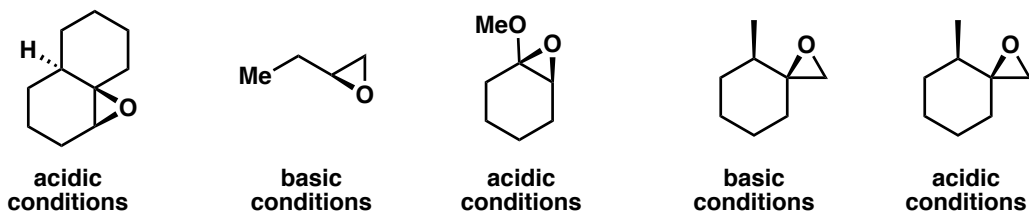
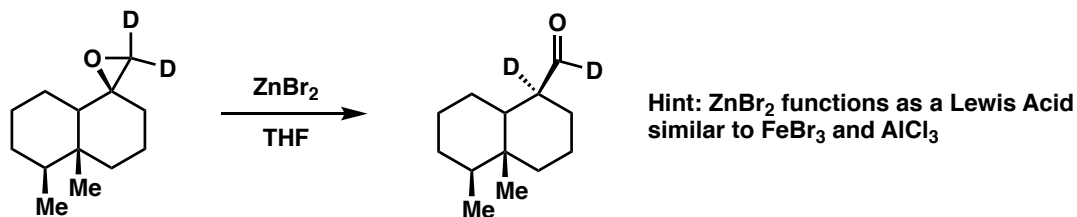


**Problem Set 9**  
**CHM 2211**

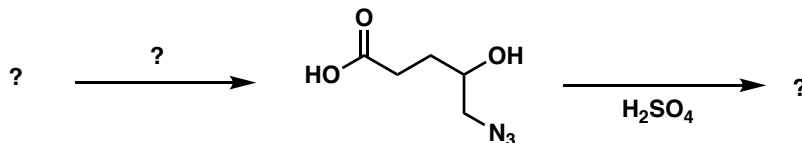
1. a. Provide the most likely atom of substitution on the epoxide under the given type of reaction conditions.



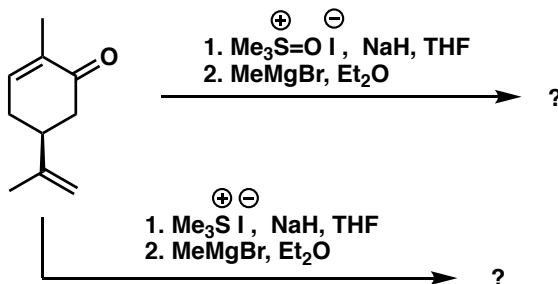
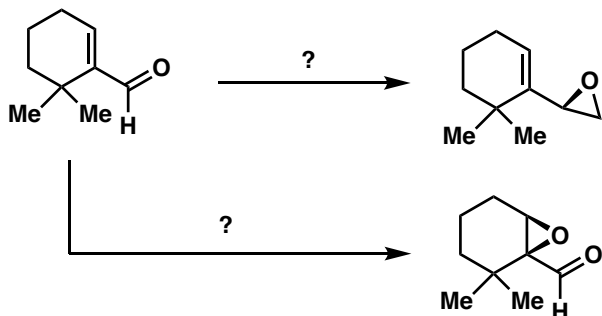
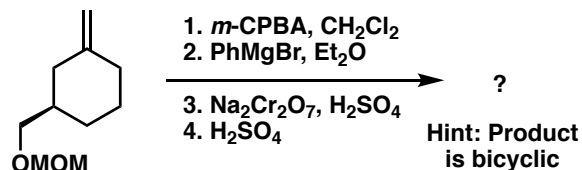
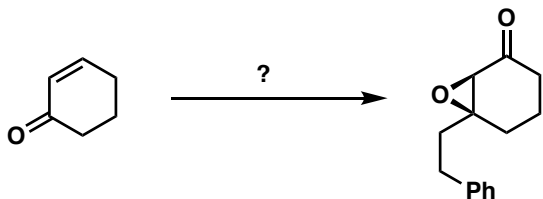
b. Epoxides can rearrange under Lewis acidic conditions promoting a hydride shift. IN the example below, the starting material was deuterium labeled and then treated with ZnBr<sub>2</sub>. Show a mechanism of how the product is formed.



