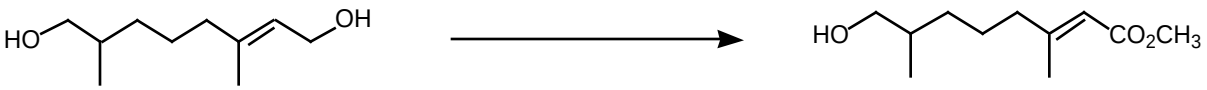
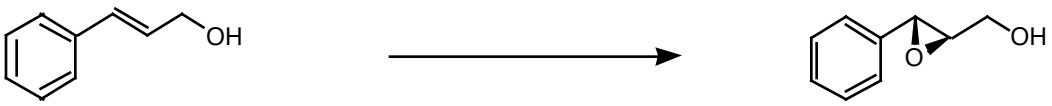
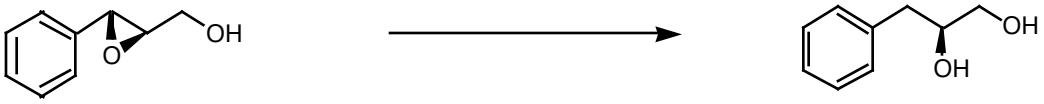
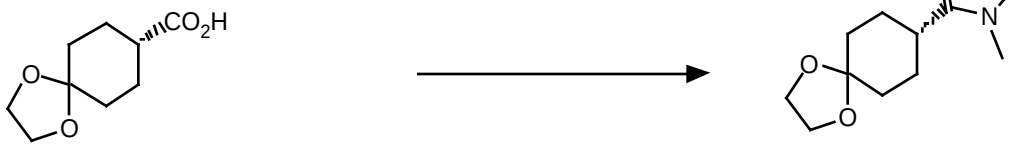
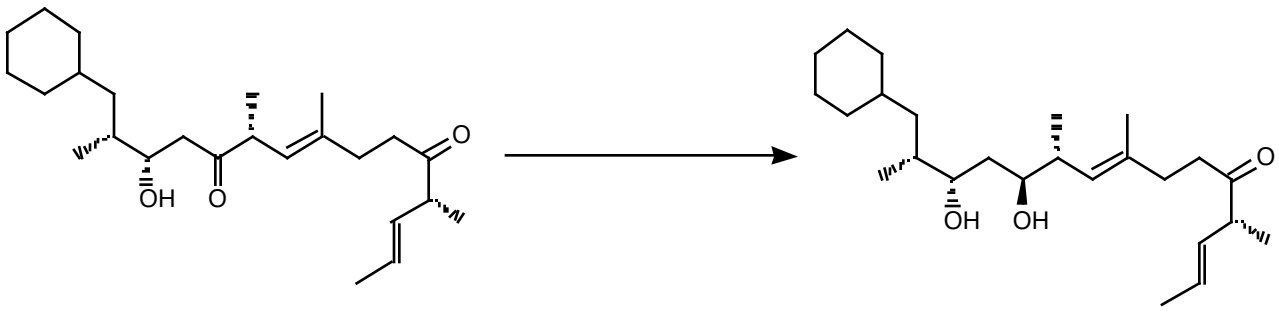
1. Give the reagent(s) necessary to carry out the following transformations. The stereochemistry of the products and reactants is as shown. (20 pts)



