

Chemistry 334

Examination #3

August 14, 1998

Professor Charonnat

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

Be certain that your examination has ten (10) pages including this one.

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

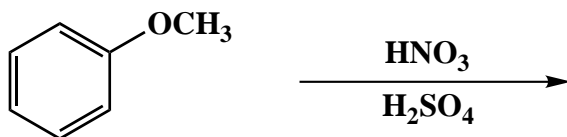
By putting your name on this examination booklet you agree to abide by California State University, Northridge policies of academic honesty and integrity.

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

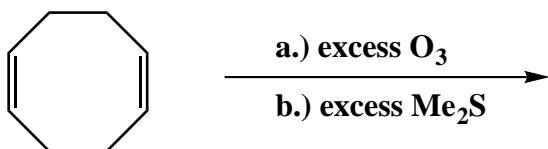
1. (25 points)

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.

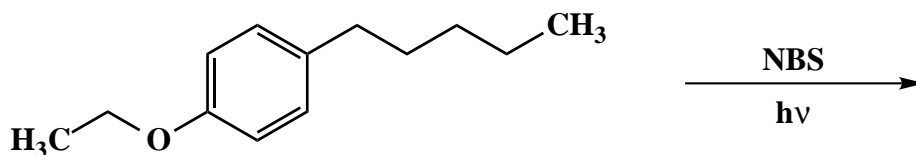
A.



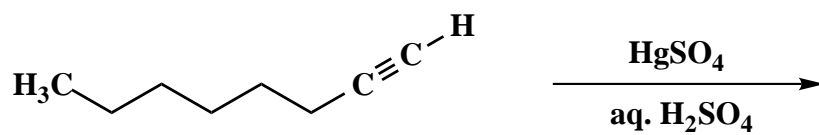
B.



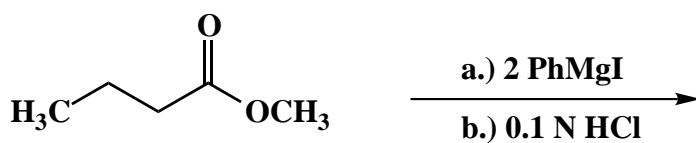
C.



D.



E.

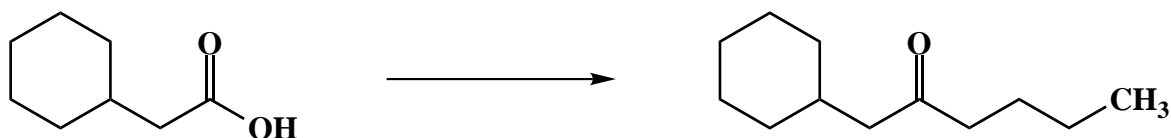


Name: \_\_\_\_\_

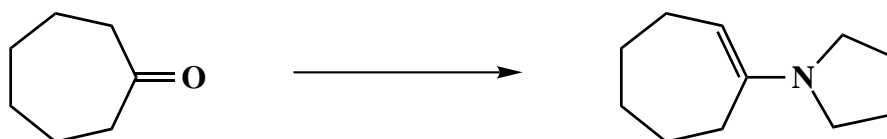
2. (25 points)

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.

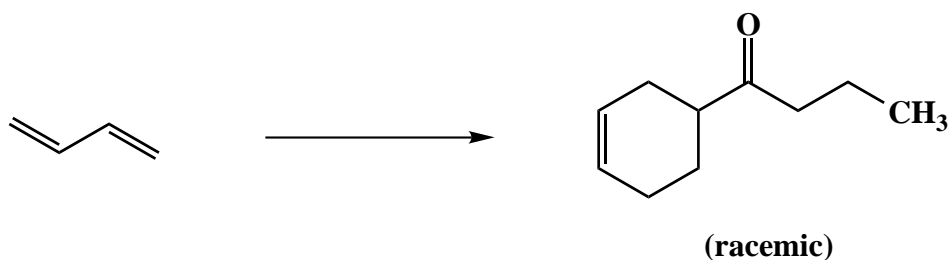
A.



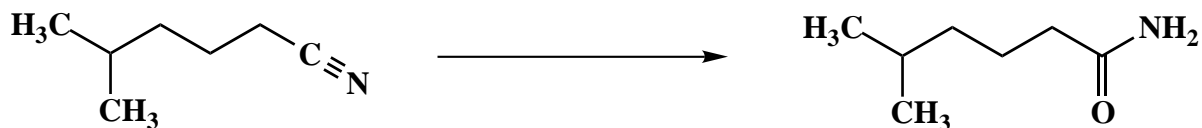
B.



