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.

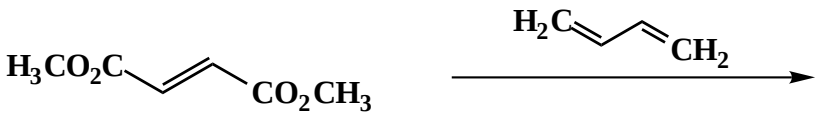
By putting your name on this examination booklet you agree to abide by
California State University, Northridge policies of academic honesty and integrity.

Name:_____

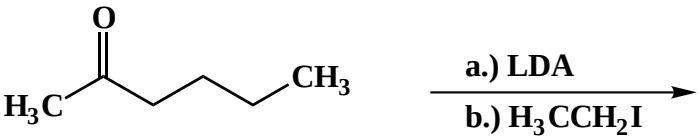
1. (25 points)

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.

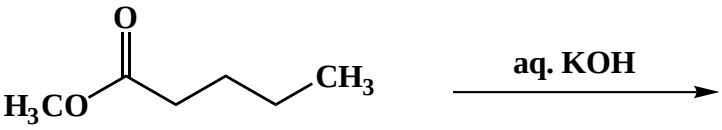
A.



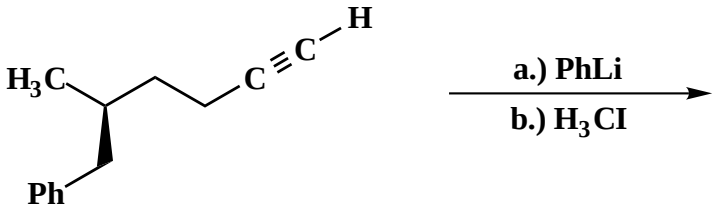
B.



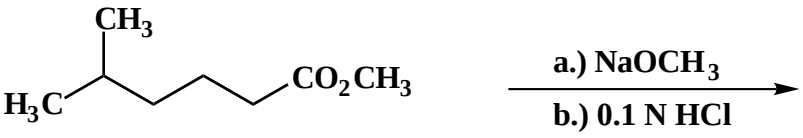
C.



D.



E.

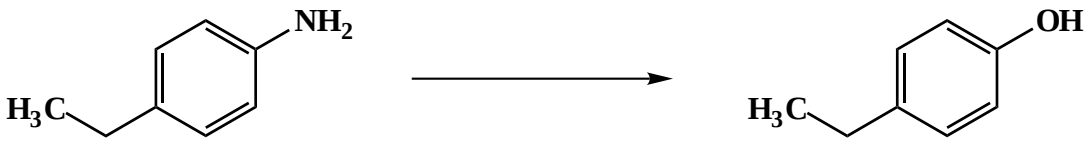


Name:_____

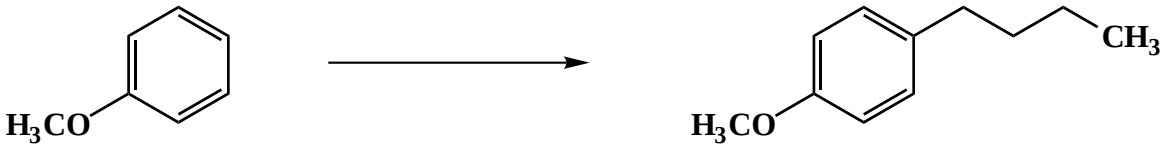
2. (25 points)

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.

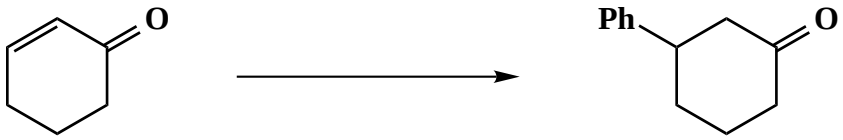
A.



B.

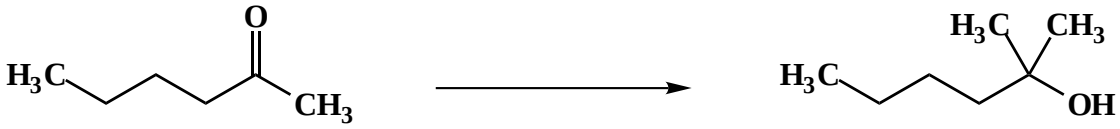


C.



(racemic)

D.



E.

Name:_____

3. (20 points)

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

A. Infrared spectra of secondary amines show:

1. no absorptions around 3400 cm^{-1}
2. one absorption around 3400 cm^{-1}
3. two absorptions around 3400 cm^{-1}

B. The absolute stereochemistry of D-alanine [$H_3N^+CHCH_3CO_2^-$] is:

1. R
2. S
3. neither R nor S

C. Cystine is a dimer of the α-amino acid, cysteine. Cystine contains:

1. a disulfide link between the two cysteines
2. a peroxide link between the two cysteines
3. a selenide link between the two cysteines

D. Fats and oils are esters of:

1. ethanol
2. ethylene glycol
3. glycerol

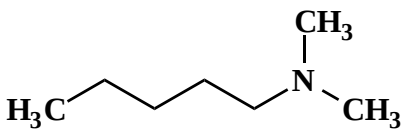
E. Steroid biosynthesis begins with:

1. NADPH
2. acetyl coenzyme A
3. ATP

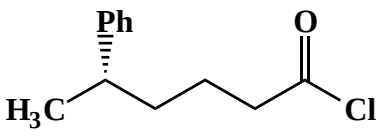
4. (20 points)

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

A.