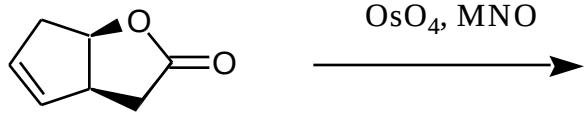


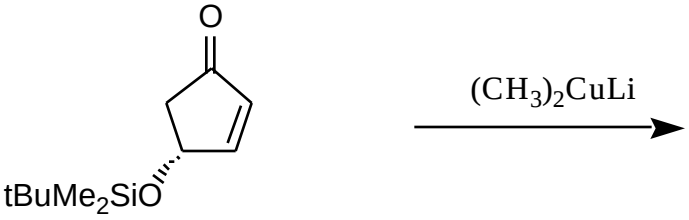


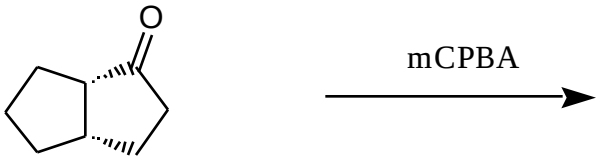


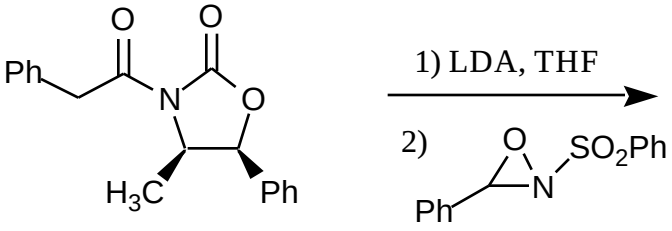


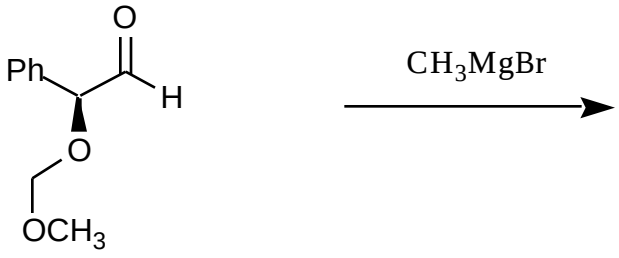
2. Give the product of the following reactions. The stereochemistry of the reactant is as shown. Give the proper sterochemistry of the major steroisomer of the product. (20 pts)