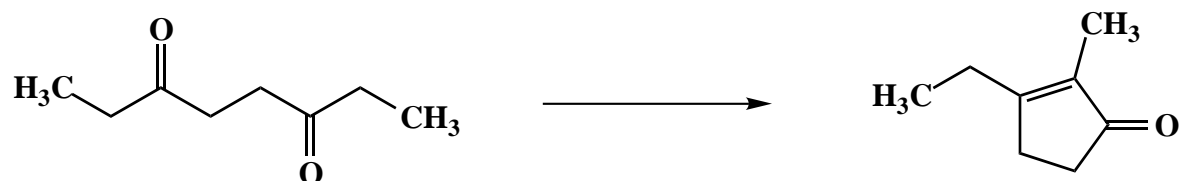
C.



D.



E.



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

3. (20 points)

For each of the following four (4) questions, circle the number that corresponds to the correct answer.

A. Terpenes containing fifteen carbons are called:

1. triterpenes
2. sesquiterpenes
3. monoterpenes
4. diterpenes

B. A steroid always contains:

1. four six-membered rings
2. two six-membered rings and two five-membered rings
3. three five-membered rings and one six-membered ring
4. three six-membered rings and one five-membered ring

C. An omega loop is an example of protein:

1. primary structure
2. secondary structure
3. tertiary structure
4. quaternary structure

D. Fatty acids contain an even number of carbons because they are derived from:

1. acetyl coenzyme A
2. NADPH
3. ATP
4. isopentenyl pyrophosphate

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

4. (30 points)

Answer the following three (3) questions precisely, succinctly and with correct grammar.

A. What stereochemical problem exists with free-radical polymerization of styrene?

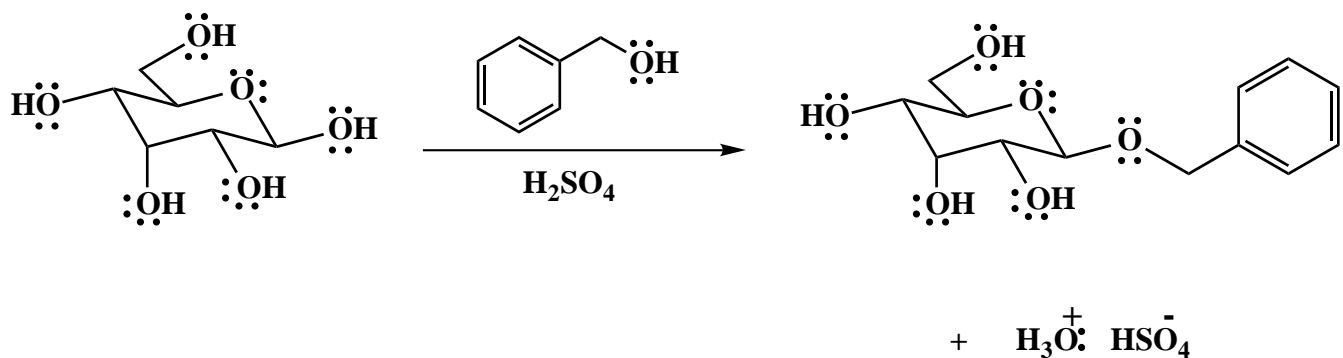
B. Why do most enzymes have very high substrate-binding selectivity?

C. What is meant by the term, "essential amino acid"? Give a specific example.

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

5. (25 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.



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

6. (25 points)

The infrared,  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR (broadband  $^1\text{H}$  decoupled) spectra of compound A ( $\text{C}_6\text{H}_{15}\text{N}$ ) are shown below. Clearly assign all the resonances that you can identify with certainty and draw the structure of compound A. (Correlation tables are included separately.)

The infrared spectrum is unavailable due to copyright considerations.

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

6. (continued)

The  $^1\text{H}$  NMR and  $^{13}\text{C}$  NMR spectra are unavailable due to copyright considerations.

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

6. (continued)

**Infrared absorption assignments:**

| wave number (cm <sup>-1</sup> ) | functional group | type of vibration (stretch or bend) |
|---------------------------------|------------------|-------------------------------------|
|---------------------------------|------------------|-------------------------------------|

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

| chemical shift (ppm) | assignment | explanation of multiplicity |
|----------------------|------------|-----------------------------|
|----------------------|------------|-----------------------------|

**<sup>13</sup>C NMR assignments:**

| chemical shift (ppm) | assignment | explanation of multiplicity |
|----------------------|------------|-----------------------------|
|----------------------|------------|-----------------------------|

**structure of compound A:**

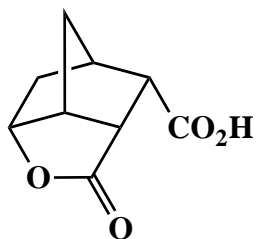
**Congratulations!**

|        |      |
|--------|------|
| 1      | /25  |
| 2      | /25  |
| 3      | /20  |
| 4      | /30  |
| 5      | /25  |
| 6      | /25  |
| <hr/>  |      |
| Total: | /150 |

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

7. (10 points of extra credit)

Design a synthesis of the following tricyclic lactone from cyclopentene. Show all reagents and stable synthetic intermediate compounds. (**N.B.** Do not draw mechanisms for each synthetic transformation!)



(racemic)