

Chemistry 2522
Spring 2006; Midterm / Exam

This exam has 8 problems on 6 pages. Make sure your copy is complete and correct.

Printed Name (*Last*, First) _____

Key

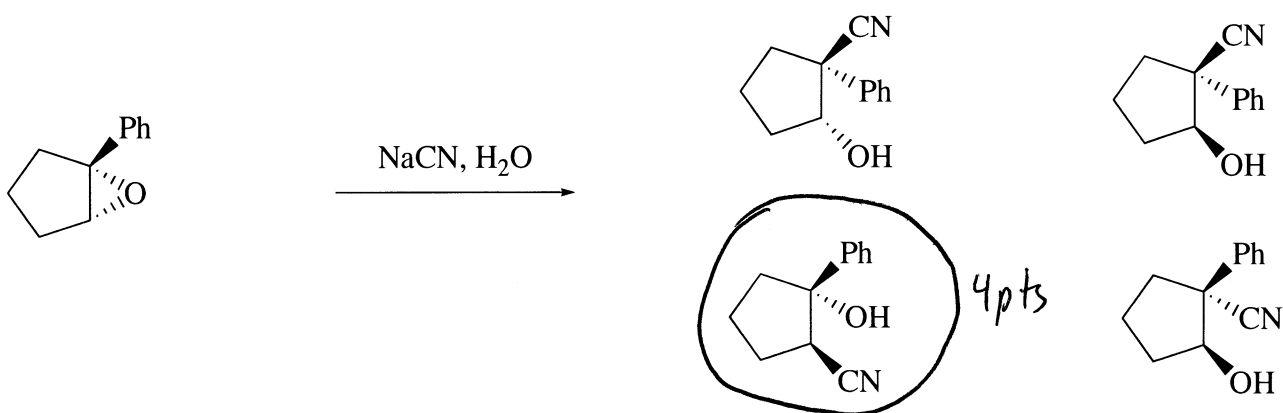
Scores:

1. 8
2. 8
3. 12
4. 18
5. 16
6. 10
7. 8
8. 20

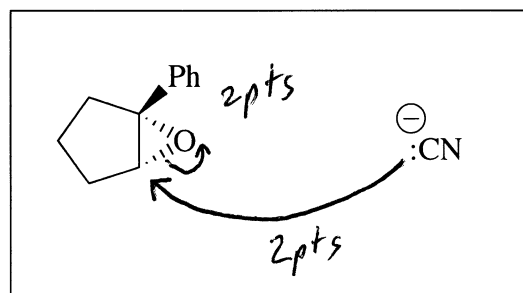
Total:

100

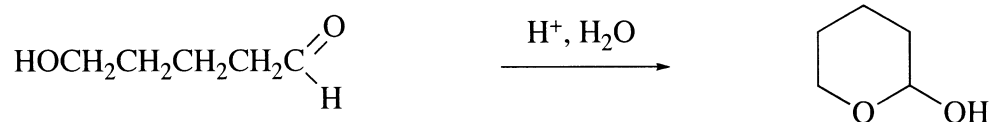
1. (8) (a) Circle the major product in the following reaction (4 pts):



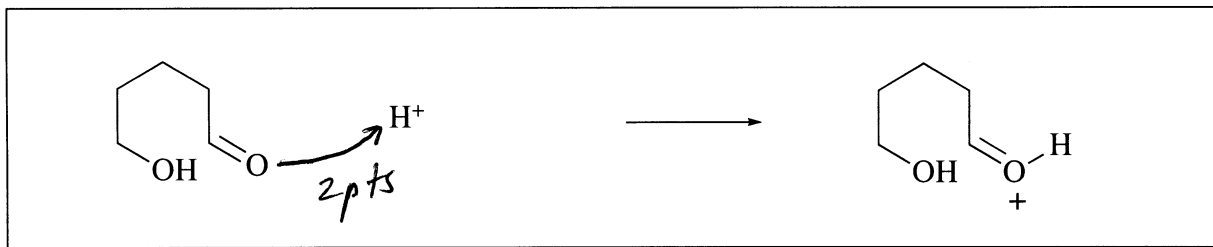
(b) In the provided box, draw **two curved arrows** explaining the initial step in the mechanism of this reaction (4 pts):



