

UNIVERSITY OF VICTORIA

CHEMISTRY 335

MIDTERM #1 — February 6, 2009

NAME: \_\_\_\_\_

STUDENT ID: \_\_\_\_\_

INSTRUCTOR: DR. FRASER HOF

TOTAL MARKS = **39**

DURATION: **50 minutes**

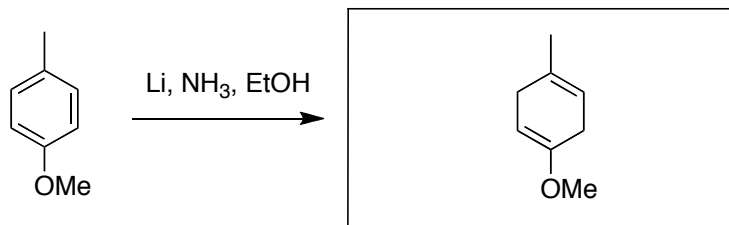
QUESTIONS ARE TO BE ANSWERED IN THE SPACE PROVIDED ON THE EXAM FORM

THIS EXAMINATION PAPER HAS **8 PAGES**, INCLUDING THIS COVER PAGE. COUNT THE NUMBER OF PAGES IN THIS EXAMINATION PAPER BEFORE YOU START TO WRITE, AND IMMEDIATELY REPORT ANY DISCREPANCY TO THE INVIGILATOR.

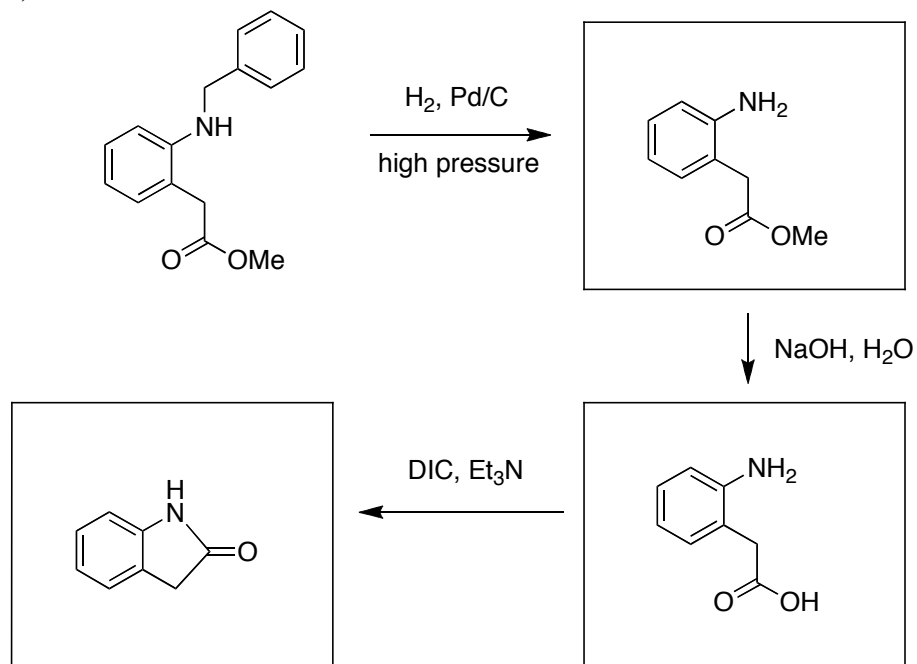
ANSWERS IN PENCIL ARE ACCEPTABLE, BUT WILL NOT BE ELIGIBLE FOR RE-GRADING.

1. (15 points total, 1 for each box) Fill in the boxes for each reaction with the major products, intermediates, or reagents and reaction conditions.

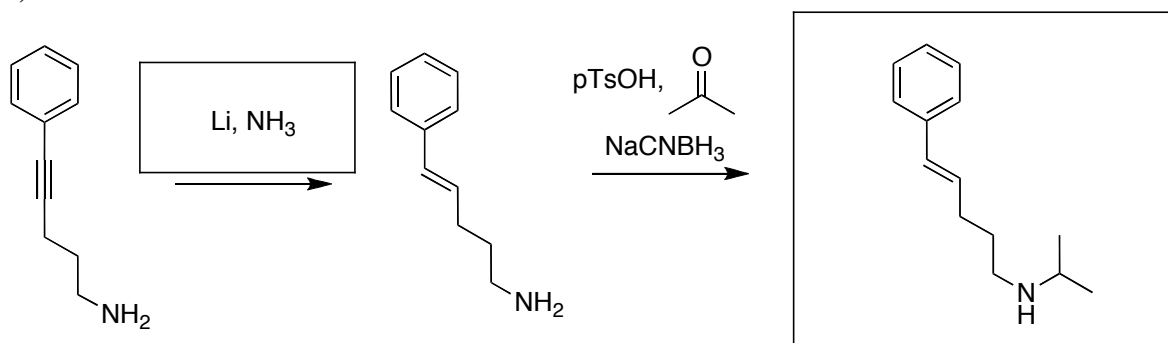
a)



