uOttawa

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Please print

CHM 3120

PRACTICE EXAM (50%)

December 2013

Family name: _____

First name: _____

Student #: _____

Time allowed: 180 minutes

NO BOOKS OR NOTES ALLOWED

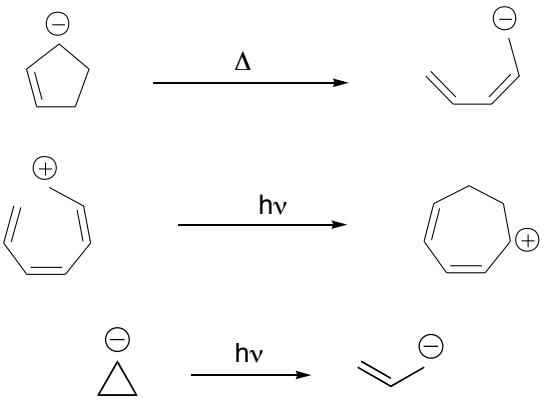
MOLECULAR MODELS ALLOWED

Question	1	2	3	4	5	6	7	8	9	B	T
Value											
Mark											
Notes											

PLEASE ANSWER ALL QUESTIONS IN THE ANSWER BOOKLET PROVIDED

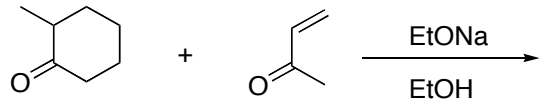
GOOD LUCK AND HAVE A GREAT HOLIDAY!

1. With the aid of an FMO analysis, indicate which of the following processes are likely to occur.

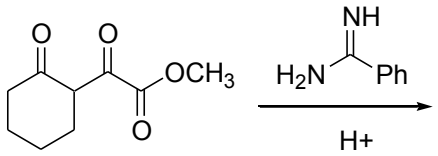


2. Give the expected product and the complete mechanisms for the transformations below.

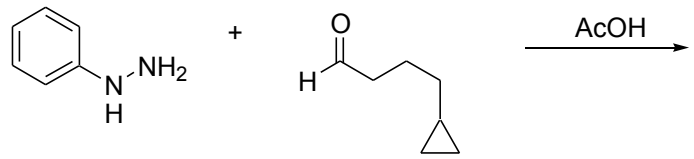
a.



b.

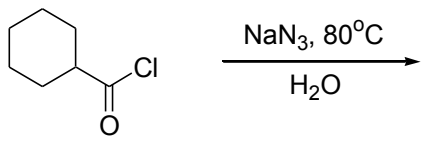


c.

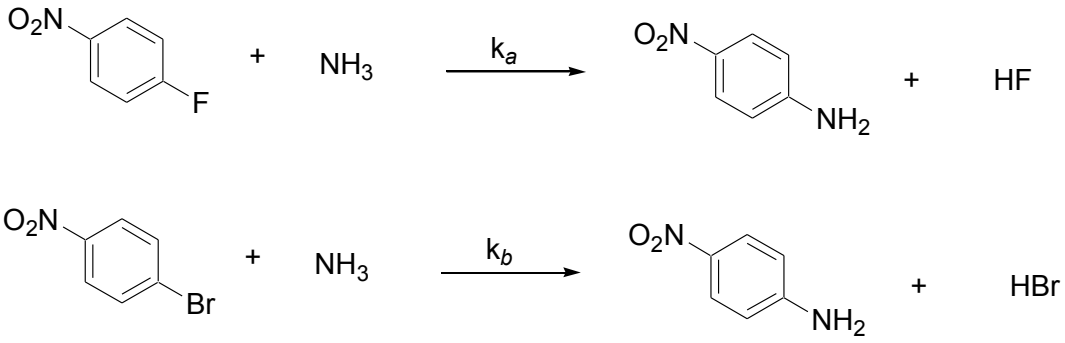


d.