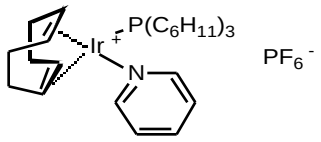


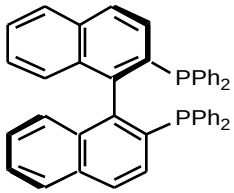


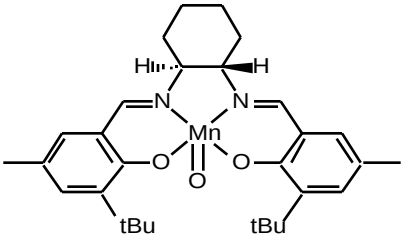




3. What are the following reagents used for. Please be specific. (8 pts each)

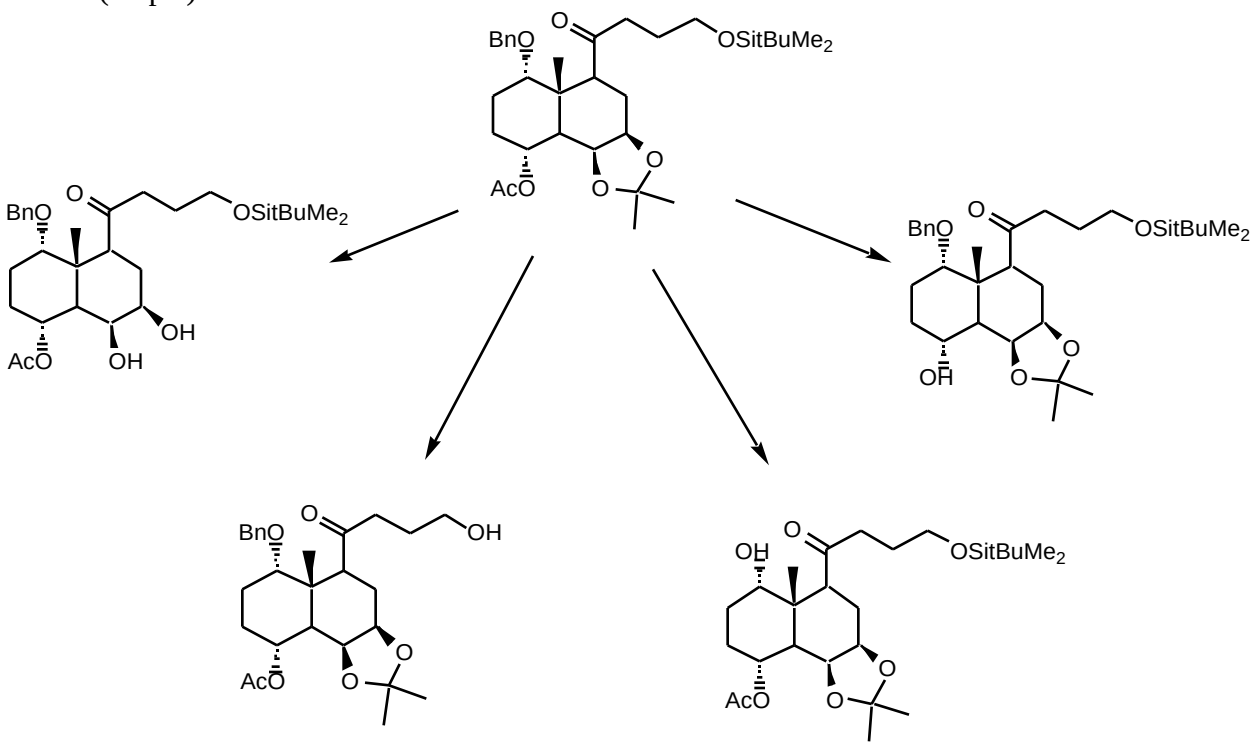




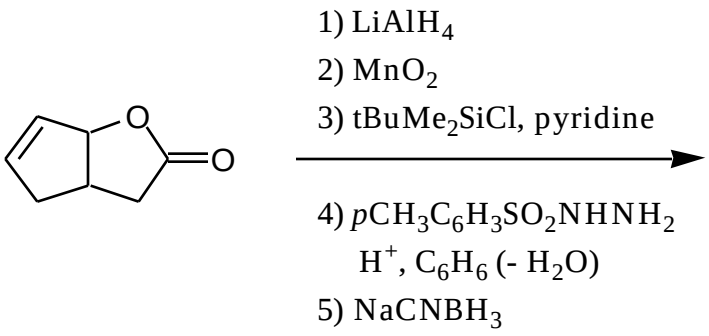


Bu_2BOTf, iPr_2NEt

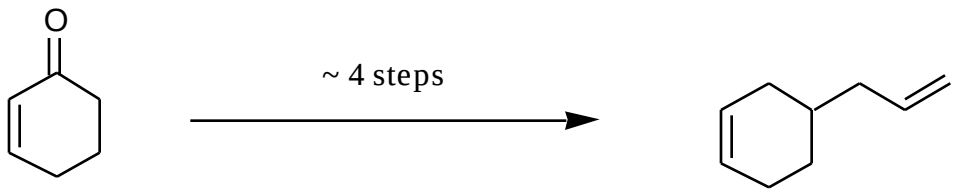
4. Give the reagent(s) needed to selectively deprotect the substrate below to the desired product. (16 pts)



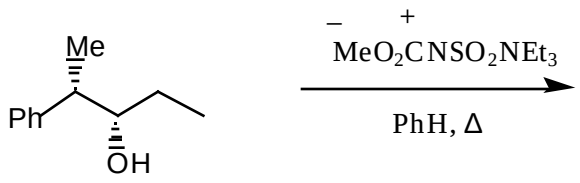
5. Provide the product and all intermediates for the following sequence of reactions. (20 pts)

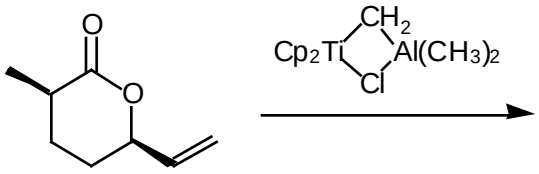


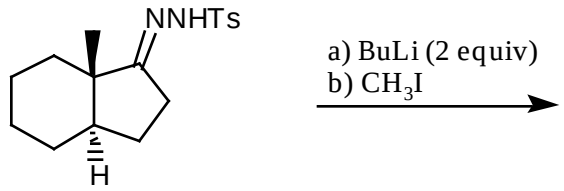
6. Starting from cyclohexanone, provide a feasible synthesis target shown. Give all reagents and intermediates. (16 pts)

