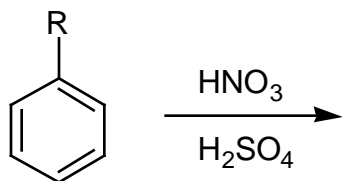
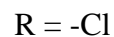
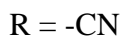
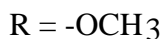


1. (12 pts) a) Write the products of the reaction below when $R = -OCH_3$, $R = -CN$, $R = -CH_2CH_3$, and $R = -Cl$.

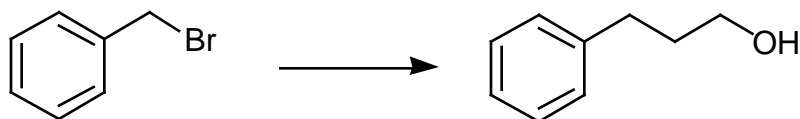


- b) Predict the order of reactivity for the above reaction according to the following substituents. Place a 1,2,3, or 4 by the substituents with 1 being the fastest and 4 the slowest. Explain your reasoning.



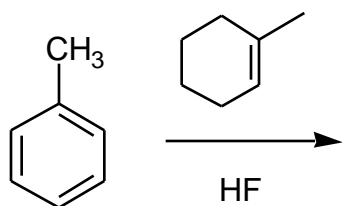
2. (10 pts) Provide a series of synthetic steps by which 3-bromopropylbenzene can be prepared from benzene.

3. (10 pts) Propose a synthesis to accomplish the following transformation.

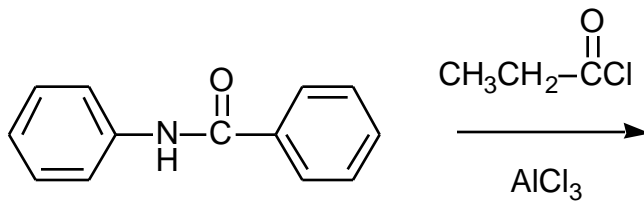


4. (15 pts) Write the major product for the following reactions.

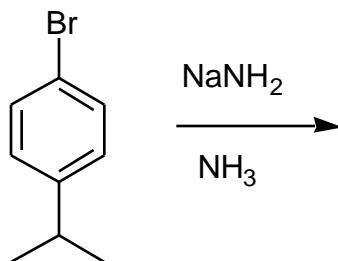
a)



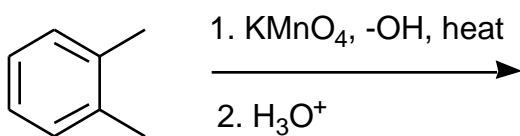
b)



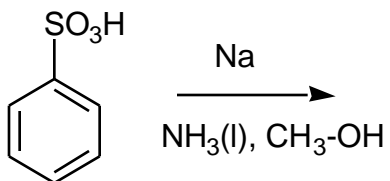
c)



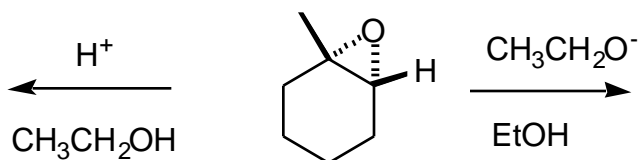
d)



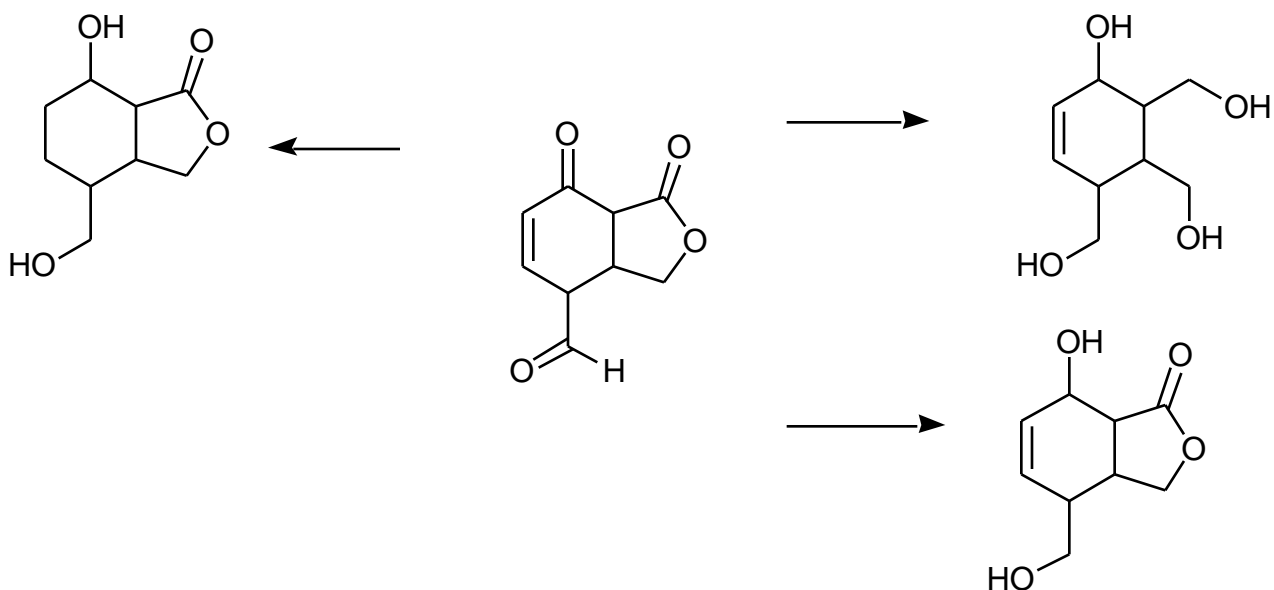
e)



