CHEM 330

Final Exam
December 9, 2009

Your name: _____

This a closed-notes, closed-book exam

The use of molecular models is allowed

This exam contains 10 pages

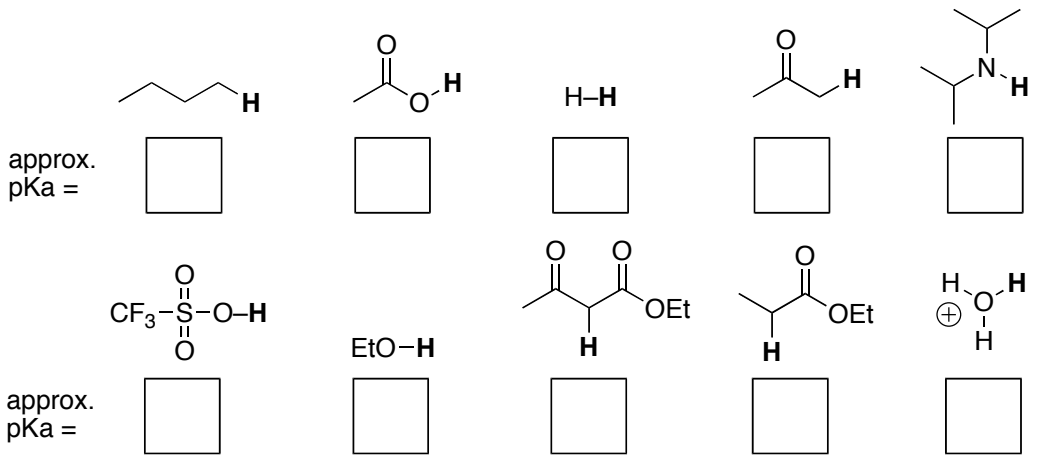
Time: 2h 30 min

1. _____ / 20
2. _____ / 20
3. _____ / 20
4. _____ / 30
5. _____ / 40
6. _____ / 40
7. _____ / 40
8. _____ / 40

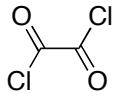
TOTAL _____ / 250 = _____ / 100

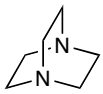
This exam counts for 45% of your CHEM 330 final grade

1. (20 pts.) Indicate the approximate pKa for the dissociation of the H in boldface in the substances listed below



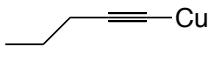
2. (20 pts.) Write a chemical equation to show an example of a reaction involving the use of the reagents listed below (**do not** write mechanisms – just the reactions).

a. 

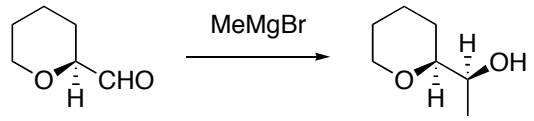
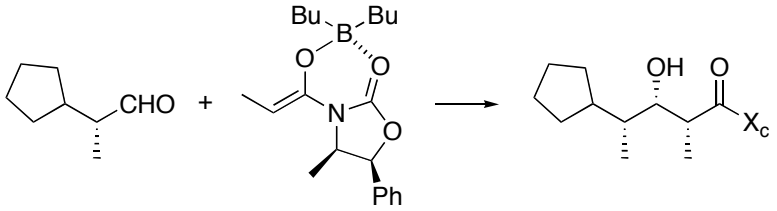
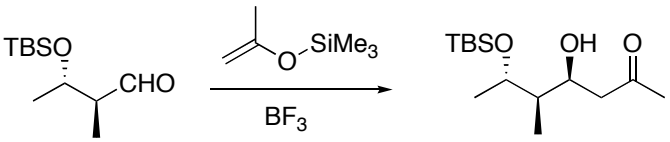
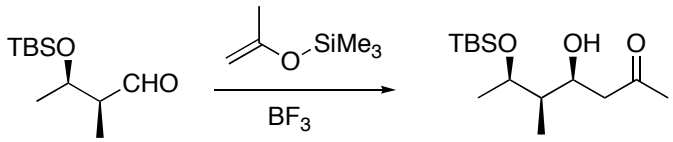
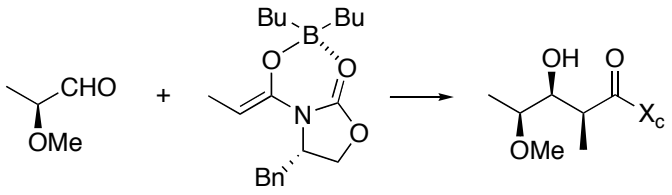
b. 