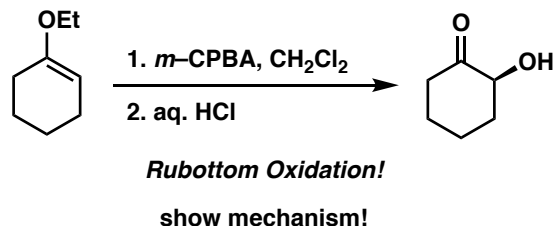
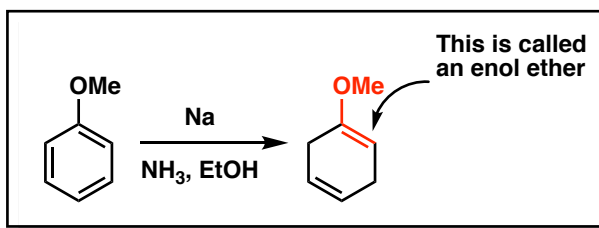
c. Provide a starting epoxide for the following sequence and then provide conditions to form the molecule shown. Then predict the product of the final transformation.



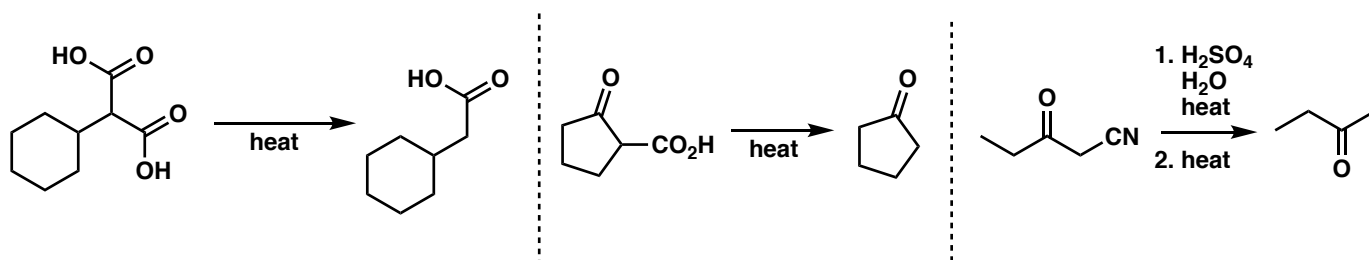
2. Provide reagents and/or products to the reactions below.



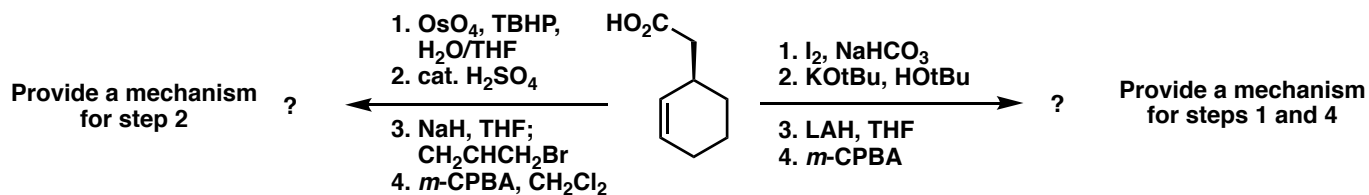
3. The Rubottom oxidation is an epoxidation reaction on a functional group called an enol ether. You have seen enol ethers before as the product of Birch reductions. Provide a mechanism for the epoxidation of **A** and then provide a mechanism for its subsequent hydrolysis (Hint: the product of epoxidation can be considered an acetal)



4. a. Provide a mechanism for the reactions shown below.



b. Provide products for the following transformations and mechanisms where indicated.



5. Provide a forward synthesis of the following compounds from pyrrole and units of 3 carbons or fewer (a retrosynthesis will help you!!).

