

Chemistry 334

Final Examination

December 13, 1999

Professor Charonnat

Name: \_\_\_\_\_

Be certain that your examination has eleven (11) pages including this one.

Put your name on **each** page of this examination booklet.

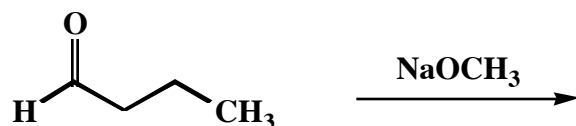
By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

Name: \_\_\_\_\_

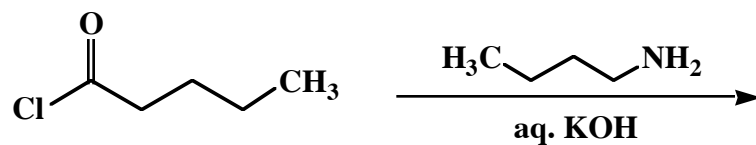
1. (25 points)

For each of the following five (5) questions, draw the structure of the expected major organic product. If relevant, explicitly specify absolute and/or relative stereochemistry.

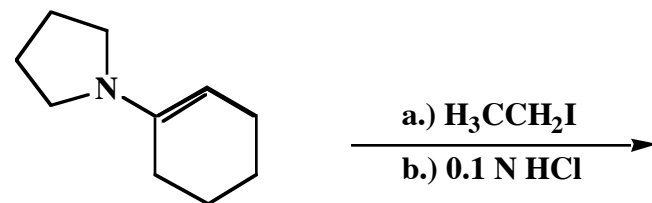
A.



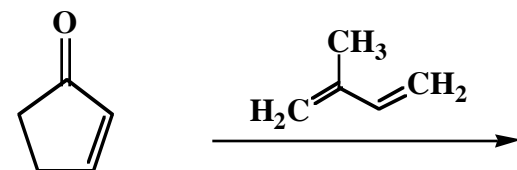
B.



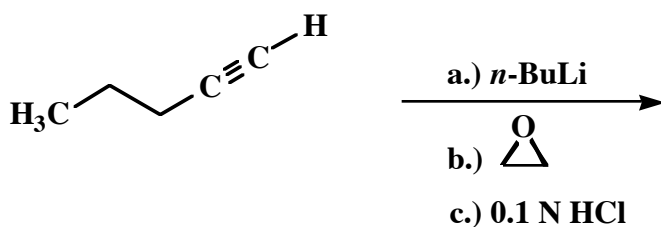
C.



D.



E.



Name: \_\_\_\_\_

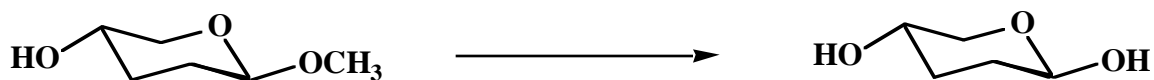
2. (25 points)

For each of the following five (5) questions, draw the specific reagent(s) necessary to effect the transformation shown. If more than one reaction is involved in an answer, be certain to distinguish the individual steps clearly.

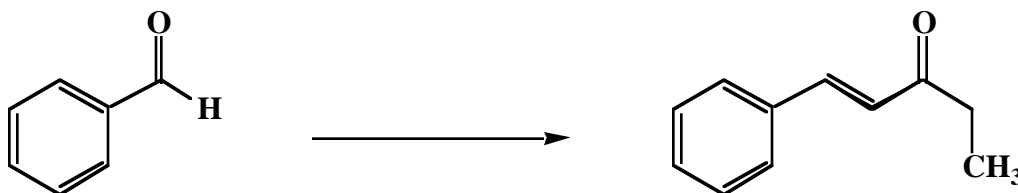
A.



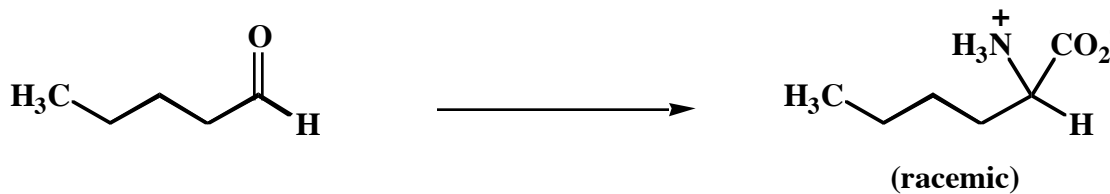
B.



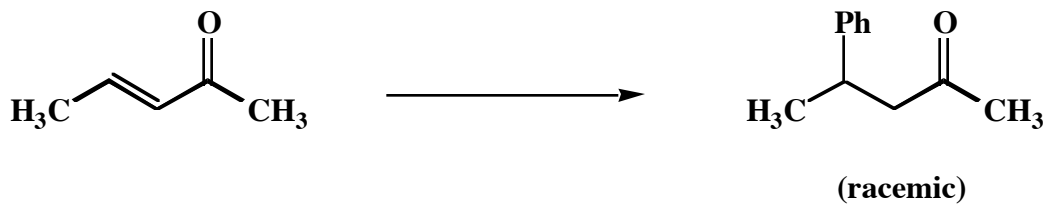
C.



