Chemistry 334

Hour Examination #2

April 3, 2000 Professor Charonnat

Name: _____

Be certain that your examination has seven (7) pages including this one.

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

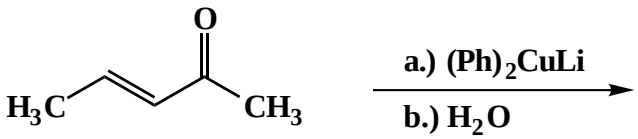
By putting your name on this examination booklet you agree to abide by
California State University, Northridge policies of academic honesty and integrity.

Name:_____

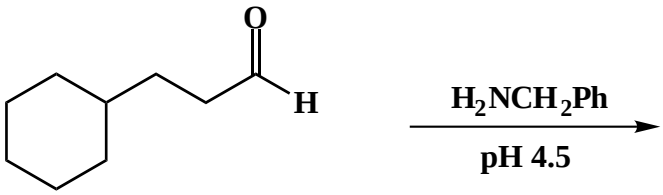
1. (25 points)

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.

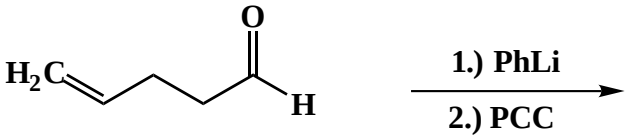
A.



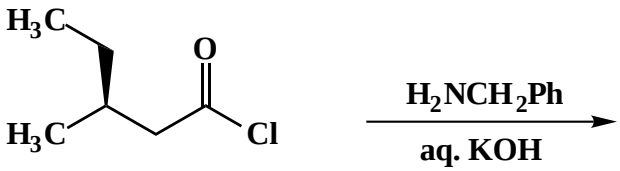
B.



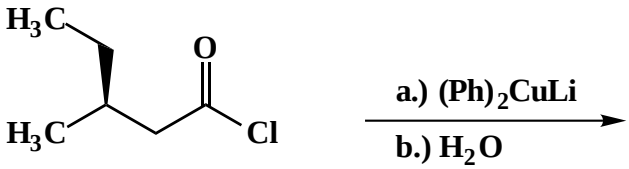
C.



D.



E.



Name:_____

2. (20 points)

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

A. Lithium aluminum hydride reduction of an amide, followed by aqueous workup yields:

1. an imine
2. an enamine
3. an amine

B. Which of the following carboxylic acids has the lowest pK_a?

1. propionic acid
2. 2-bromopropionic acid
3. 3-bromopropionic acid

C. The Michael addition is an example of a:

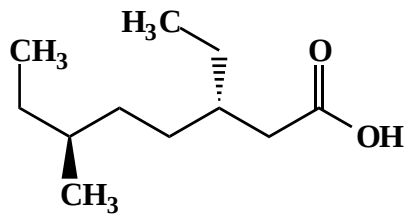
1. 1,2-addition to an α,β-unsaturated carbonyl compound
2. 1,3-addition to an α,β-unsaturated carbonyl compound
3. 1,4-addition to an α,β-unsaturated carbonyl compound

D. The reaction of a resonance-stabilized Wittig reagent with an aldehyde affords:

1. a cis alkene
2. a trans alkene
3. approximately a 1:1 mixture of cis and trans alkenes

3. (10 points)

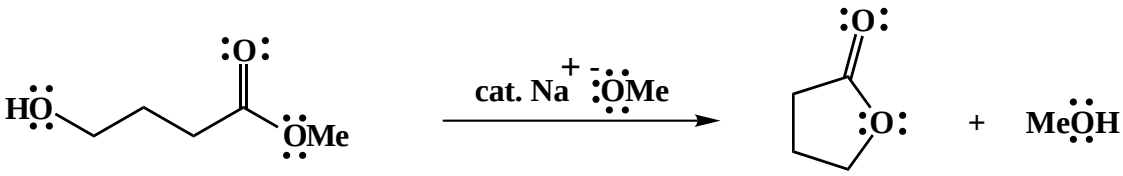
Use IUPAC nomenclature to write the systematic name of the following carbonyl compound.



Name:_____

4. (20 points)