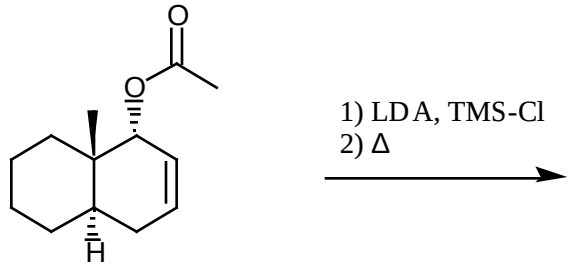


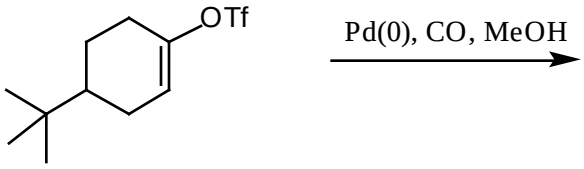
1. Give the product of the following reactions. The stereochemistry of the reactant is as shown. Give the proper sterochemistry of the major stereoisomer of the product. (24 pts)

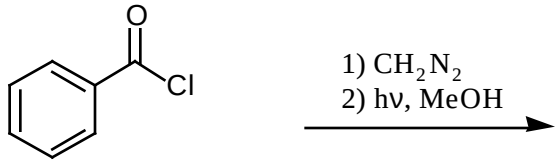




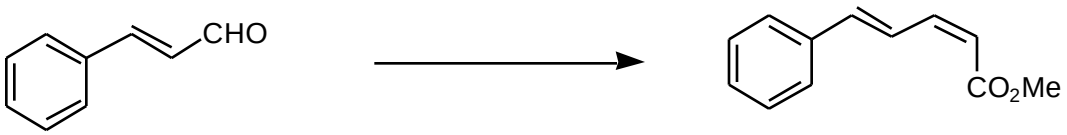


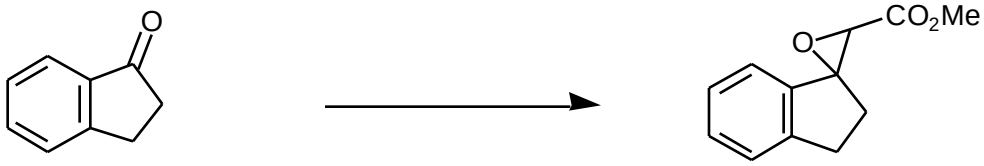


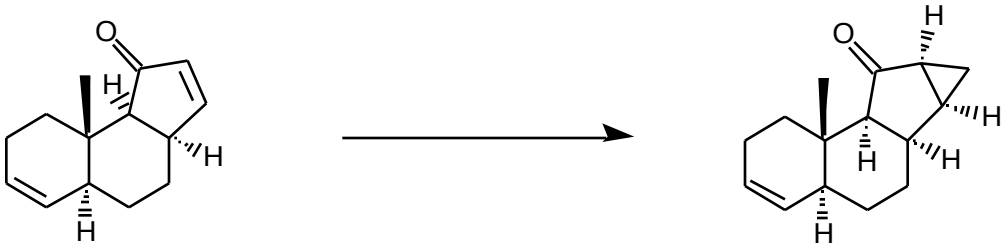


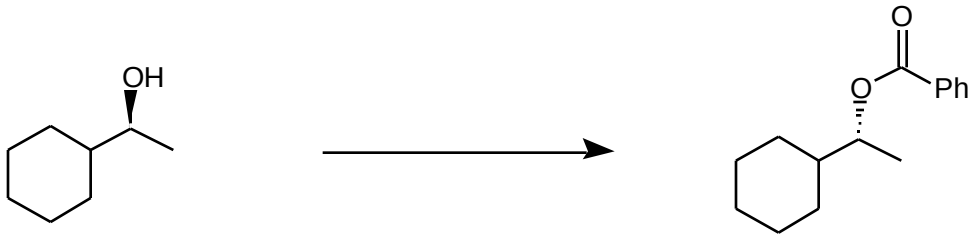


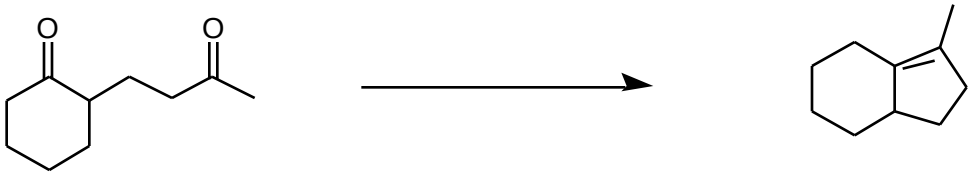
2. Give the reagent(s) necessary to carry out the following transformations. The stereochemistry of the products and reactants is as shown. (24 pts)