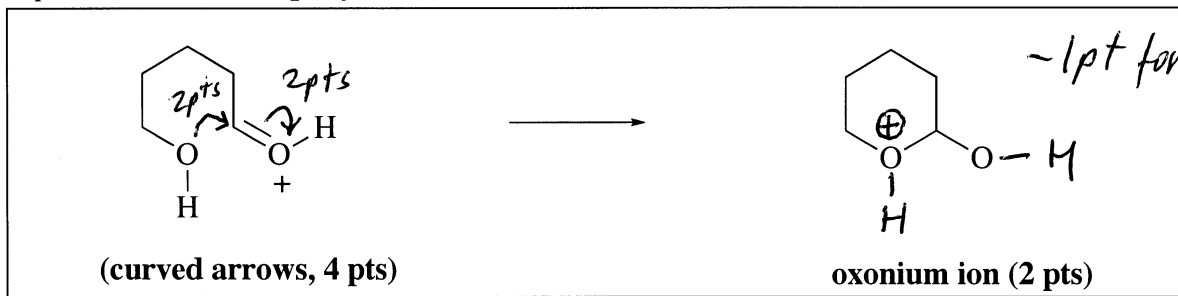
2. (8) Using provided boxes, answer the questions on the **mechanism** of the following reaction:



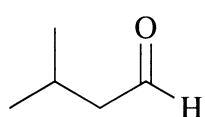
Draw **one curved arrow** to show the **first step** in the reaction mechanism (2 pts):



Draw **two curved arrows** (4 pts) and finish drawing of the **oxonium** intermediate (2 pts), to explain the **second step** (cyclization) in the reaction mechanism:



3. (12) Circle the **major organic product** obtained from each of the following of reactions (4 pt each):



