

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

**EXAM #3**                      **WEDNESDAY, NOVEMBER 28, 2007**  
**ORGANIC CHEMISTRY II**                      **4:122**

Instructions: Print your name in the spaces provided on every sheet of the exam. Failure to do so will lead to loss of credit.

Make sure that you do the problems on the front and back of every sheet.

On multiple choice questions, clearly circle the answer that you think is correct.

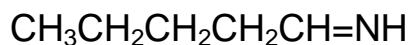
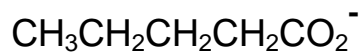
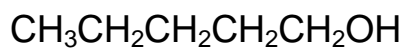
Exams that are done in pencil, red ink, erasable ink, or that have white-out on them will not be regraded.

Question #	Possible Points	Point Scored
1	30	_____
2	14	_____
3	12	_____
4	8	_____
5	28	_____
6	8	_____
	_____	
	100	

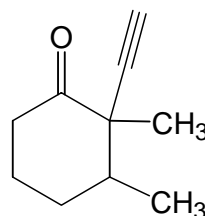
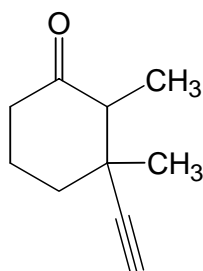
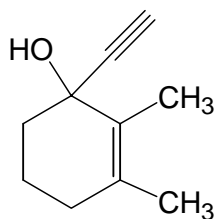
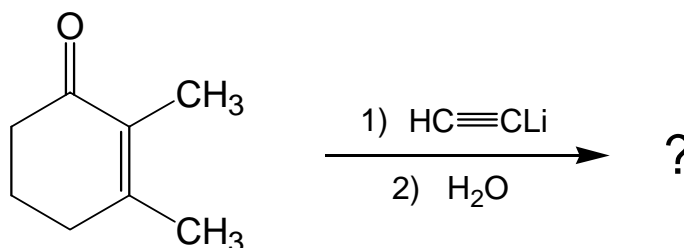
<b>TOTAL</b>
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1. Multiple Choice Questions. Clearly circle your chosen answer. (30 points; 3 apiece)

a) What product is formed when  $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CHO}$  reacts with  $\text{Ag}_2\text{O}/\text{NH}_4\text{OH}$ ?

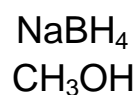
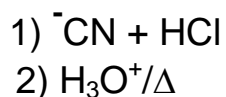


b) What is the major product of the following reaction?



No  
Reaction

c) Which reagents can be used to convert an aldehyde into a primary alcohol?



none of  
them

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

d) Which compound has a  $^1\text{H}$  NMR signal that is furthest downfield?

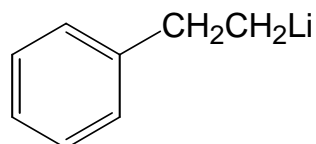
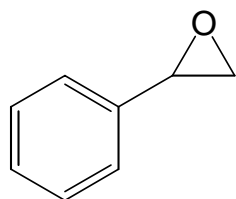
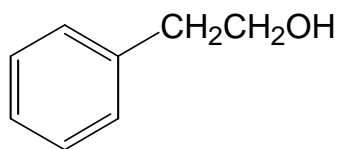
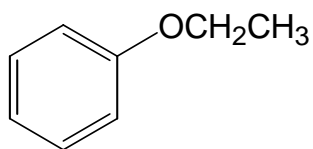
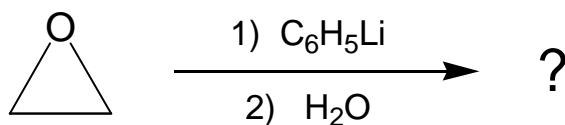
benzaldehyde

benzyl alcohol

benzyl bromide

acetophenone

e) What is the product of the following reaction?



f) Which reagent converts  $\text{C}_6\text{H}_5\text{CH}_2\text{OH}$  into  $\text{C}_6\text{H}_5\text{CHO}$ ?

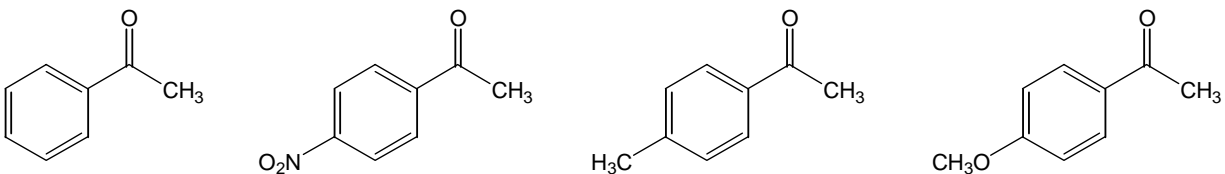
$\text{Ag}_2\text{O} + \text{NH}_4\text{OH}$

$\text{CrO}_3$  in  
aqueous  
 $\text{H}_2\text{SO}_4$

PCC in  
 $\text{CH}_2\text{Cl}_2$

DIBAL-H

g) Which compound forms the highest percentage of hydrate at equilibrium?



h) In what type of orbital does the lone pair on N of  $\text{CH}_3\text{CN}$  reside?