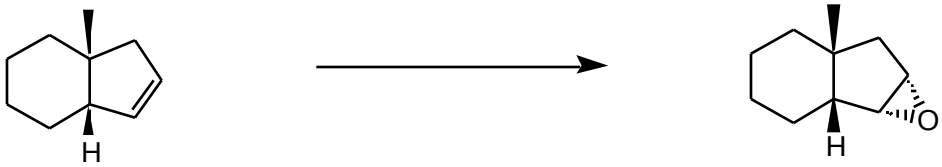




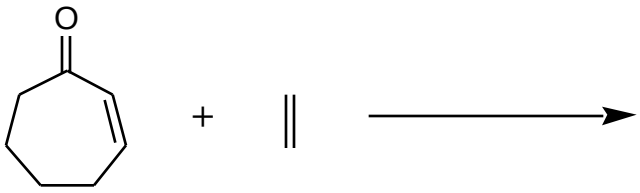




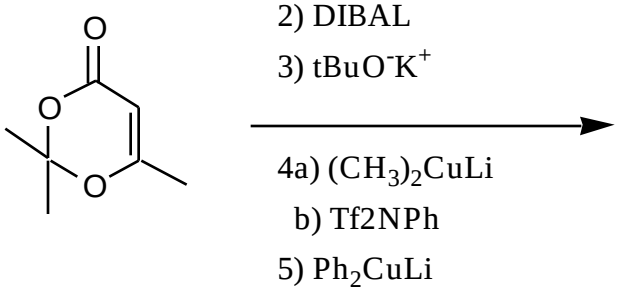




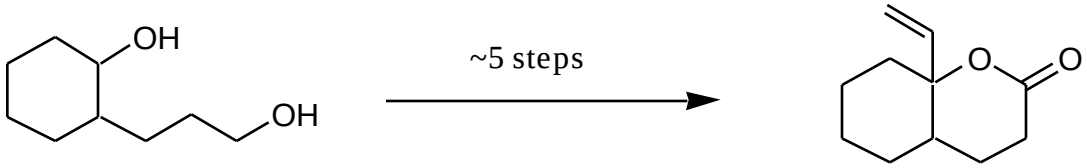
3. Give the expected product from a thermal and photochemical [2+2] cycloaddition of cycloheptenone with ethylene. Using MO's, clearly show why the photochemical and thermal pathways give different stereochemical outcomes. (12 pts)



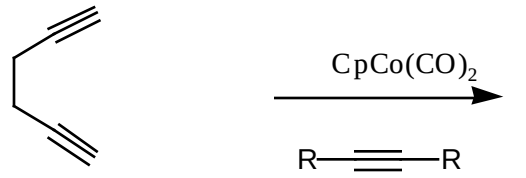
4. Provide the product and all intermediates for the following sequence of reactions. (20 pts)

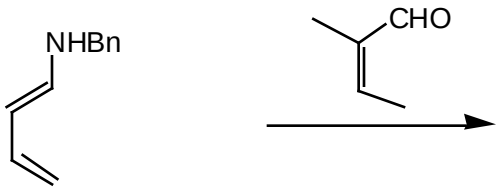


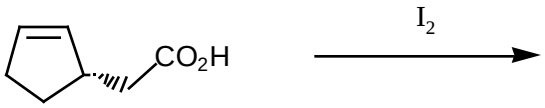
5. Complete the synthesis for the target shown. Give all reagents and intermediates. (20 pts).

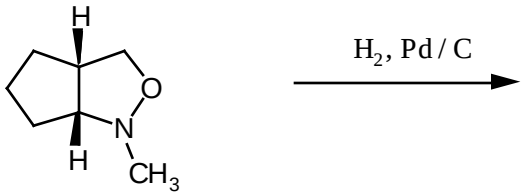


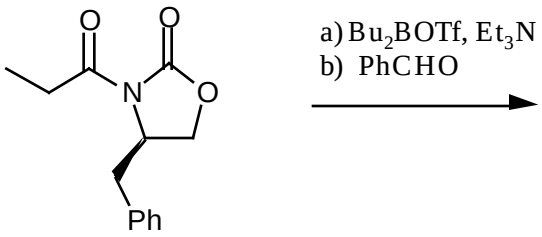
1. Give the product of the following reactions. The stereochemistry of the reactant is as shown. Give the proper sterochemistry of the major stereoisomer of the product. (20 pts)