c. $Me_3Si-\overset{H}{N}-SiMe_3$

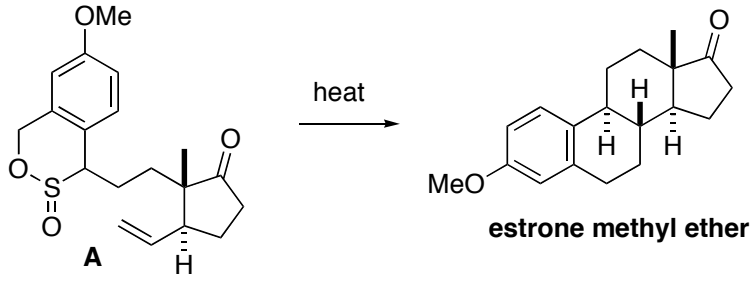
d. $NaBH(OAc)_3$

e. 

3. (20 pts.) Check the appropriate box to indicate whether the following C=O addition reactions have occurred in accord or in disaccord with the Cram-Felkin or Felkin-Anh reactivity model, as appropriate. For reactions that involve the combination of a chiral reagent with a chiral substrate, also indicate whether a stereochemical match or a mismatch subsists.

	accord	disaccord	match	mismatch
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐
	☐	☐	☐	☐

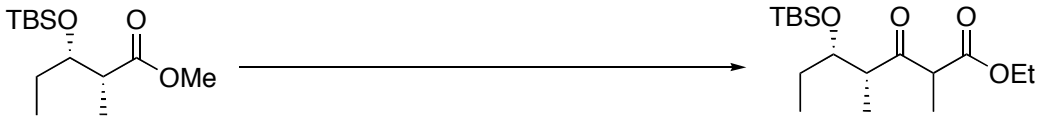
4. (30 pts.) A synthesis of estrone, an important steroid, involved the reaction shown below.

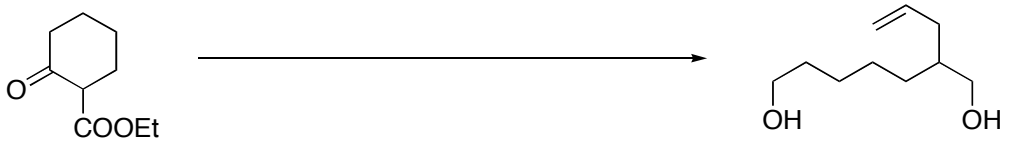


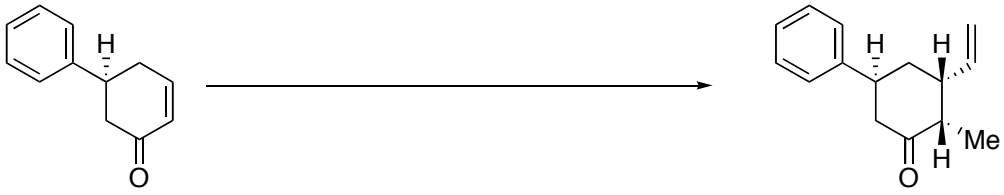
a. Write an accurate mechanism for this transformation;
b. Briefly account for the stereochemical outcome of the reaction by commenting on the stereochemical and topological aspects of the process. Draw a transition state structure to illustrate your arguments.

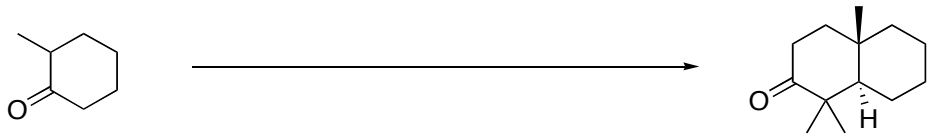
5. (40 pts.) Complete the following equations by indicating all the reagents that are necessary to effect the transformations shown. Provide your answers as a numbered list of reagents, in the correct order, written over/under the reaction arrows.

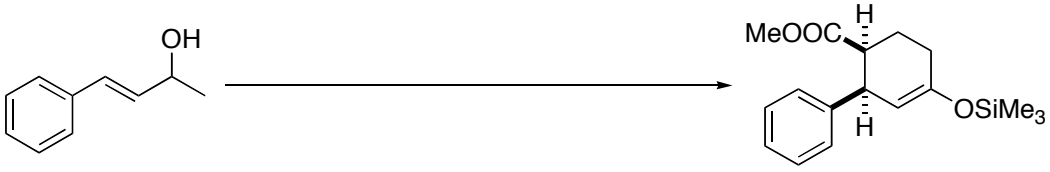
   Note: aqueous workups are understood and are not to be included in your answers.

a. 

b. 

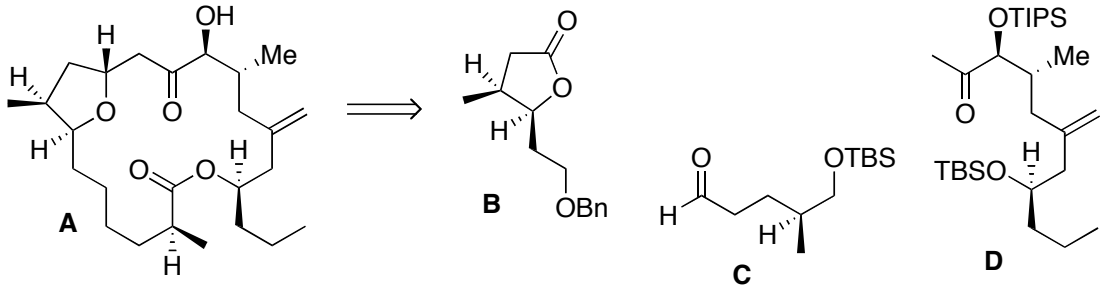
c. 

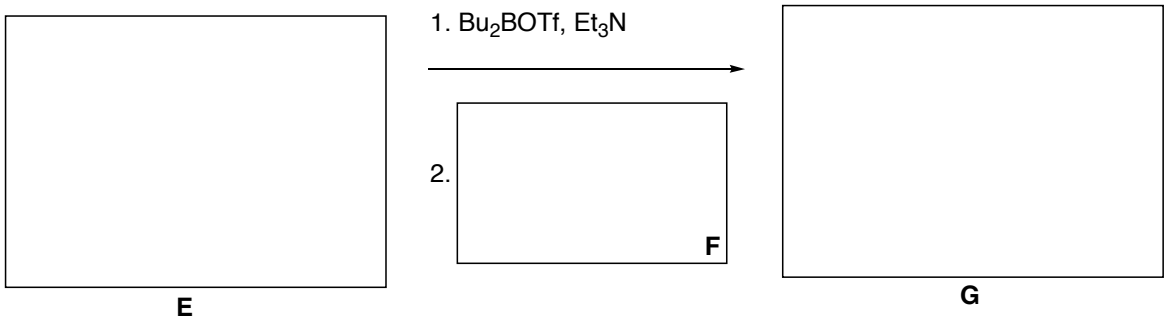
d. 

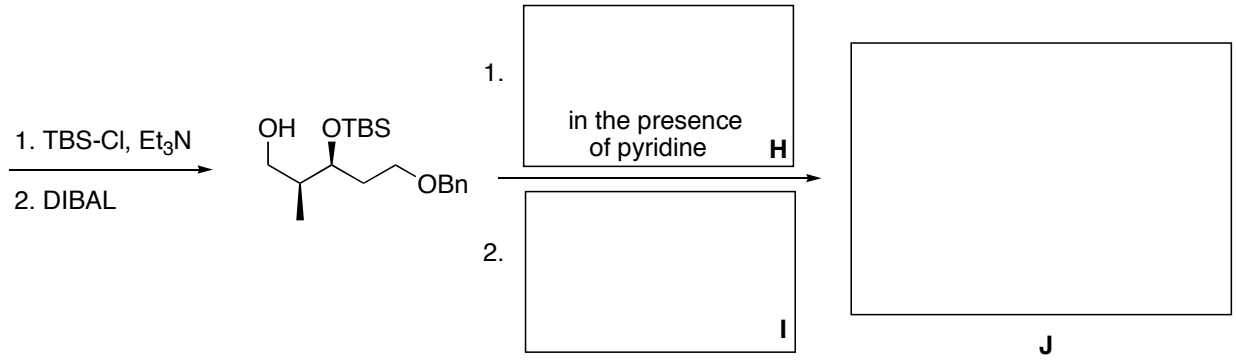
e. 

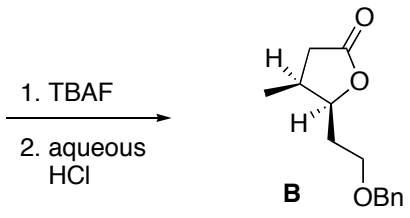
6. (40 pts) Amphidinolide T1, **A**, is a potent antitumor agent of marine origin. Its extreme rarity makes synthesis the only practical way to secure material for biological work. Substance **A** may be assembled from fragments **B**, **C**, and **D** (cf. *J. Am. Chem. Soc.* **2003**, *125*, 2378). The synthesis of **B** and **C** is outlined in the diagram below. Complete this diagram by indicating all missing reagents / products. Each box corresponds to **one** reagent / product.

Note: aqueous workup steps are understood and are not to be included in your answers.

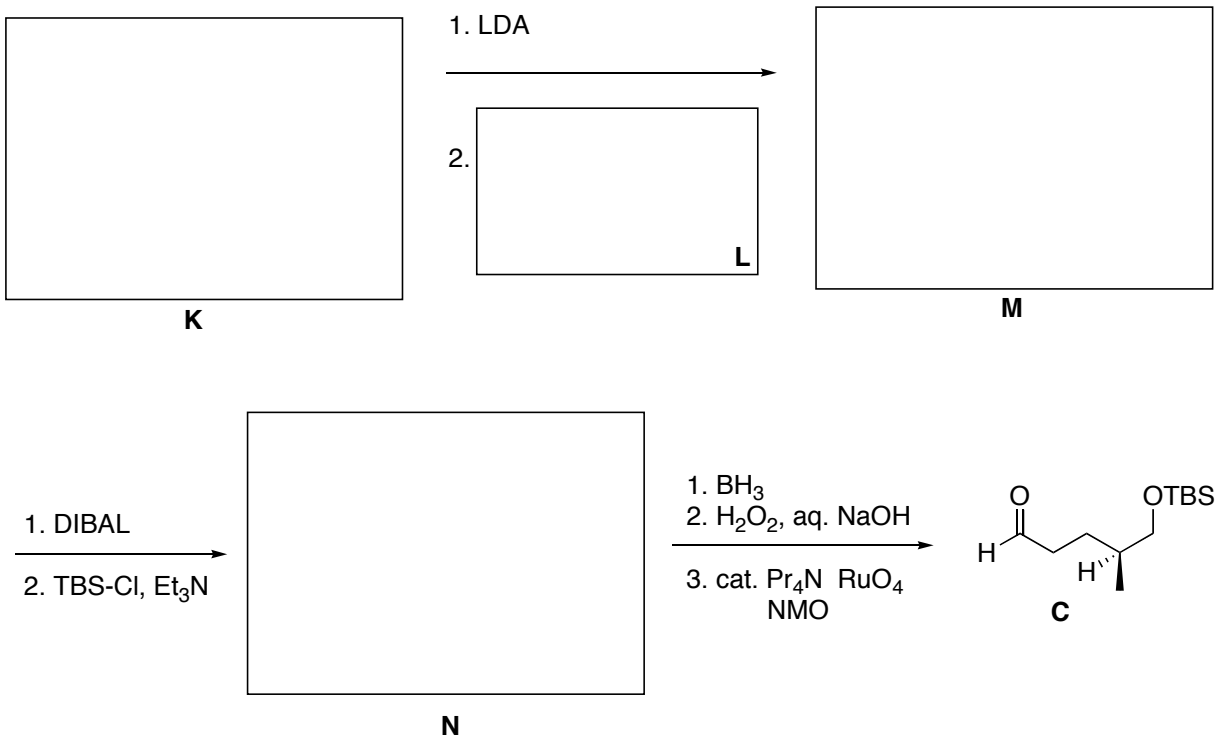








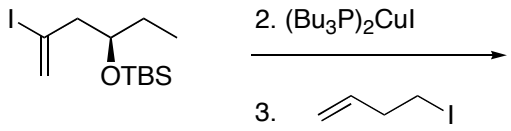
* * * *



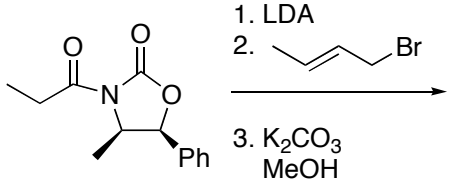
7. (40 pts.) Predict the structure of the major product expected from the following reactions. Note: **It is not necessary to draw mechanisms**.

Note: aqueous workups at appropriate stages are understood

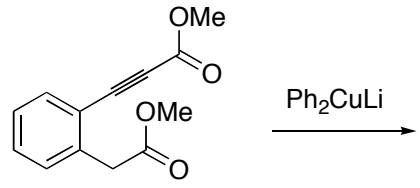
a.



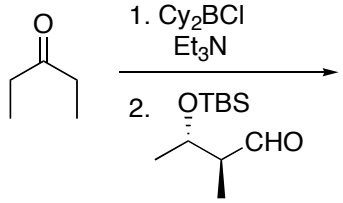
b.



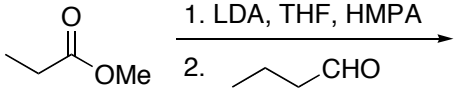
d.


OMe
O
OMe
O
Ph_2CuLi

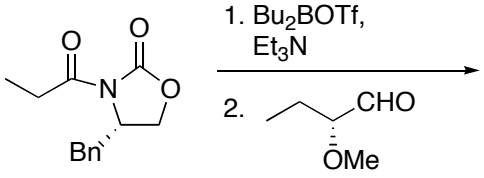
e.


O
1. Cy_2BCl
Et_3N
2. OTBS
CHO

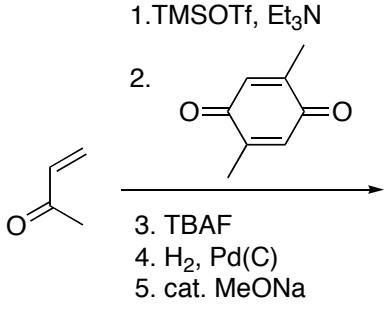
f.


O
OMe
1. LDA, THF, HMPA
2.
CHO

g.

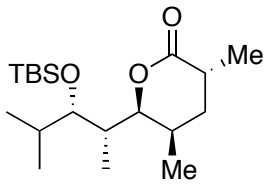

O
O
N
O
Bn
1. Bu_2BOTf,
Et_3N
2.
CHO
OMe

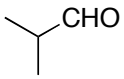
h.

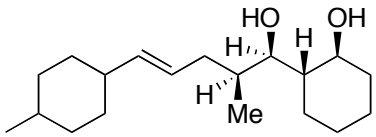

1.TMSOTf, Et_3N
2.
O
O
O
3. TBAF
4. H_2, Pd(C)
5. cat. MeONa

8. (40 pts) Propose an enantioselective synthesis of the molecules shown below starting with the indicated building blocks. Be careful about protecting groups and configurations of stereocenters. Assume the availability of all needed reagents, auxiliaries, etc. Present your answer as a flowchart.

It is not necessary to draw mechanisms or to indicate aqueous workups.

a. 

starting with 

b. 

starting with 

Happy Holidays !