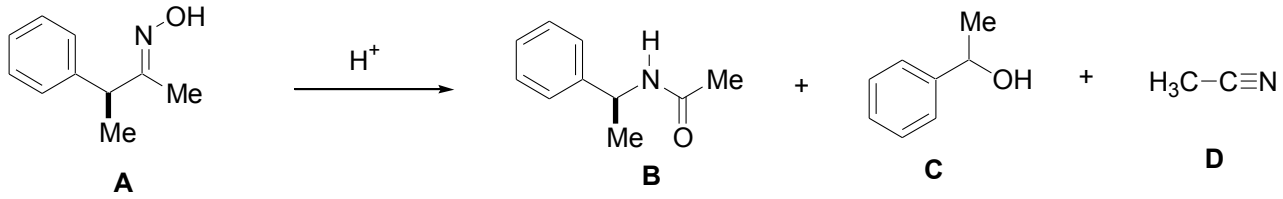
e.



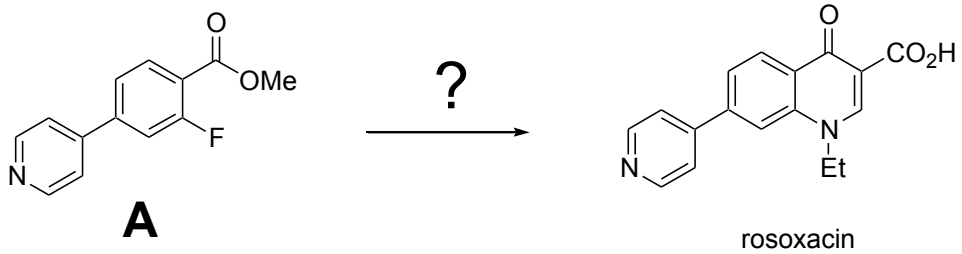
3. For the following reactions k_a / k_b > 1000. This trend is opposite to what is observed for an S_N2 reaction. Give the mechanism for this reaction. Using a potential energy diagram, explain the relative rate constants.



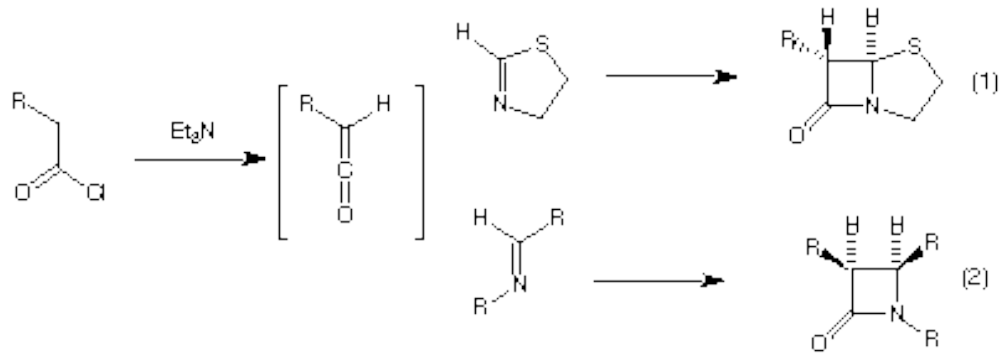
4. The Beckman rearrangement of **A** gives 3 products : **B** (80%), **C** (10%) and **D** (10%). Give a mechanism which accounts for these products and provide an explanation for why **C** and **D** are observed. (hint: **B** retains the same stereochemistry throughout, whereas **C** is racemic)