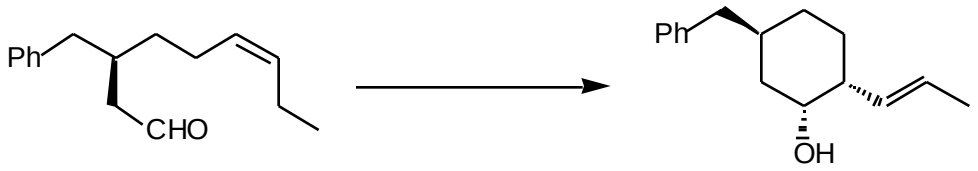


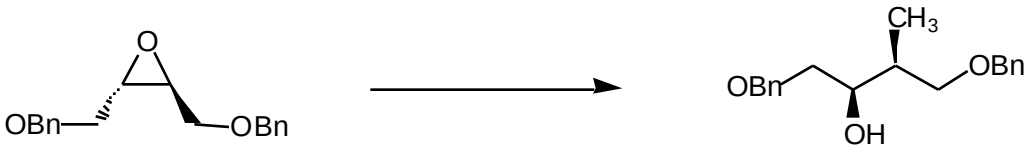


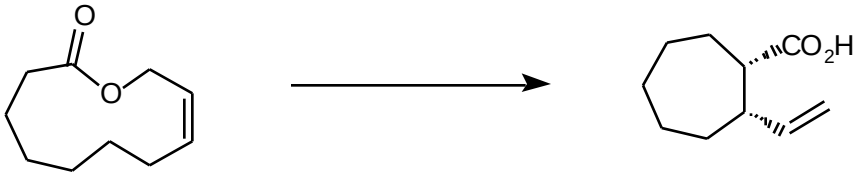


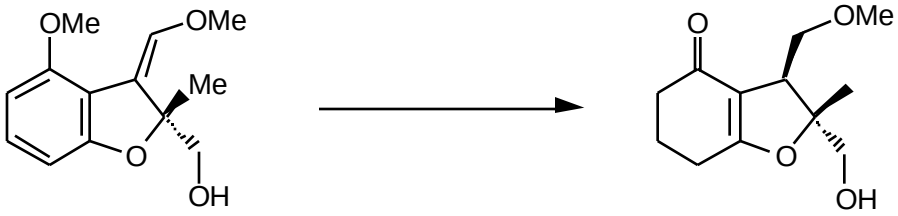


2. Give the reagent(s) necessary to carry out the following transformations. The stereochemistry of the products and reactants is as shown. (20 pts)









3. Short Answers. (5 points each, 20 points total)

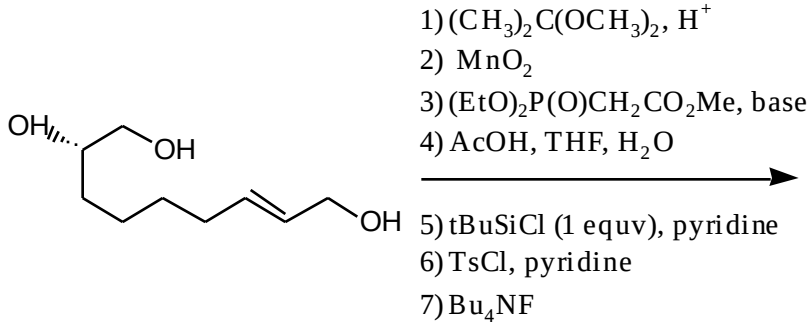
a. Define enantioselective and enantiospecific and give examples of each.

b. What is the Stork-Eschenmoser hypothesis?

c. What are Baldwin's Rules (be general, do not give each specific rule)? Be sure to explain what are the basis of the rules and give one example each of a reaction that is favored and disfavored according to Baldwin's rule.

d. Define umpolung and give an example.

4. Provide the product and all intermediates for the following sequence of reactions. (20 pts)



5. Complete the synthesis for the target shown. Give all reagents and intermediates. (20 pts).