

**Organic Chemistry 2**  
**Second Examination**  
**March 17, 2006**  
**Prof. Malachowski**



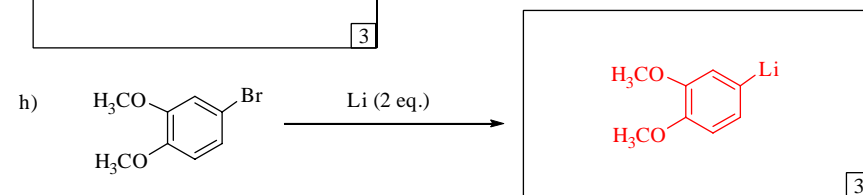
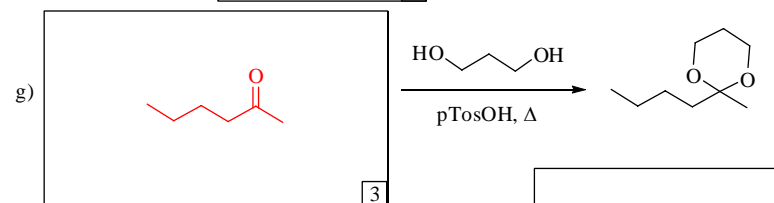
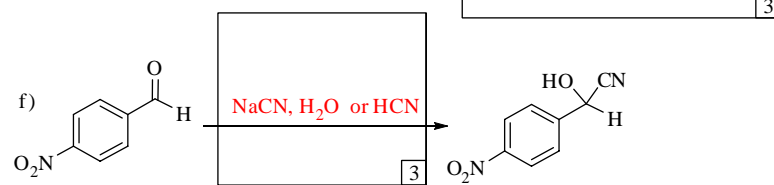
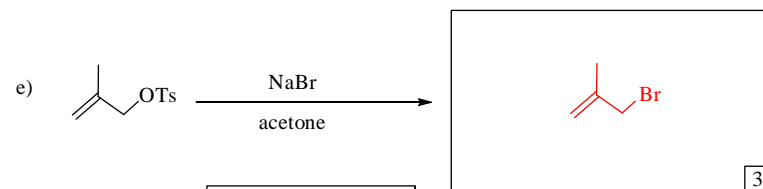
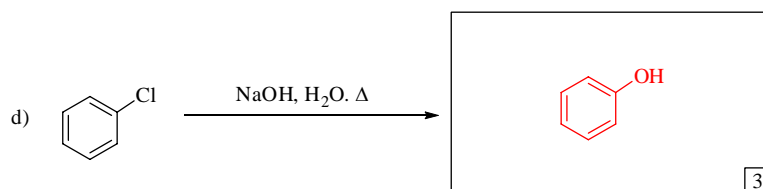
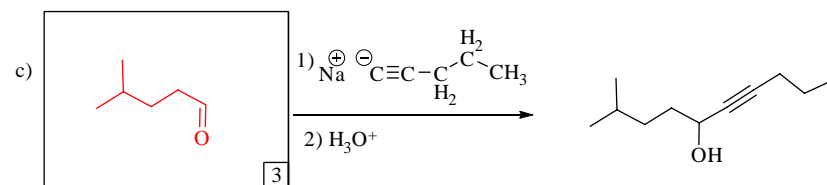
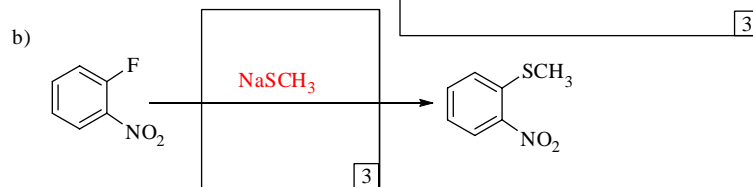
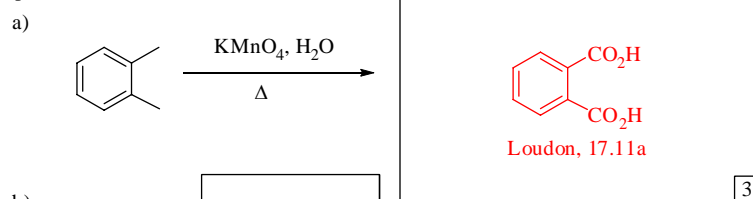
Name: Boreen O'Kem

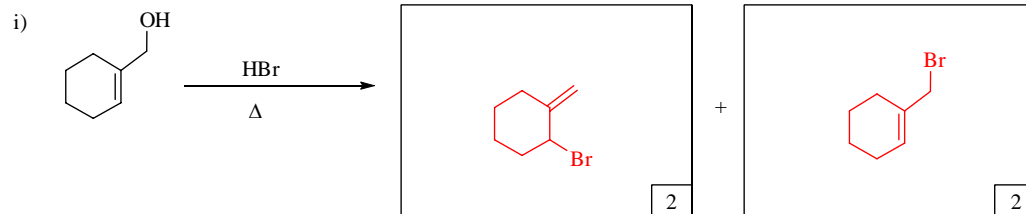
The examination has six questions on four pages. The point values for each question are found with the question. Partial credit where appropriate will be given.

Read each question carefully before answering. Be certain you understand everything the question is requesting. Do the easy questions first. If questions appear confusing or exceedingly complex, then you may need to rethink the question. Keep in mind the intended examination topics.