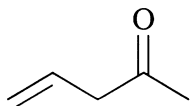
1. CH_3MgBr
2. H_3O^+

2,3-dimethylbutanal

4-methyl-2-pentanol

4-methyl-2-pentanal

4-methyl-1-pentanol



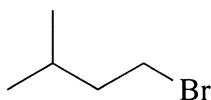
1. LiAlH_4 , ether
2. H_3O^+

2-pentanone

4-pentene-2-ol

2-pentanol

4-hydroxy-2-pentanone



Mg
ether

$\text{CH}_3\text{CO}_2\text{H}$

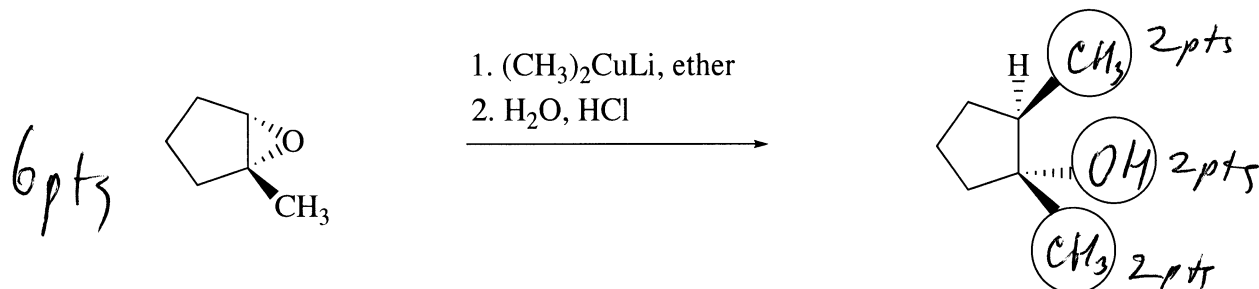
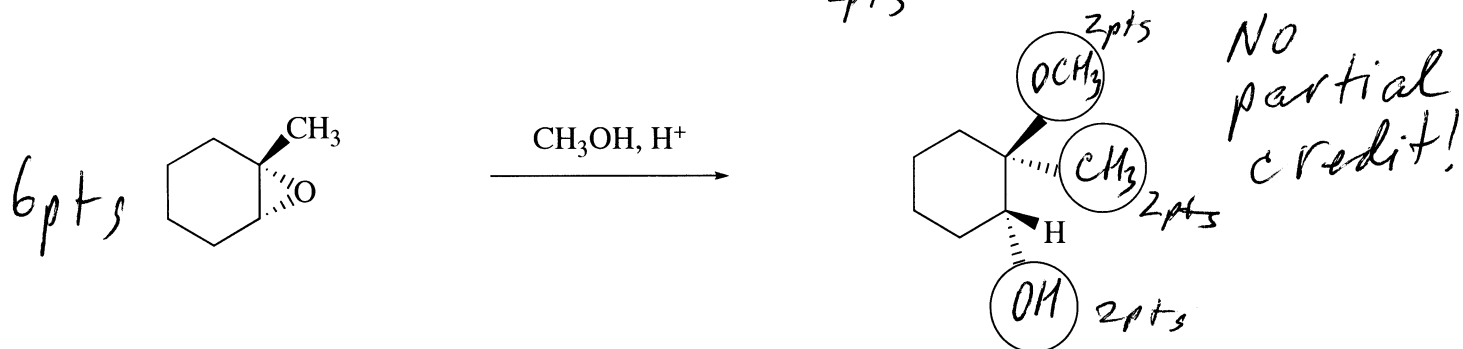
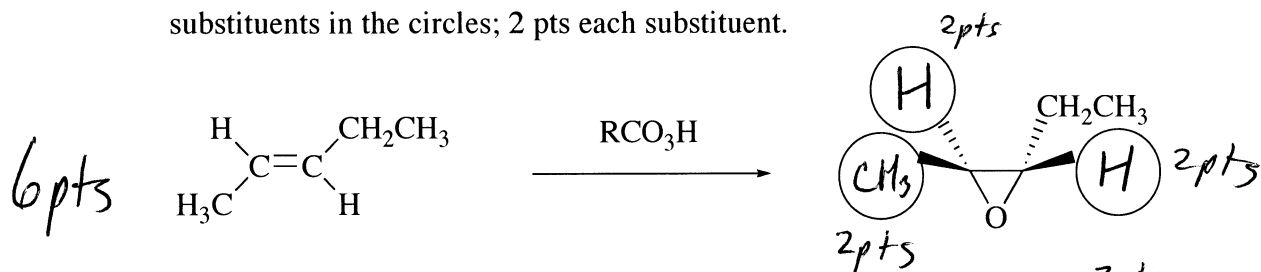
3-methyl-2-butene