b)

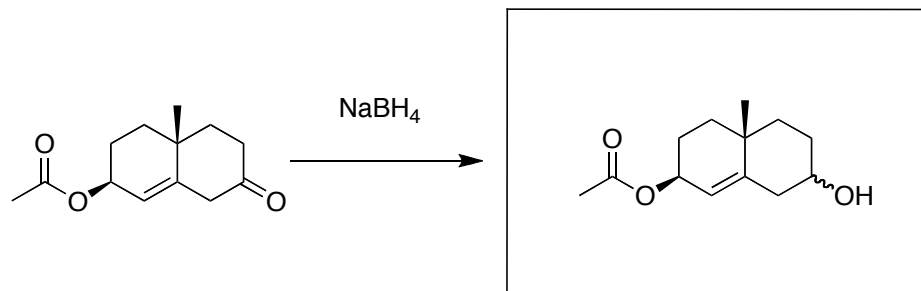


c)

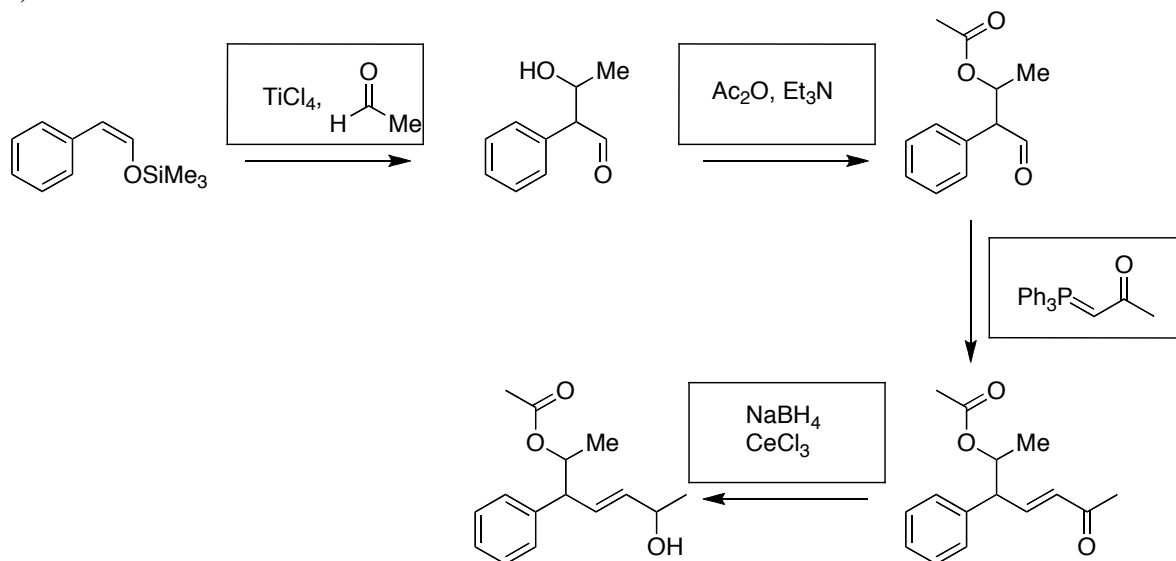


## 1. (continued)

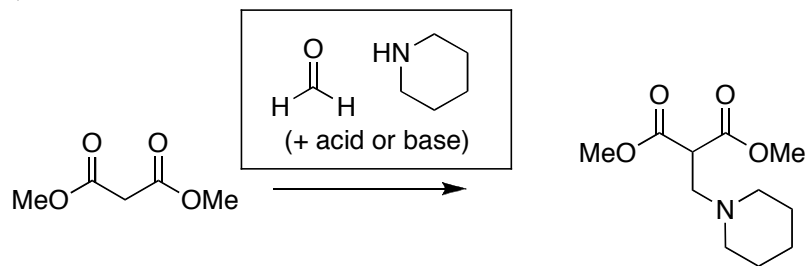
d)