D.



E.



Name: \_\_\_\_\_

3. (20 points)

Circle the number that corresponds to the correct answer for each of the following five (5) questions.

A. Cyclohexylamine is:

1. more basic than aniline ( $\text{PhNH}_2$ )
2. equally basic compared to aniline ( $\text{PhNH}_2$ )
3. less basic than aniline ( $\text{PhNH}_2$ )

B. Essential  $\alpha$ -amino acids are obtained:

1. exclusively from dietary sources
2. exclusively from biosynthesis in the body
3. from dietary sources and biosynthesis in the body

C. The conversion of an  $\alpha$ -bromocarboxylic acid to the corresponding  $\alpha$ -amino acid involves:

1. an addition
2. an elimination
3. a substitution

D. Naturally-occurring soaps are:

1. esters of fatty acids
2. carboxylate salts of fatty acids
3. phosphate salts of fatty acids

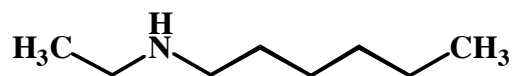
E. Prostaglandins are derived from:

1.  $\alpha$ -amino acids
2. carbohydrates
3. fatty acids

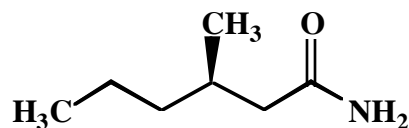
4. (20 points)

Use IUPAC nomenclature to write the systematic names of the two (2) following compounds.

A.



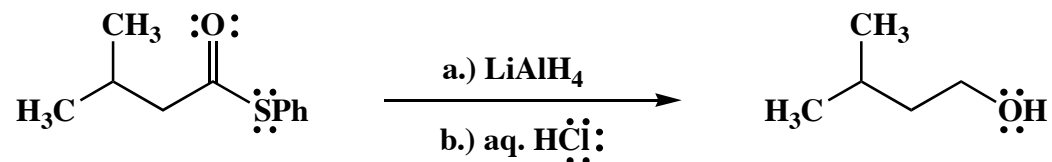
B.



Name: \_\_\_\_\_

5. (20 points)

An early step in the biosynthesis of terpenes and steroids is the NADPH reduction of a thioester to the corresponding primary alcohol. Although the starting material and reagent are different, the following reaction is analogous in that it accomplishes the same general, overall transformation. Draw the mechanism of this reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all lone pair electrons, formal charges and countercharges where appropriate.



Name: \_\_\_\_\_

6. (25 points)

Draw the structure of a specific example for each of the following twelve (12) categories.

A. any benzylic carbocation:

B. any unconjugated diene:

C. any L-ketotetrose:

D. any prostaglandin:

E. any monoterpene:

F. any disaccharide:

G. any chain-growth homopolymer:

H. any nonnucleophilic base:

I. any nucleophilic base:

J. any naturally-occurring phospholipid:

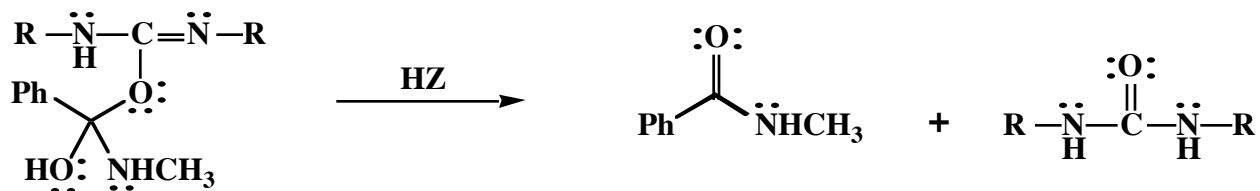
K. any naturally-occurring, neutral  $\alpha$ -amino acid:

L. any steroid:

Name: \_\_\_\_\_

7. (15 points)

The following transformation is the final part of a DCC-facilitated coupling of a carboxylic acid to an amine. Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all lone pair electrons, formal charges and countercharges where appropriate.

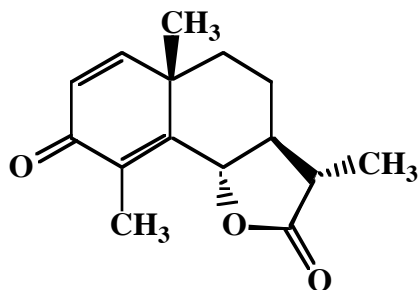


(R = cyclohexyl)

Name: \_\_\_\_\_

8. (10 points)

Circle the "isoprene" units in the following terpene. Clearly label the head (h) and tail (t) of each "isoprene" unit.