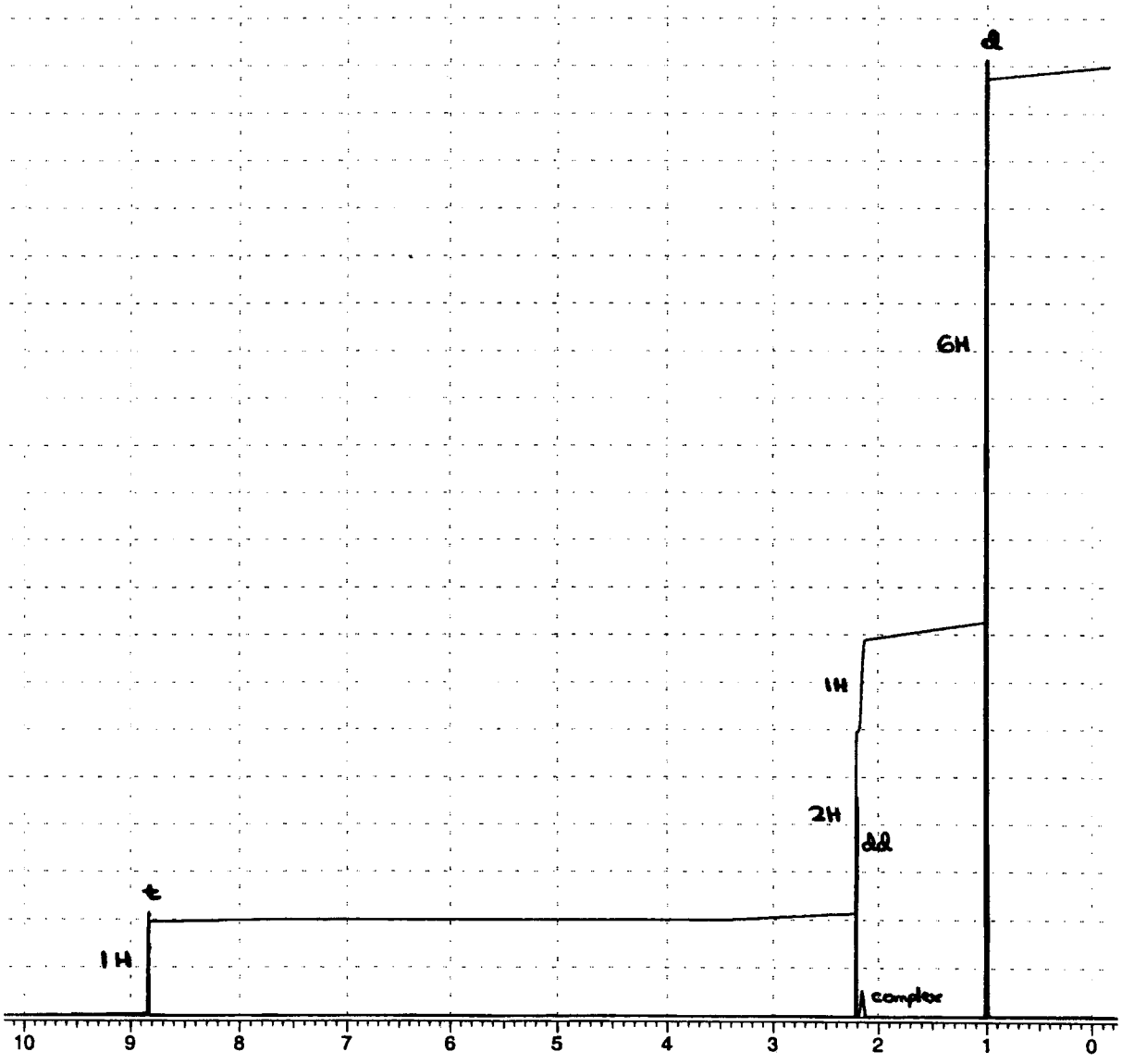
Draw the mechanism of the following reaction, using the curved-arrow notation to indicate the reorganization of electron density. Show all intermediates and denote all unshared electrons, formal charges and countercharges where appropriate. Clearly designate reversibility or irreversibility for each primary mechanistic step. Explain briefly why a ring is formed instead of an acyclic dimer.



Name:_____

5. (25 points)

The ^1H NMR spectrum of compound A ($C_5H_{10}O$) is shown below. Clearly assign all the resonances that you can identify with certainty and draw the structure of compound A. (A ^1H NMR correlation table is included on page 7.)



Name:_____

5. (continued)

^{1}H NMR assignments:

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

structure of compound A:

Congratulations!

1	/25
2	/20
3	/10
4	/20
5	/25
Total:	/100

SELECTED ^{1}H NMR CORRELATIONS

structural type	chemical shift range (ppm)
cyclopropyl	0.0 - 0.9
RNH$_2$ R$_2$NH	0.5 - 5.0 [a]
—CH$_3$ (saturated)	0.7 - 1.3
H$_3$C- C- C—X (X = halogen, O, N, carbonyl)	0.9 - 1.2
—CH$_2$ (saturated)	1.2 - 1.3
—CH (saturated)	1.4 - 1.6
H$_3$C- C—X (X = halogen, O, N, carbonyl)	1.0 - 2.0
ROH	1.0 - 5.0 [a]
H$_3$C, C=C / \	1.6 - 1.9
H$_3$C-C≡C—	1.8 - 2.2
H$_3$C with C=O	1.9 - 2.6
H$_3$C-Ar	2.1 - 2.6
H$_3$C-N / \	2.1 - 3.0
—C≡C-H (nonconjugated)	2.0 - 2.6
—C≡C-H (conjugated)	2.8 - 3.1
H$_3$C—X (X = halogen, O)	2.6 - 4.4
Ar-NH$_2$ Ar$_2$NH	3.0 - 5.0 [a]
H$_3$C-O—	3.3 - 4.2
ArOH	4.0 - 10.0 [a]
H$_2$C=C / \ (nonconjugated)	4.6 - 5.0
H, C=C / \ (nonconjugated)	5.1 - 5.9
H$_2$C=C / \ (conjugated)	5.3 - 6.3
H, C=C / \ (conjugated)	5.3 - 7.7
ArH	6.0 - 9.5
R with C(=O)H Ar with C(=O)H	9.5 - 10.5
R with C(=O)OH Ar with C(=O)OH	9.7 - 13.2