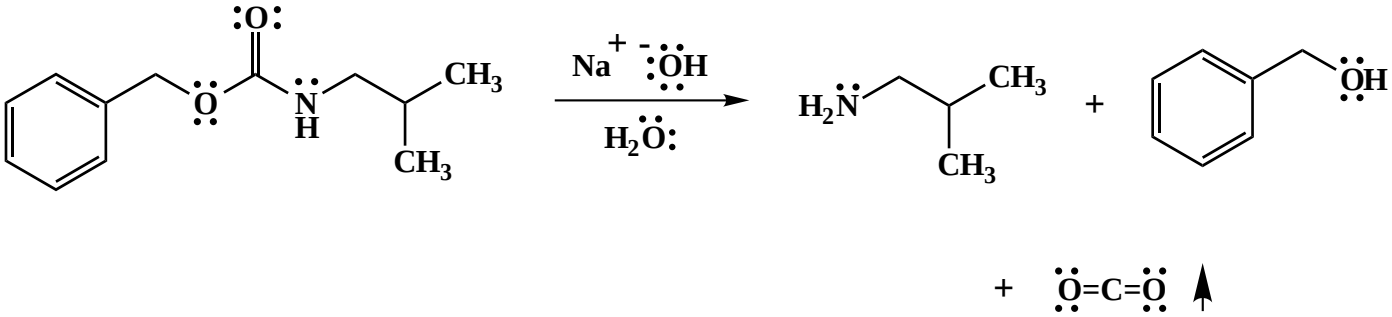
B.



Name:_____

5. (20 points)

The carbobenzyloxy (Cbz) group is an amine protecting group that can be removed with aqueous basic conditions. Draw the mechanism of the following Cbz deprotection 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 allylic radical:

B. any oxidizing agent:

C. any D-aldohexose:

D. any steroid:

E. any diterpene:

F. any reducing carbohydrate:

G. any step-growth copolymer:

H. any nucleophile:

I. any electrophile:

J. any naturally-occurring wax:

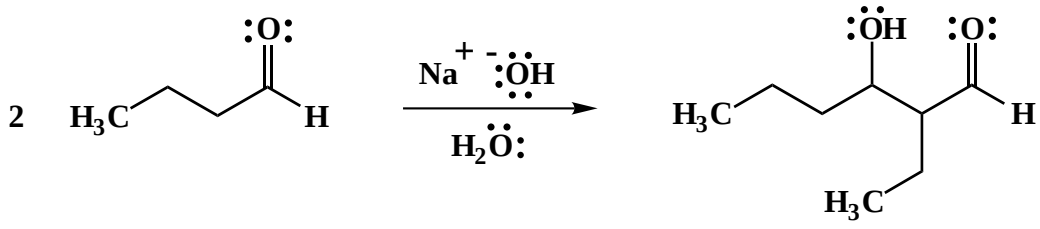
K. any naturally-occurring, acidic α-amino acid:

L. any prostaglandin:

Name:_____

7. (15 points)

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.

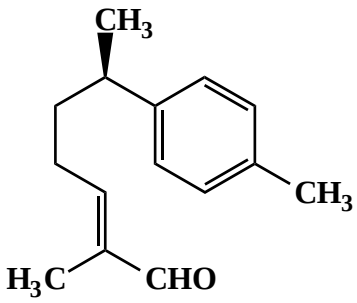


(mixture of diastereomers)

Name:_____

8. (10 points)

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



nuciferal

9. (20 points)