3-methyl-2-butanol

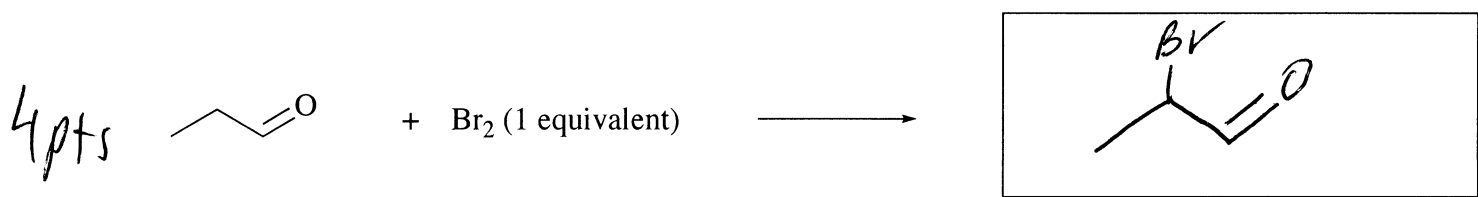
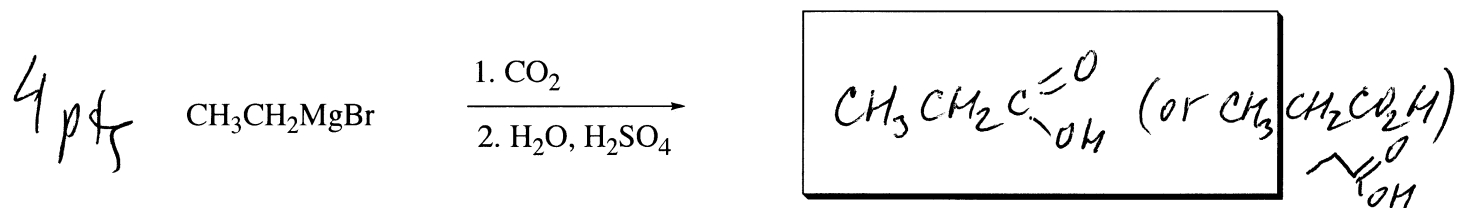
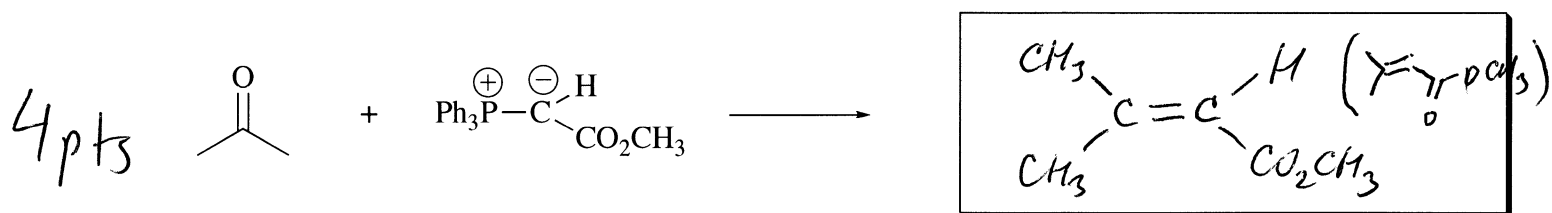
3-methyl-1-butanol

2-methylbutane

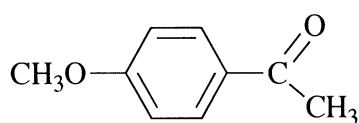
4. (18) Finish drawing of the main product for each the following reactions by placing appropriate substituents in the circles; 2 pts each substituent.



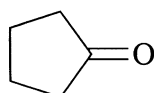
5. (16) Draw the structure of the main product for each the following reactions (4 pts each):



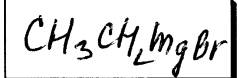
partial credit - OK


 $\xrightarrow{\text{H}_2\text{NNH}_2, \text{KOH, heat}}$


6. (10, 2 pts each box) Write the molecule of a reagent that is required to perform each of the following reactions in the box above the arrow:

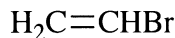
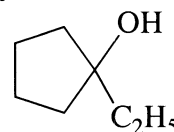
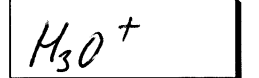


or $\text{CH}_3\text{CH}_2\text{Li}^+$

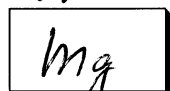


ether

or $\text{H}_2\text{O}, \text{H}^+$ or any acid (R-OH)

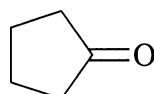
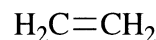
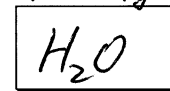


or Li

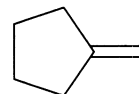
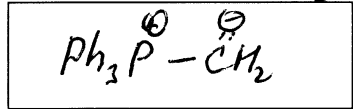


ether or pentane

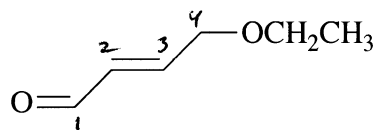
or any acid



or $\text{Ph}_3\text{P}=\text{CH}_2$



7. (8) Give either the IUPAC name or the correct structure for each of the following compounds:



(3 pts)

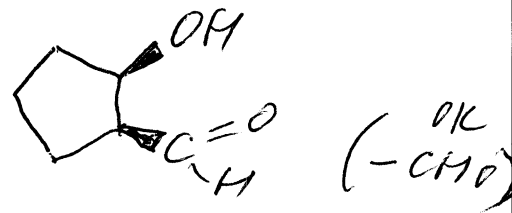
1 pt for (E) or trans

(E) - 4-ethoxy-2-butenal

or trans -

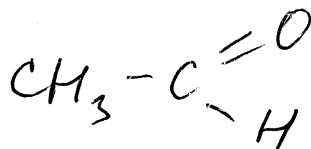
cis-2-hydroxycyclopentanecarbaldehyde

(3 pts)