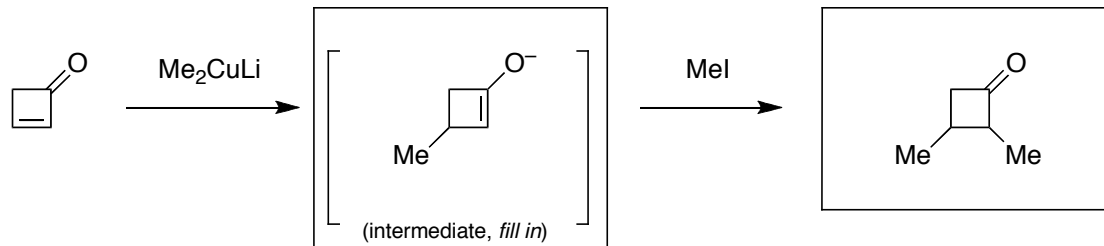
e)



f)

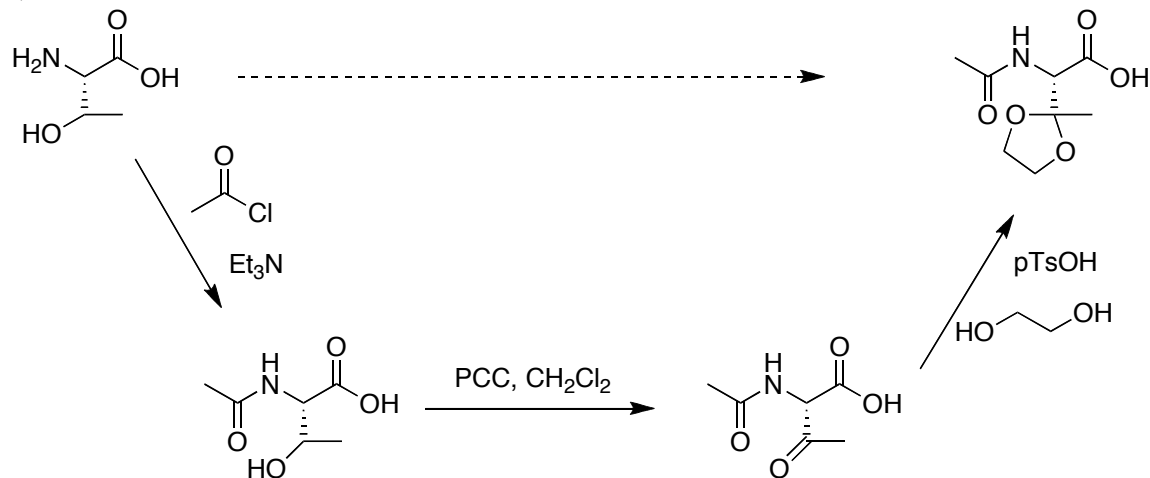


g)