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

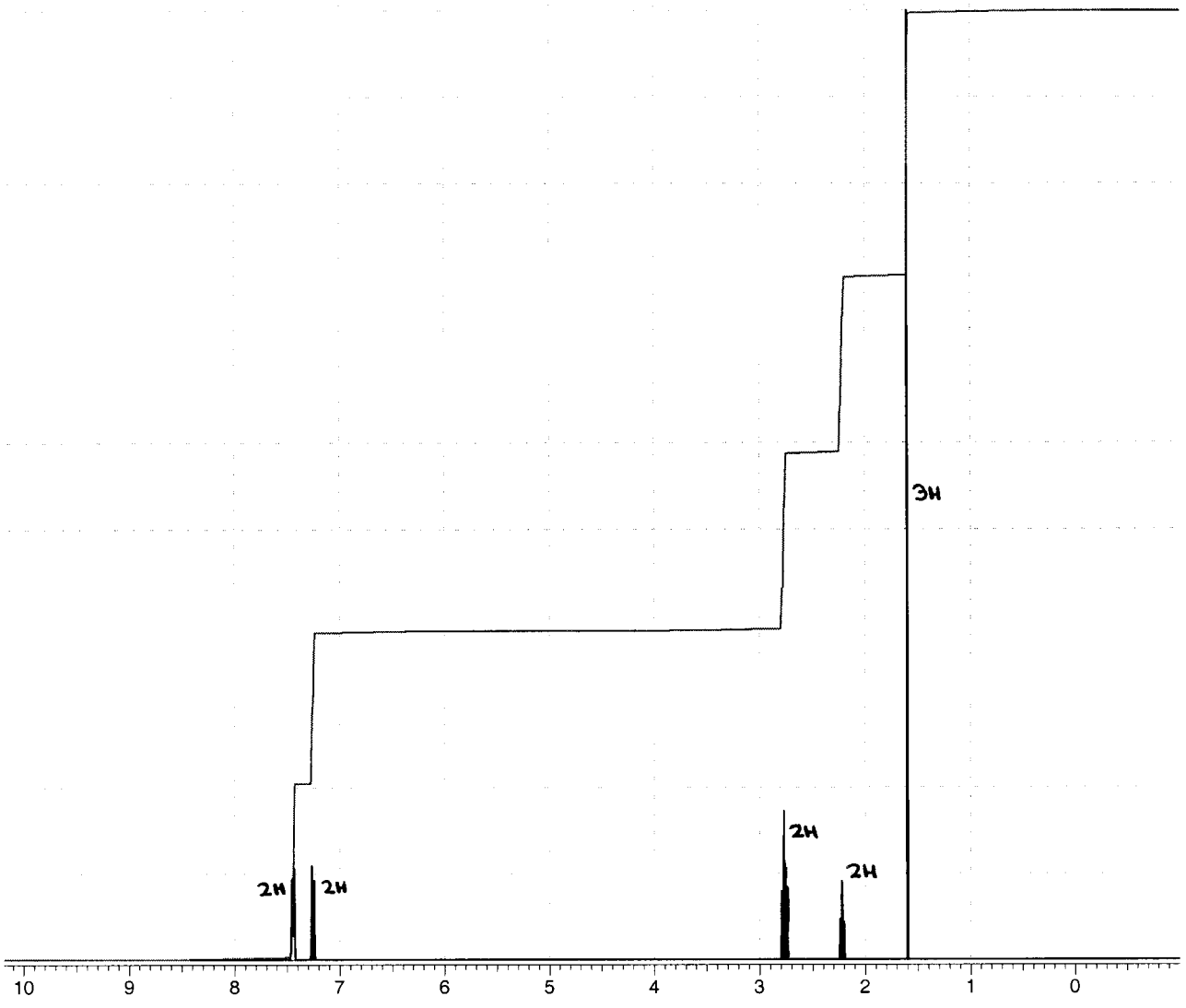
A. Why do some globular proteins have quaternary structure?

B. Why do nucleophilic additions to carboxylic acid derivatives typically afford an sp^2-hybridized carbonyl compound as a product (viz., not an sp^3-hybridized product, instead)? Draw a general reaction schematic to illustrate your answer.

Name:_____

10. (20 points)

The ^1H NMR spectrum of compound A ($C_{10}H_{11}BrO$) is shown below. Clearly assign all the resonances and draw the structure of compound A.



Name:_____

10. (cont.)

^{1}H NMR assignments:

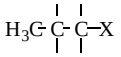
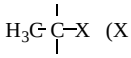
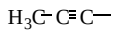
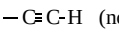
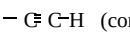
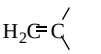
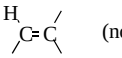
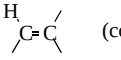
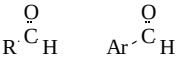
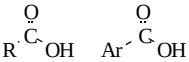
chemical shift (ppm)	**assignment**	**explanation of multiplicity**

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
Total:	/200

SELECTED ^{1}H NMR CORRELATIONS

structural type	chemical shift range (ppm)
cyclopropyl	0.0 - 0.9
RNH_2 R_2NH	0.5 - 5.0 [a]
$-CH_3$ (saturated)	0.7 - 1.3
 (X = halogen, O, N, carbonyl)	0.9 - 1.2
 (saturated)	1.2 - 1.3
 (saturated)	1.4 - 1.6
 (X = halogen, O, N, carbonyl)	1.0 - 2.0
ROH	1.0 - 5.0 [a]
	1.6 - 1.9
	1.8 - 2.2
	1.9 - 2.6
H_3C-Ar	2.1 - 2.6
	2.1 - 3.0
 (nonconjugated)	2.0 - 2.6
 (conjugated)	2.8 - 3.1
H_3C-X (X = halogen, O)	2.6 - 4.4
Ar-NH_2 Ar_2NH	3.0 - 5.0 [a]
	3.3 - 4.2
ArOH	4.0 - 10.0 [a]
 (nonconjugated)	4.6 - 5.0
 (nonconjugated)	5.1 - 5.9
 (conjugated)	5.3 - 6.3
 (conjugated)	5.3 - 7.7
ArH	6.0 - 9.5
	9.5 - 10.5
	9.7 - 13.2