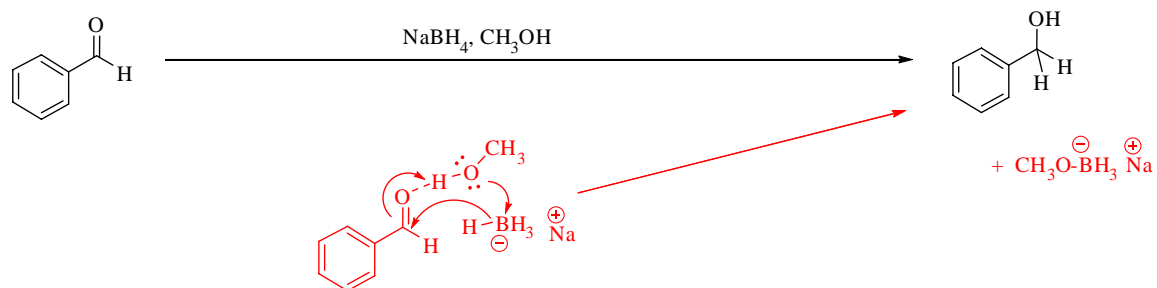
In organic chemistry, hand-drawn pictures convey specific information. Be sure the drawing you have made conveys the essential information required to answer the question. Make certain that three-dimensional pictures display the correct atom arrangements. Don't forget to include lone pairs of electrons and formal charges when appropriate.

1. Complete the following reactions by providing the necessary information: starting material, reagent or major product. (points listed in corner of box)





2. a) Draw the curved-arrow electron flow mechanism of the following reaction. (9 pts.)

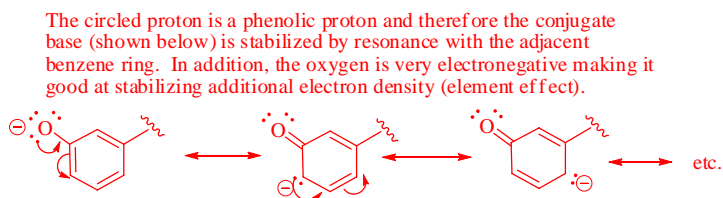
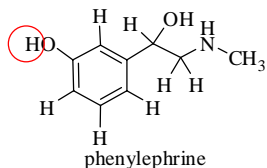


b) Lithium aluminum hydride reacts similar to  $\text{NaBH}_4$ , but it is a stronger source of hydride for reduction reactions. Use the electronegativity values of B (2.04), Al (1.61) and H (2.20) to explain why  $\text{AlH}_4^-$  is a stronger source of hydride than  $\text{BH}_4^-$ . (6 pts.)

In  $\text{AlH}_4^-$ , there is a greater polarization of the Al-H bond towards H based on a greater difference in electronegativity between Al-H versus B-H. Consequently, there should be more electron density with the hydrogen atoms, which corresponds to more hydride ( $\text{H}^-$ ) character and greater hydrogen reactive as a hydride source.

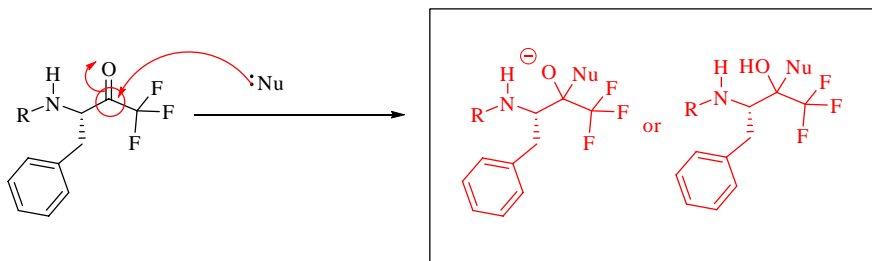


3. Circle the most acidic proton on phenylephrine, the replacement drug for pseudoephedrine, and explain why it is the most acidic. (8 pts.)



4. Drug designers often incorporate reactive electrophiles in their drugs with the intention of forming a covalent interaction with the drug's target, an enzyme. The covalent bond that forms binds the drug to the enzyme, inhibits the enzyme and elicits the therapeutic effect. Answer the questions below to show how a nucleophile (Nu) in the enzyme would react with the structure shown below.

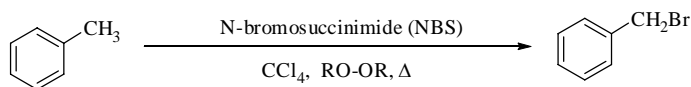
- a) Circle the most electrophilic atom in the molecule. (3 pts.) (Hint: this is related to our lecture topics.)



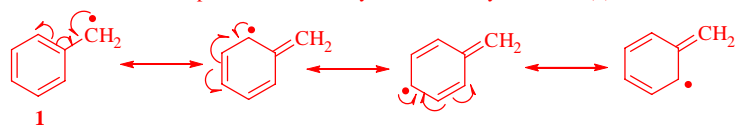
- b) Draw curved electron flow arrows to show the covalent bond that forms. (4 pts.)  
 c) Draw the structure that results from your arrows in the box to the right. (4 pts.)  
 d) The reaction shown represents an example of what type of reaction mechanism? (3 pts.)

nucleophilic addition

5. Draw the intermediate formed in the following reaction and all the contributing resonance forms of the intermediate. You do not need to draw the mechanism. You should use curved arrow electron flow conventions to show the transformation to the different resonance forms. (11 pts.)



The reaction is a free radical process that initially forms a benzylic radical (I).



6. Devise a synthesis for the product on the right from the starting material on the left. You may use any inorganic or organic reagents. (8 pts. each)