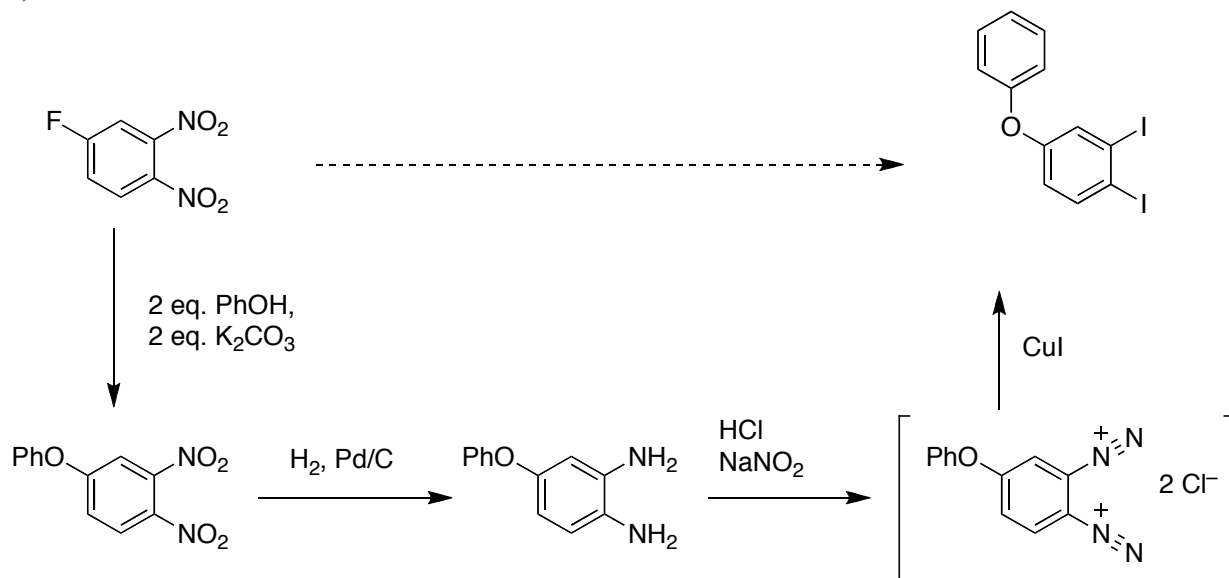


2. (12 points total, 4 for each part) COMPLETE ONLY THREE OF THE FOUR PROBLEMS LABELED 2a-d. Design a synthesis for the following multi-step transformations. Show all necessary reagents, reaction conditions, and intermediates in the space below each reaction. Do not show mechanisms.

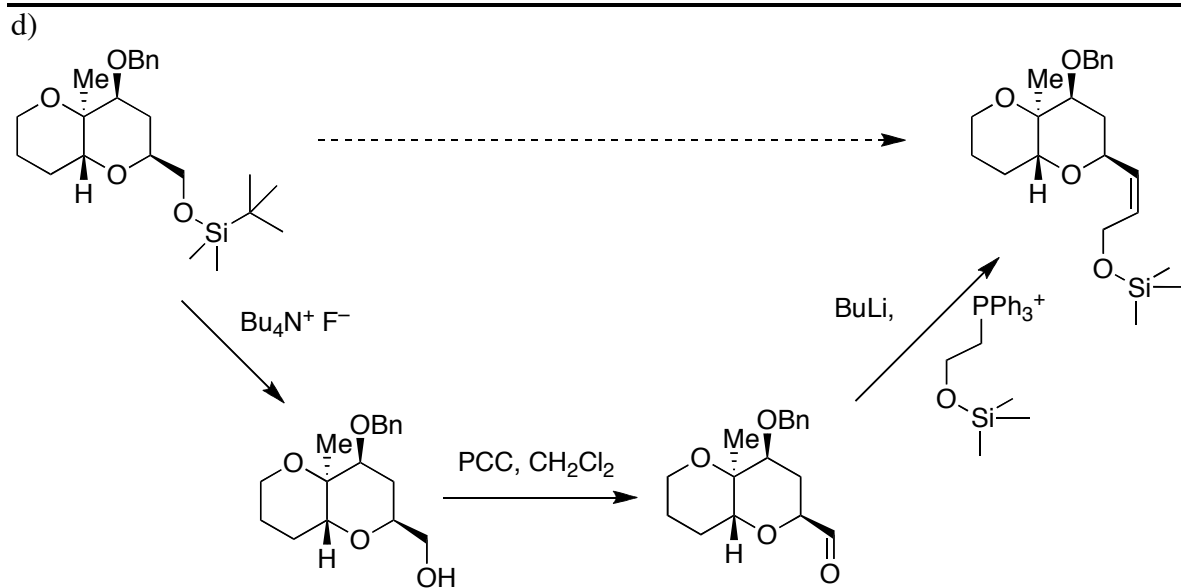
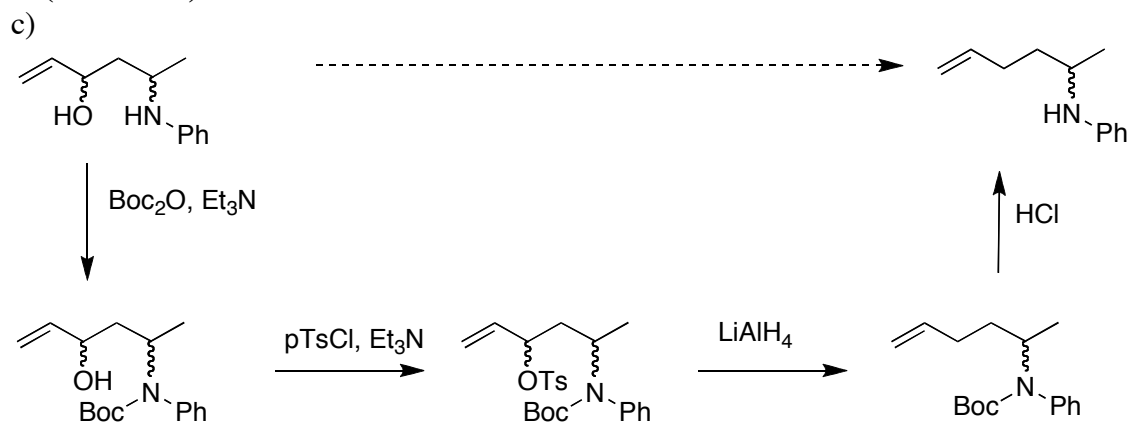
a)