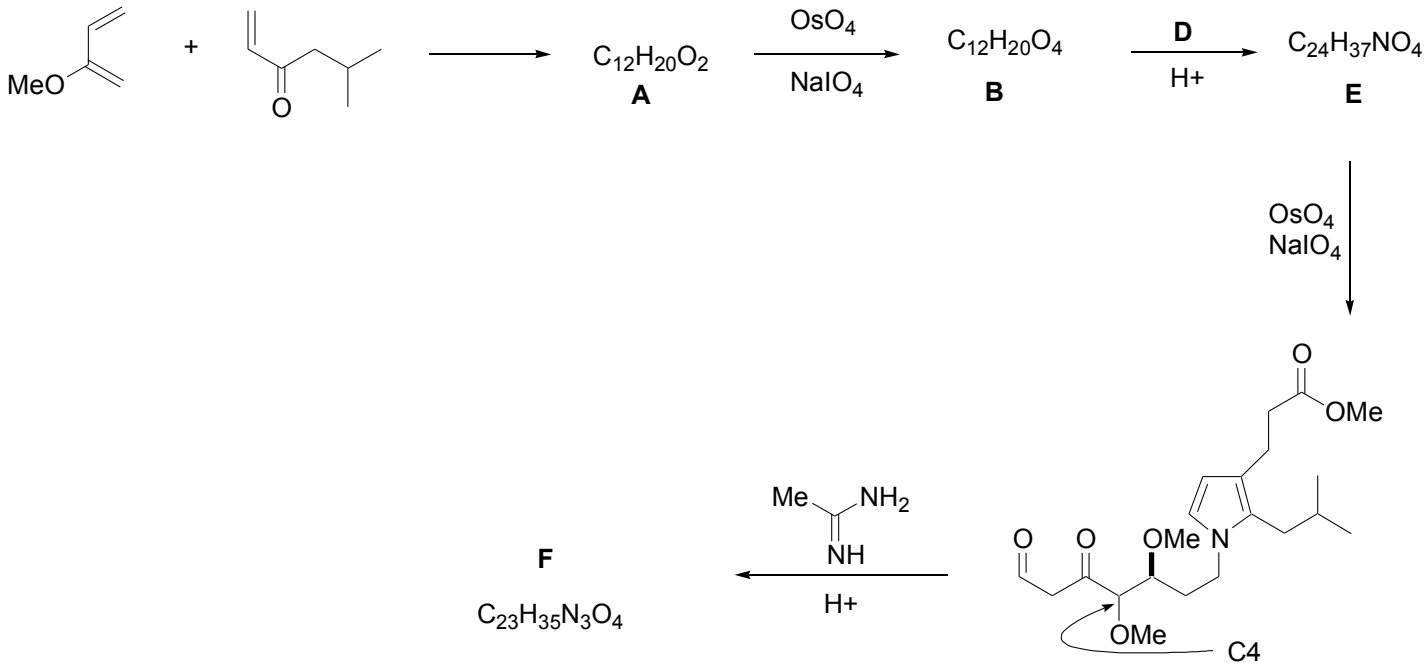
5. Propose a synthesis rosoxacin from the advanced intermediate **A** (no mechanism is necessary).

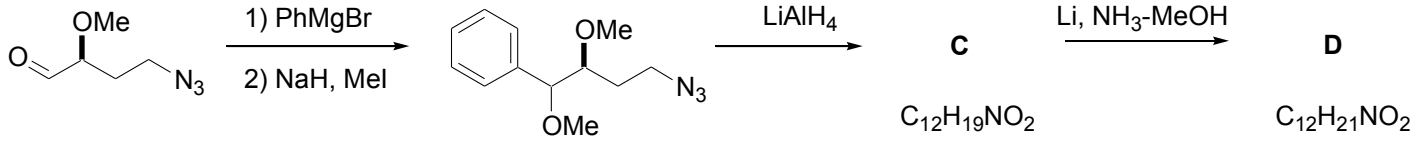


6. Two examples of a formal [2+2] ketene cycloaddition are shown below. When the azomethine/imine (RN=CHR) geometry in the reactant is (Z), the product stereochemistry is trans (eq 1). In a complementary fashion, the (E) imine affords the cis-substituted product (eq 2). Provide a mechanism for the transformation and explain the stereochemical outcome of the process.



7. a) Give the structure of the intermediates **A**, **B**, **C**, **D, E** and **F** in the following reactions.