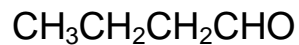
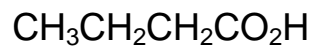
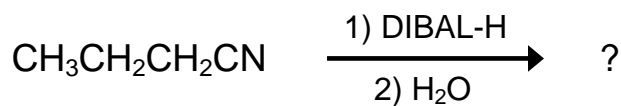
$\text{sp}^2$

2p

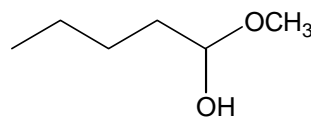
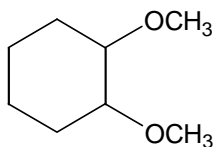
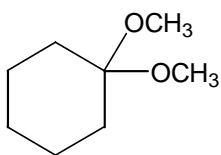
sp

$\text{sp}^3$

i) What is the product of the following reaction?



j) Which compound is an acetal?

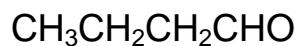


none of them

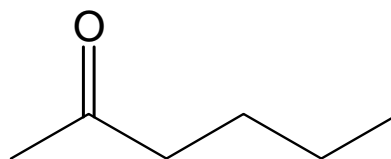
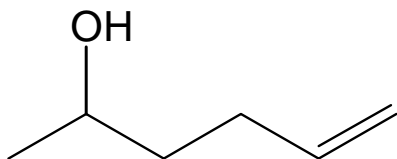
Name: \_\_\_\_\_

2. Comparison Questions. Clearly circle your chosen answer. (14 points; 2 apiece)

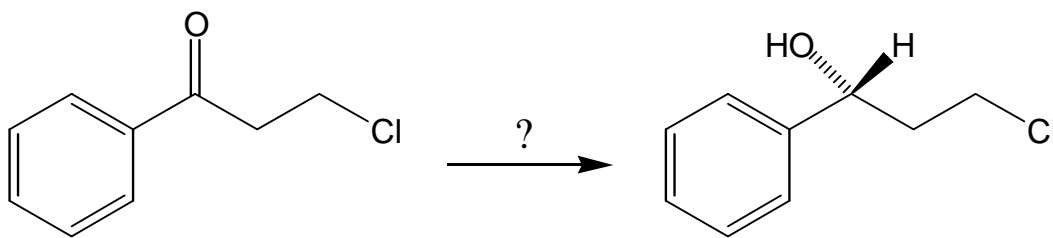
a) Which compound is more reactive toward nucleophilic attack?



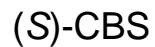
b) What product is formed when  $\text{CH}_3\text{COCH}_2\text{CH}_2\text{CH}=\text{CH}_2$  is treated with 1 equivalent of  $\text{H}_2$  in the presence of  $\text{Pd/C}$ ?



c) Which reagent is used to effect the following transformation?



major product

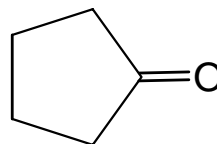
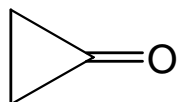


d) Which reagent is used to convert  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{COCl}$  to  $(\text{CH}_3)_2\text{CHCH}_2\text{CH}_2\text{CHO}$ ?

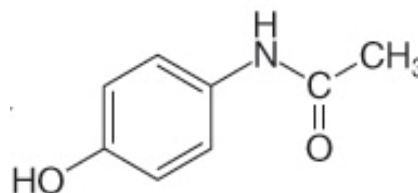
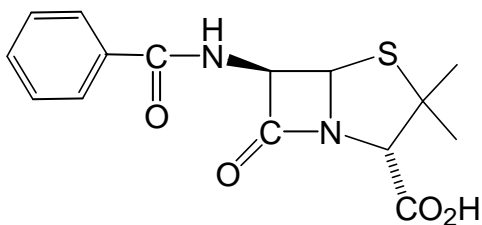
DIBAL-H

$\text{LiAlH}(\text{O}-t\text{-Bu})_3$

e) Which compound has the higher C=O stretching frequency in the IR?



f) Which molecule is a penicillin antibiotic?



g) Which compound forms the higher percentage of *gem*-diol at equilibrium?