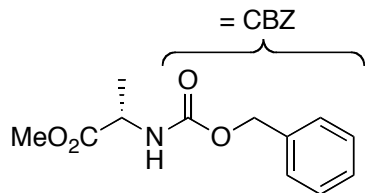
b)



## 2. (continued)

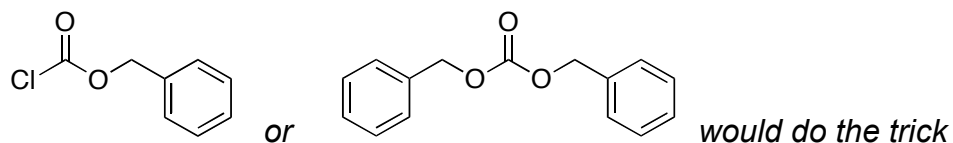


3. (3 points) The CBZ protecting group, pictured below protecting a simple amino ester, is a common protecting group for amines.



Based on your knowledge of chemical structure and reactivity, answer the following questions:

a) Draw the structure of a reagent that could be used to install a CBZ group onto an amine.

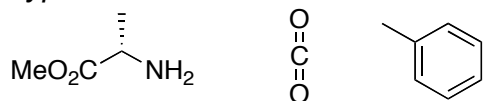


b) Under which conditions is a CBZ-protected amine best deprotected? Draw the reaction byproducts.

*Hydrogenolysis (to cleave the weak benzyl-oxygen bond)*

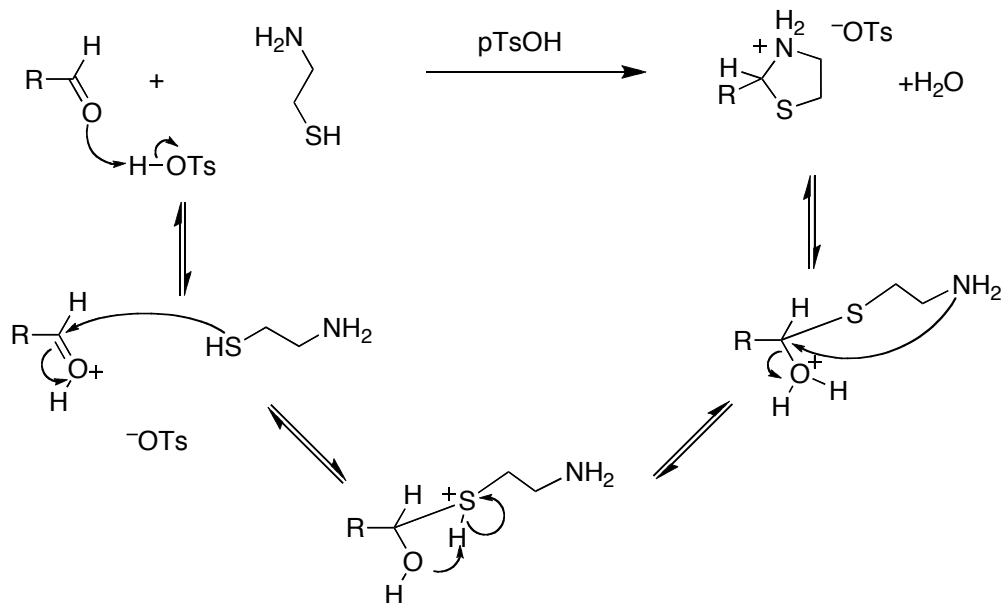
$H_2$ , Pd/C

Byproducts:

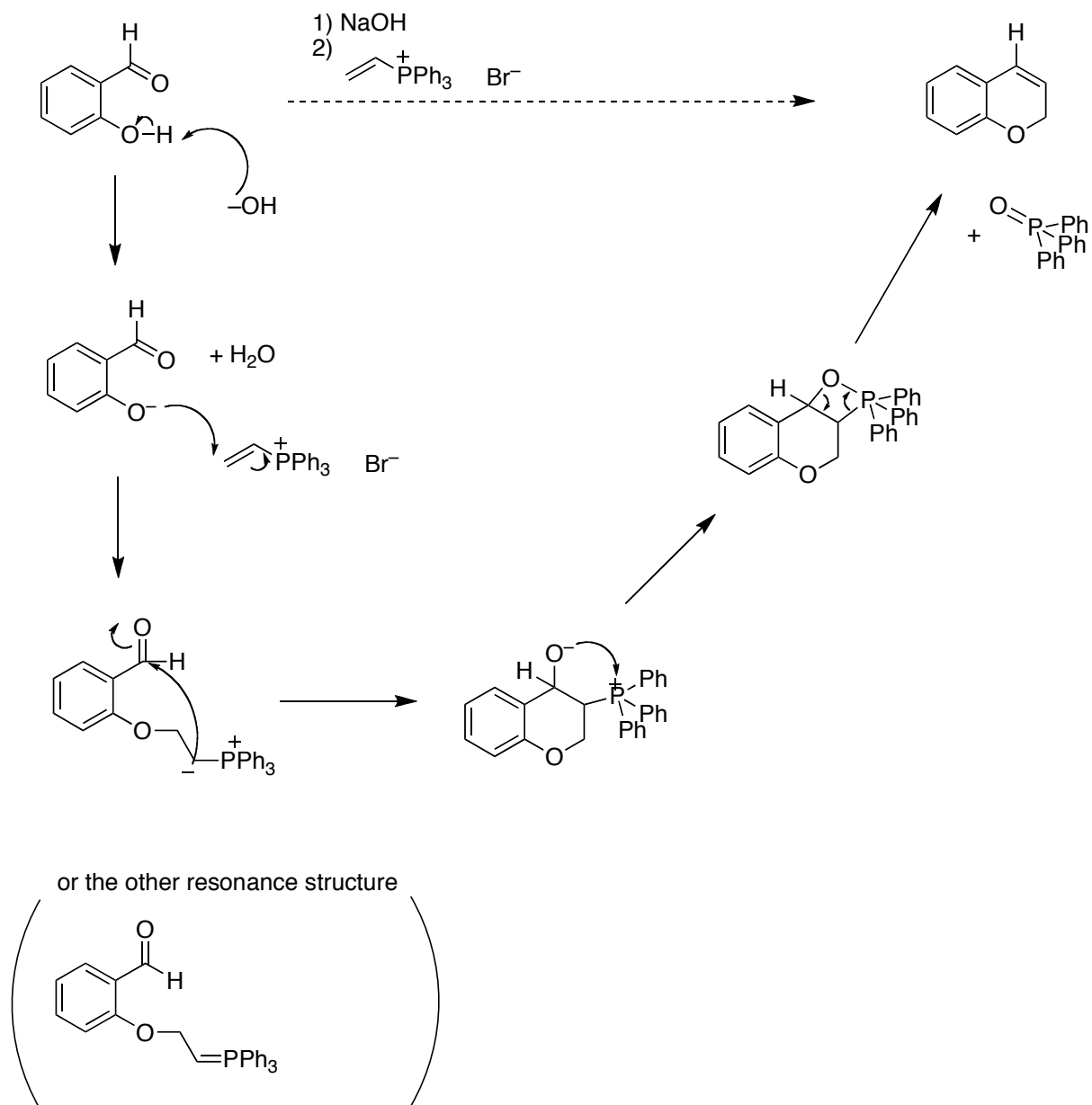


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4. (5 points) You discovered during a group problem session that you can create the heterocycle shown below from reagents of the general types pictured. Provide a detailed mechanism for this transformation, including all proton transfers, intermediates, and byproducts.



5. (5 points) The following transformation involves a conjugate addition to an unusual alkenyl phosphonium ion. Provide a detailed mechanism for this transformation, including all proton transfers, intermediates, and byproducts.



END