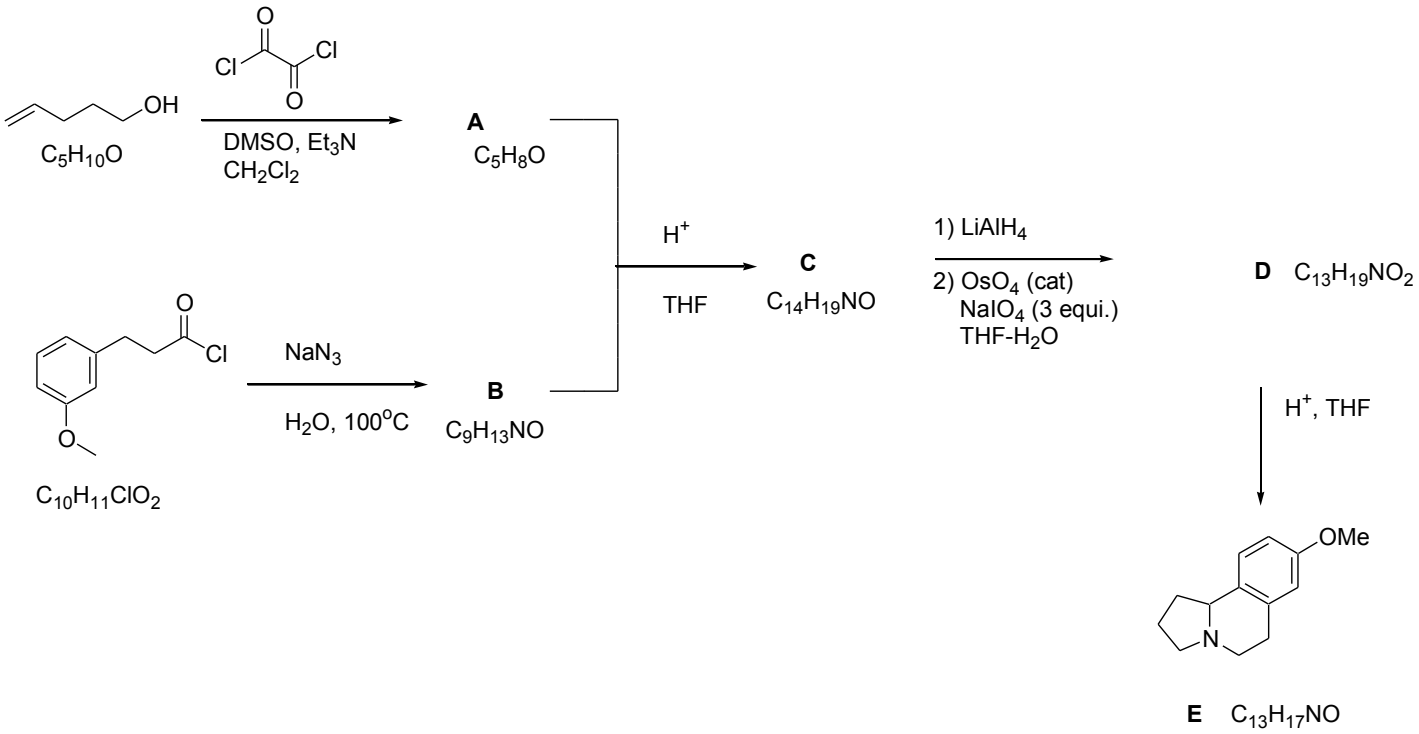


b) Suggest the stereochemistry at carbon C4 in **F**.

c) Give the mechanism of the reaction of **A** to **B**.

d) Give the mechanism of the reaction of **B** to **E**.

8. a) Give the structures of the intermediates **A**, **B**, **C** and **D** in the synthesis shown below.



b) Suggest a mechanism for the conversion of **D** to **E**.

9. The N,N-dimethylenamine of isobutyraldehyde and methyl vinyl ketone react to give dihydropyran **A**. When this compound was treated with methylmegnesium iodide, it gave the ketone **B**, but when it was treated with phenyllithium, it gave the alcohol **C**. Give the mechanism for the formation of **A** and explain the formation of **B** and **C** – how can a ketone be the product of a Grignard reaction?