$\text{CH}_3\text{CH}_2\text{CHO}$

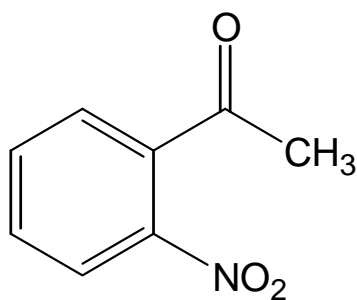
$\text{CH}_3\text{CF}_2\text{CHO}$

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

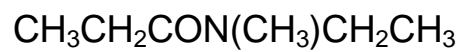
3. Draw structures or provide names for the following compounds. Names are right or wrong.  
No partial credit. (12 points; 4 apiece)

a) 4-methylheptanenitrile

b)



c)



4. Structures from Spectroscopic Data (8 points; 4 apiece)

a) Propose a structure for a compound  $C_{10}H_{12}O$  that give the following spectroscopic data.

IR absorption at  $1686\text{ cm}^{-1}$

$^1\text{H}$  NMR:  $\delta$  1.21 ppm (triplet, 3H);  $\delta$  2.39 ppm (singlet, 3H);  $\delta$  2.95 ppm (quartet, 2H);  $\delta$  7.24 ppm (doublet, 2H);  $\delta$  7.85 ppm (doublet, 2H);

b) A compound with the formula  $C_{11}H_{14}O_2$  has an absorption at  $1720\text{ cm}^{-1}$  in the IR and the following  $^1\text{H}$  NMR data:

$\delta$  1.0 doublet (6H)

$\delta$  2.1 multiplet (1H)

$\delta$  4.1 doublet (2H)

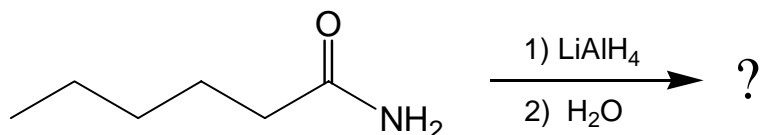
$\delta$  7.8 multiplet (5H)

What is the structure of this compound?

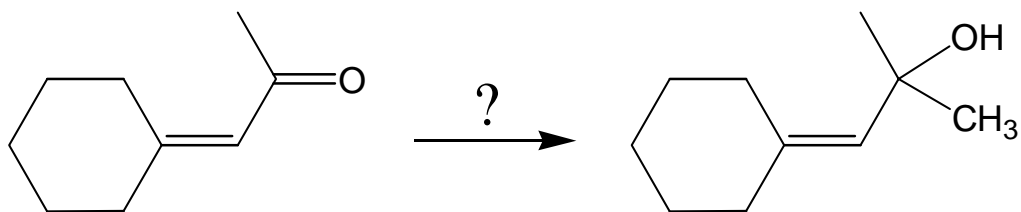
Name: \_\_\_\_\_

5. Provide the missing products or reactants for the following reactions, clearly indicating stereochemistry where appropriate. If more than one product is formed, indicate which is the major and which the minor product. If there is no reaction, so indicate. If multiple steps are required, clearly show reagents for each step. (28 points; 4 apiece)

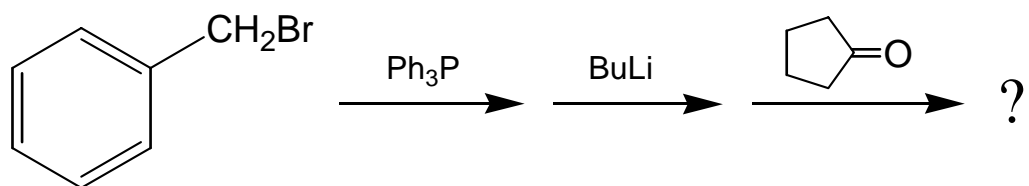
a)



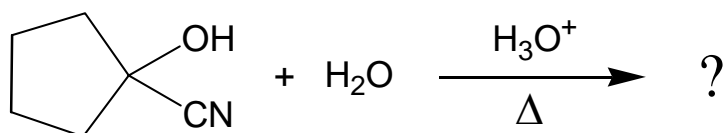
b)



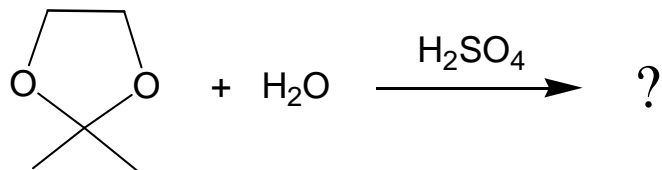
c)



d)

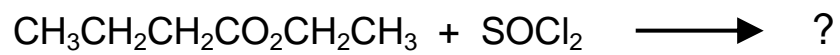


e)

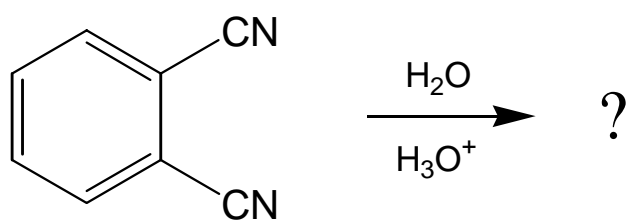


Name: \_\_\_\_\_

f)



g)



6. Draw a stepwise, electron-pushing mechanism for the following reaction.