**santonin**

9. (20 points)

Answer the following two (2) questions precisely, succinctly and with correct grammar.

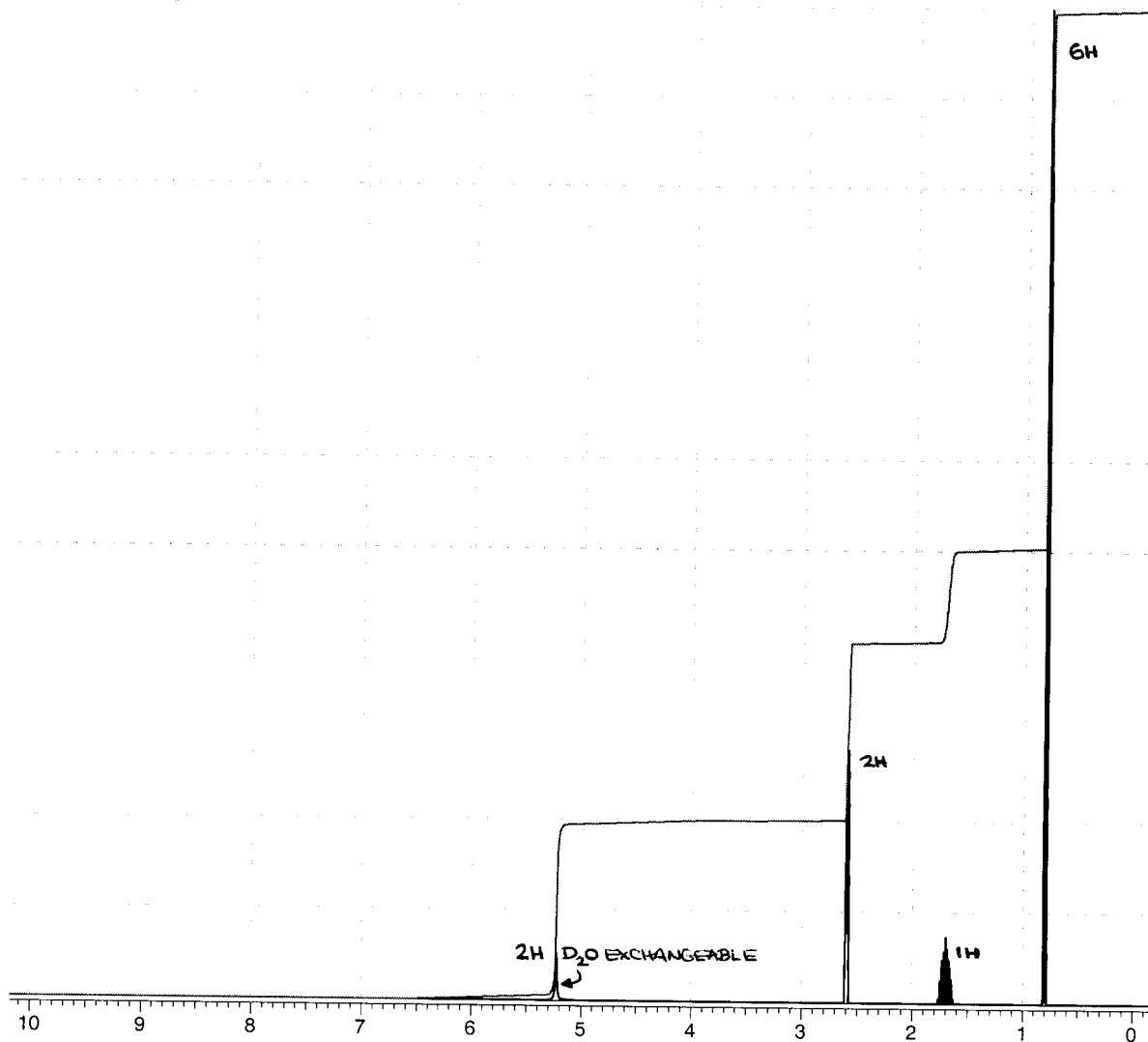
A. Why do L-amino acids form right-handed, not left-handed,  $\alpha$ -helices?

B. The anion of dithiane can be alkylated with a primary alkyl halide. Hydrolysis of the alkylated product yields the corresponding aldehyde. Why must a primary (not secondary or tertiary) alkyl halide be used for the first step?

Name: \_\_\_\_\_

10. (20 points)

The  $^1\text{H}$  NMR spectrum of compound A (MW = 73.14) is shown below. Clearly assign all the resonances and draw the structure of compound A.



Name: \_\_\_\_\_

10. (cont.)

**<sup>1</sup>H NMR assignments:**

**chemical shift (ppm)**

**assignment**

**explanation of multiplicity**

**structure of compound A:**

**Congratulations!**

1	/25
2	/25
3	/20
4	/20
5	/20
6	/25
7	/15
8	/10
9	/20
10	/20
<hr/> Total:	<hr/> /200