic ☐

Non-aromatic ☐



Pyrrole

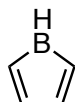


These are the 5 ψ 's of Borrole:

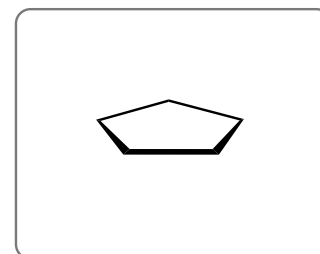
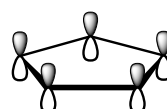
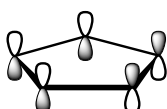
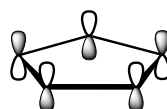
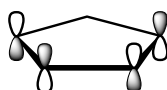
Aromatic ☐

Antiaromatic ☐

Non-aromatic ☐



Borrole

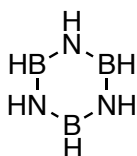


These are the 6 ψ 's of Borazine:

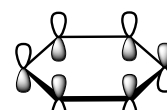
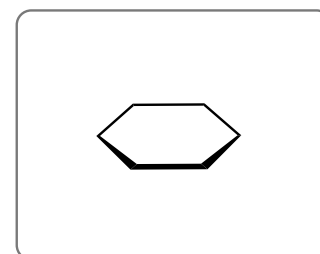
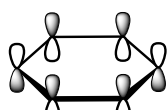
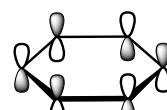
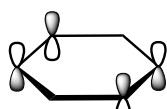
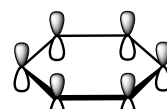
Aromatic ☐

Antiaromatic ☐

Non-aromatic ☐

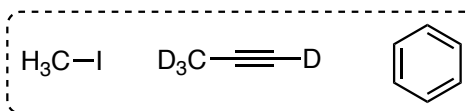


Borazine

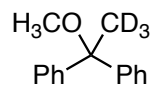


Name: _____

Using **only the three compounds in the box** (iodomethane, deuterated propyne, and benzene), synthesize each of the products shown below. You may use any additional organic or inorganic *reagents* necessary. Any compound you synthesize at any step in **6a** can be directly used in **6b**, and *vice versa*.



8 pts. **6a.** Synthesize:



8 pts. **6b.** Synthesize:

