Chem 41c Midterm Exam

Stoltz, Spring 2009, April 29, 2009

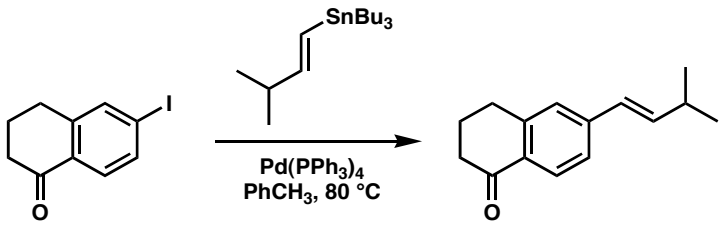
The exam begins when you turn to page 2. You have 55 minutes to complete the exam. This is a closed note and closed book exam with no collaboration. You may use the periodic table at the front of the room or the one on the last page of this packet. You may not use any other materials. The exam has a total of 60 points. Good luck.

There are 10 pages in this exam packet.

*Name:*_____

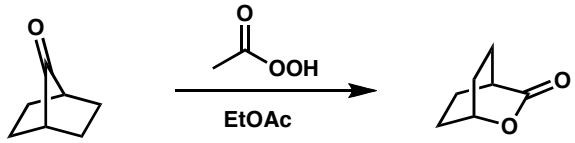
1. Predict the major non-volatile products (if any) of the following reactions or sequences. (3 points each)

a.

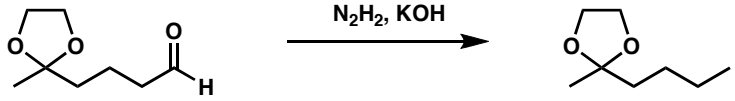


or ay other appropriate cross coupling.

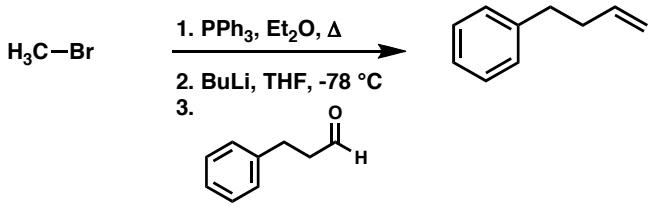
b.



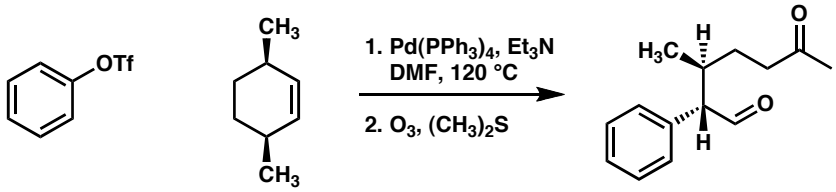
c.



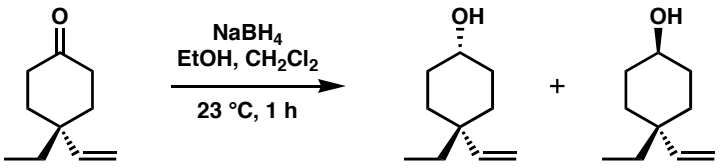
d.



e.

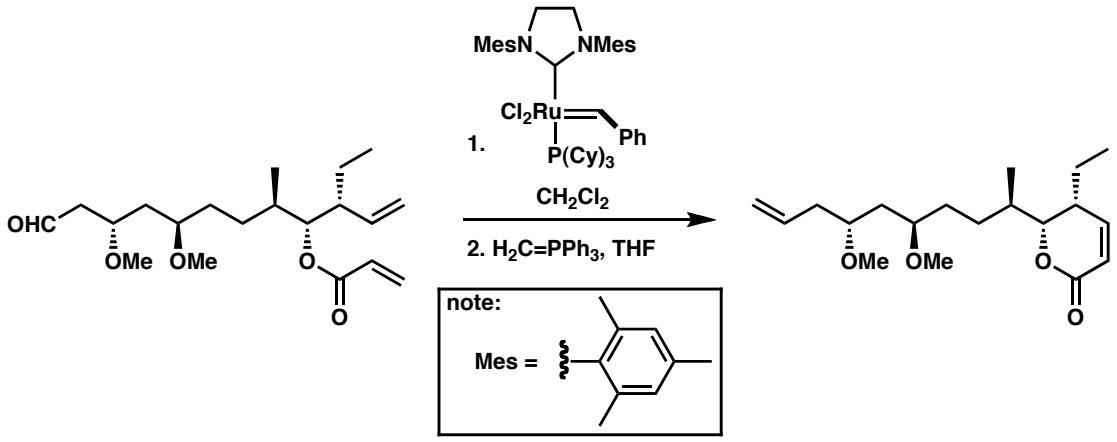


f.



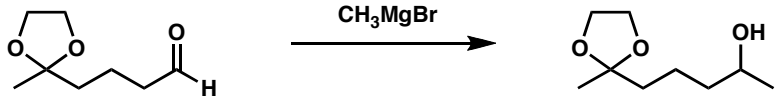
2 major products

g. (6 points)

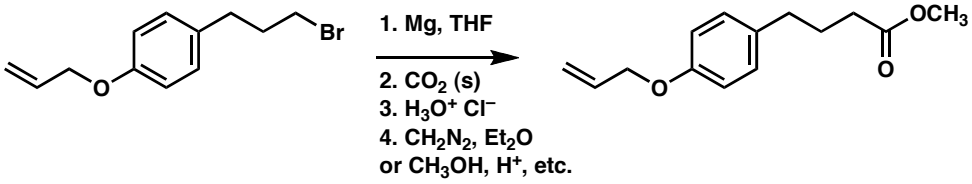


2. Provide reagents for the following transformations. They may be multistep processes. (3 points each)

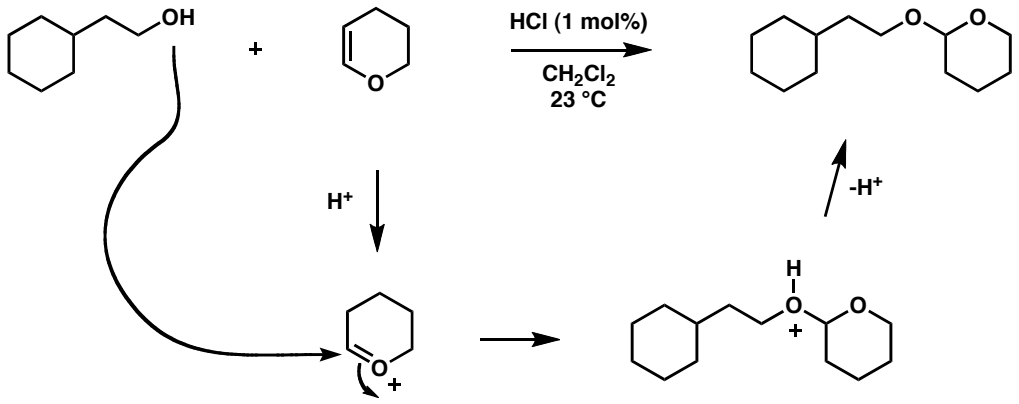
a.



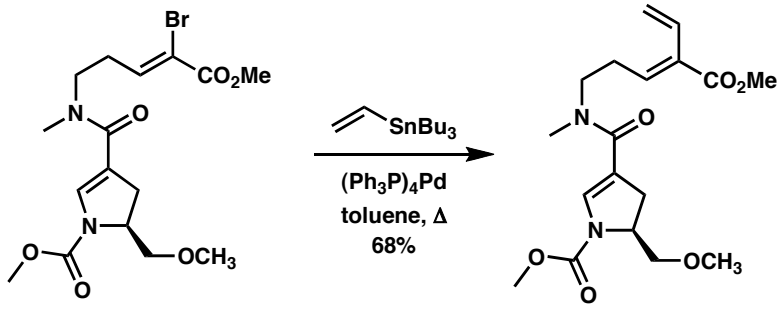
b.



3. Predict the product and provide a reasonable and detailed mechanism for the following reaction (5 points).

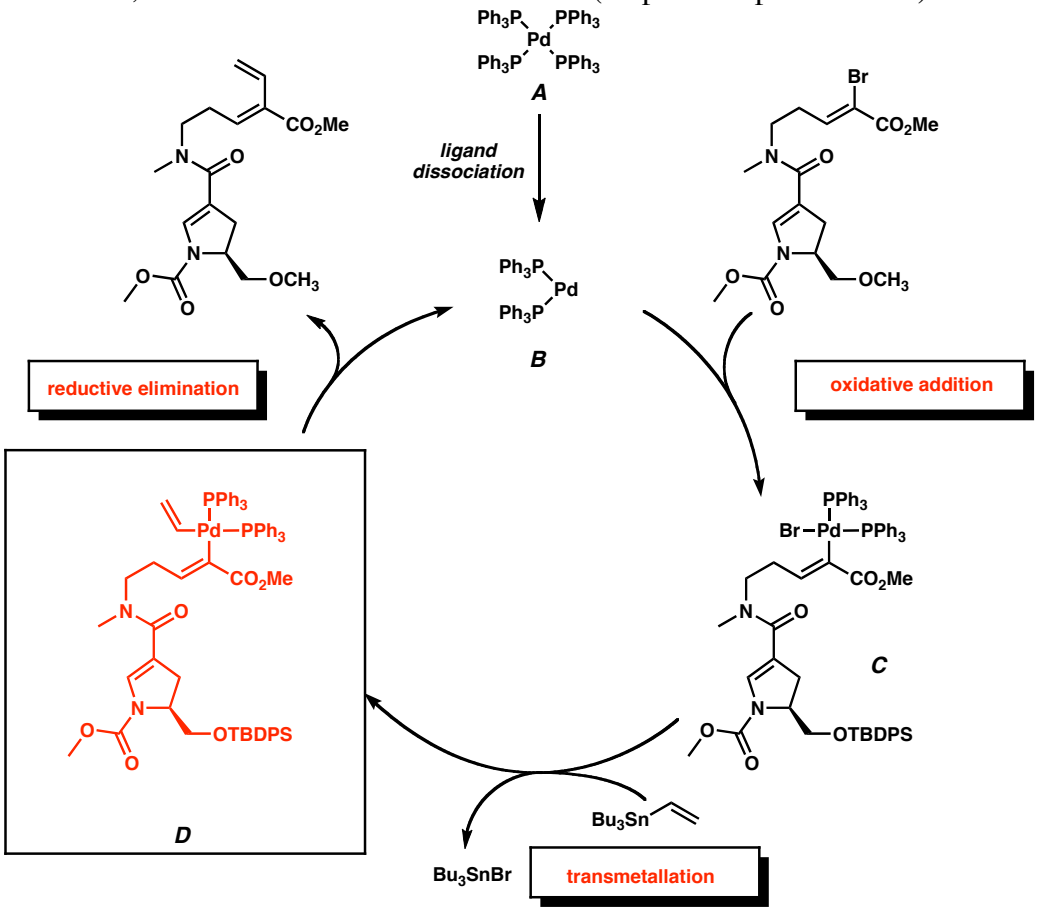


4. The following reaction produces a valuable synthetic intermediate (**2**) in high yield.



1 ***2***

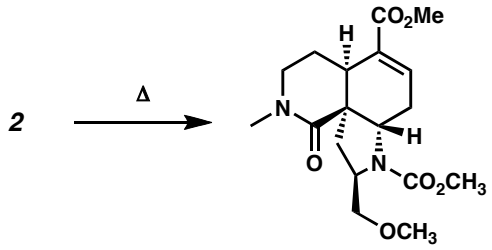
a) A catalytic cycle for this reaction is shown below. Fill in the boxes with names (e.g., associative ligand substitution) describing each of the key steps and provide the structure of intermediate **D**. Next, fill in the blanks indicating the oxidation state, *d* electron count and the total electron count of the metal species involved. Last, what is the name of this reaction? (10 points-2 points bonus)



	Compound A	Compound B	Compound C
Metal oxidation state:	0	0	+2
Metal *d* count:	d^{10}	d^{10}	d^{8}
Total electron count:	18	14	16

(bonus-2 points) Name of reaction: Stille Coupling

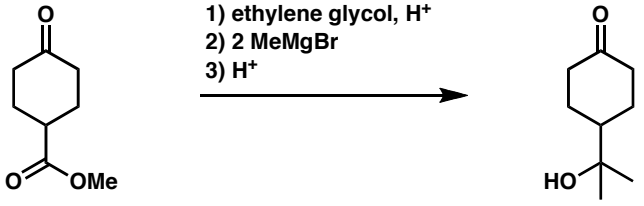
4b. (bonus 5 points) Interestingly, product 2 is not isolated but under the thermal conditions proceeds to a new product (**3**). Predict the structure of **3.**



3

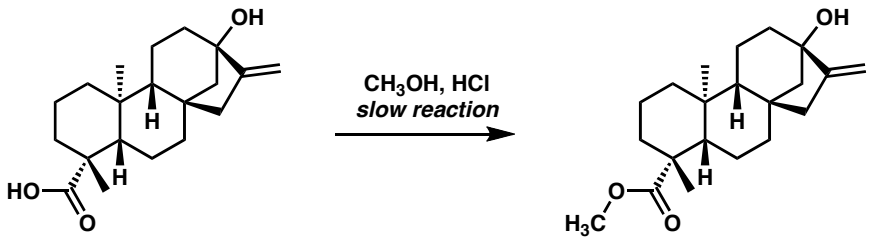
Any Diels Alder adduct is acceptable (stereochem, not important)

5. Provide a reasonable synthesis of **2** from **1**. (7 points)



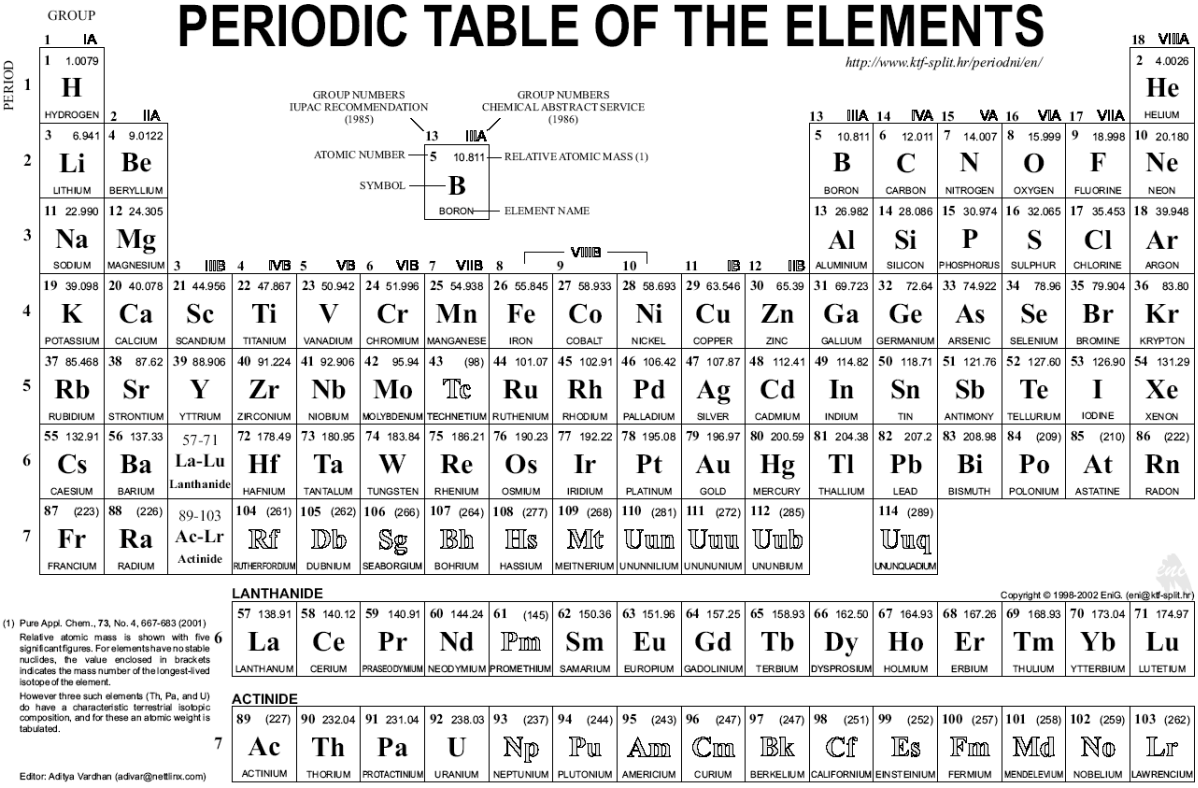
1 ***2***

6. The conversion of the natural product steviol (**1**) to its methyl ester **2** is a slow reaction under acid catalyzed esterification reaction conditions. Why would you expect this to be so? Under what conditions would you expect a rapid reaction to occur? Draw a mechanism for the successful reaction. (8 points)



Steviol (1) ***2***

–reaction is slow due to sterics
–CH_2N_2 or MeI, Base would work better. Mechanism as in class for either.


PERIODIC TABLE OF THE ELEMENTS
http://www.ktf-split.hr/periodni/en/
GROUP
PERIOD
GROUP NUMBERS IUPAC RECOMMENDATION (1985)
GROUP NUMBERS CHEMICAL ABSTRACT SERVICE (1986)
ATOMIC NUMBER
SYMBOL
RELATIVE ATOMIC MASS (1)
ELEMENT NAME
LANTHANIDE
ACTINIDE
Copyright © 1998-2002 EniG. (eni@ktf-split.hr)
(1) Pure Appl. Chem., 73, No. 4, 667-683 (2001)
Relative atomic mass is shown with five significant figures. For elements have no stable nuclides, the value enclosed in brackets indicates the mass number of the longest-lived isotope of the element.
However three such elements (Th, Pa, and U) do have a characteristic terrestrial isotopic composition, and for these an atomic weight is tabulated.
Editor: Aditya Vardhan (adivar@netlinx.com)

The End