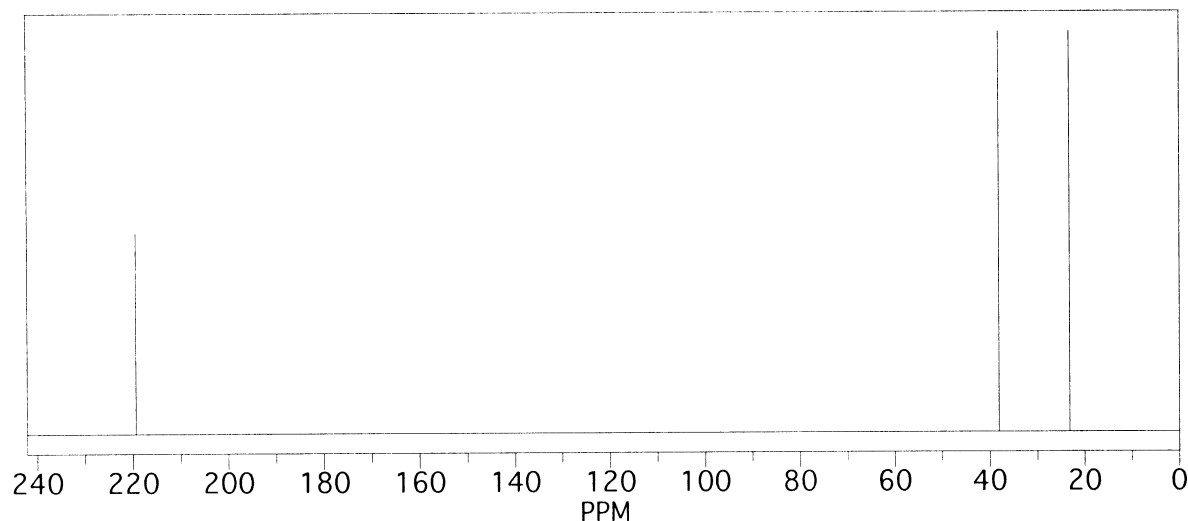
acetaldehyde

(2 pts)



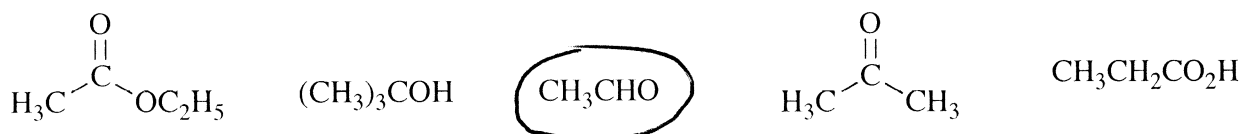
8. (20, 5 pts each) For each of the following questions (a)-(e) **circle** the item that is the correct answer.

(a) Which of the listed compounds is in agreement with the following ^{13}C NMR spectrum?

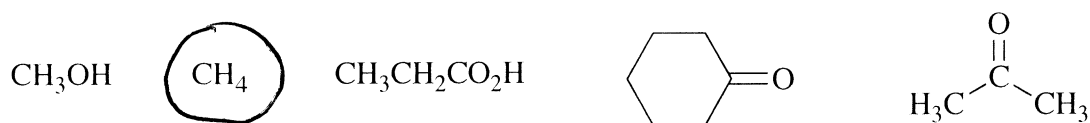


cyclopentanone cyclopropanone cyclohexanone cyclopentanol cyclopentane

(b) Which of the following compounds will have the *characteristic IR* peak at about 1700 cm^{-1} and two signals in the ^1H NMR spectrum?



(c) Which one of the following compounds has the molecular peak $\text{M}^+ m/z = 16$ in the mass spectrum? (atomic weight of C is 12, O 16, H 1)



(d) Which of the following compounds is the **enol** form of 3-methyl-2-butanone?