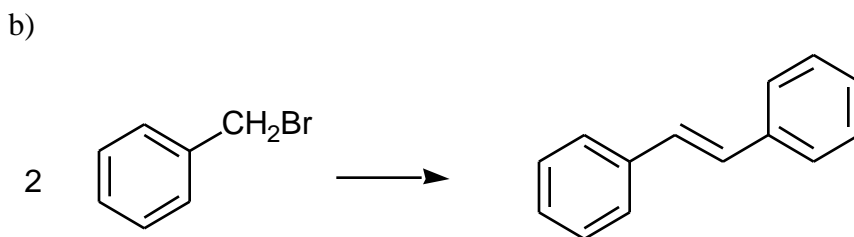
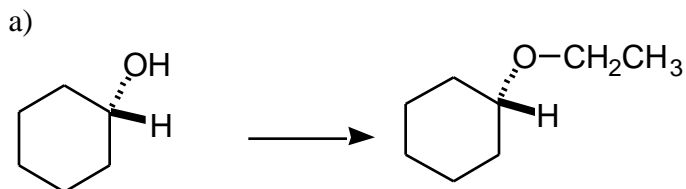
5. (10 pts) Predict the products of the following reactions. Show all stereochemistry where appropriate.



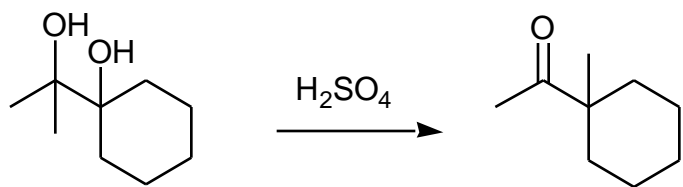
6. (9 pts) Fill in the missing reagents for the reactions below.



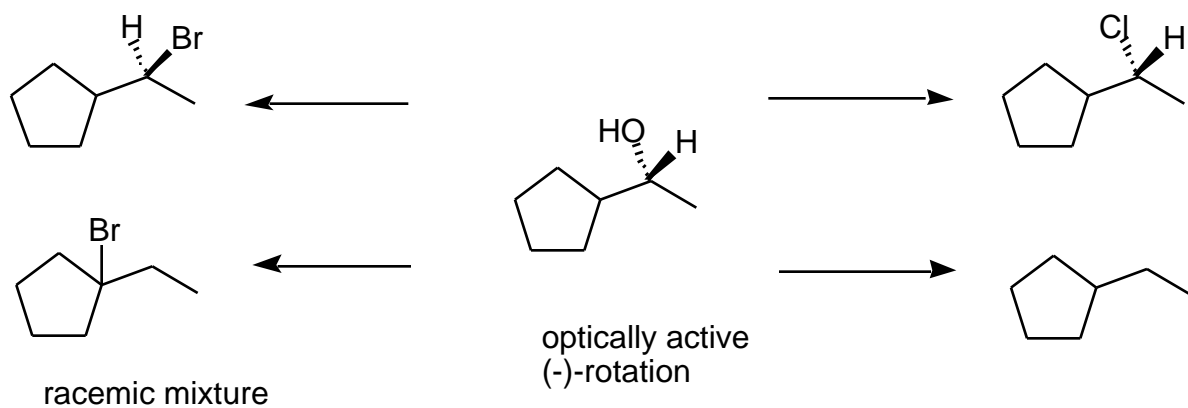
7. (10 pts) Show how you would accomplish the following synthetic conversions.



8. (10 pts) Suggest a mechanism for the following reaction.



9. (12 pts) Write in the appropriate reagents to carry out the following reactions. Comment on the optical rotation results of each product.



10. (10 pts) Write the products of the following reaction.

