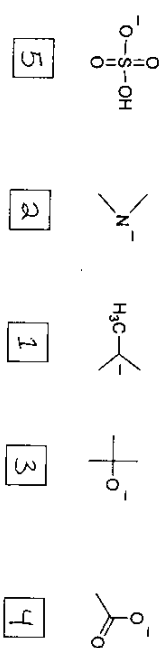
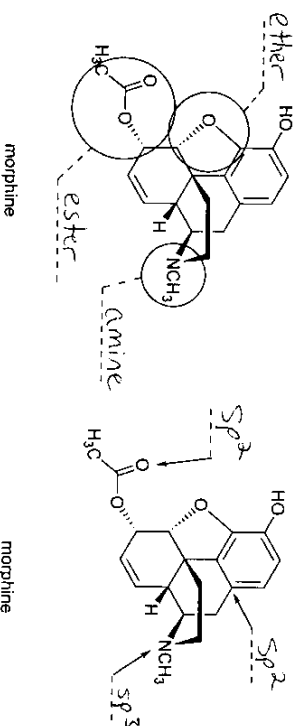


CHEM 260 final exam 2006 ANSWER KEY

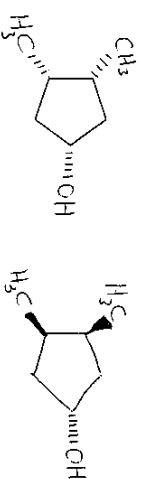
1. a) Rank the structures below from the most basic (#1) to the least basic (#5). Put your assignments in the boxes below the structures.



b) Name the circled functional groups and state the hybridization of each atom indicated by an arrow.



c) Draw all the achiral (optically inactive) stereoisomers of 3,4-dimethylcyclopentanol. Start with the template below and redraw it as necessary. Draw each isomer only once, and show stereochemistry where appropriate using "wedges" and "dashes."



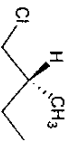
d) Match the terms below with the structures that best describe them. Put your assignments in the boxes beside the terms.

<b>Terms</b>	
a) amino acid	H
b) polypropylene	A
c) aromatic compound	E
d) sugar	I
e) soap	G
f) gasoline component	L

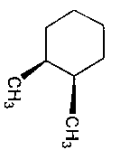
**Structures**

A		B		C	
D		E		F	
G		H		I	
J		K		L	

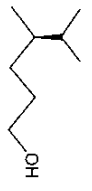
2. Name the following compounds using IUPAC nomenclature, including as necessary designation of stereochemistry.



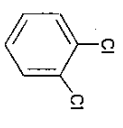
(R)-1-chloro-2-methylbutane



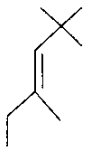
cis-1,2-dimethylcyclohexane



(R)-4,5-dimethyl-1-hexanol



ortho-dichlorobenzene

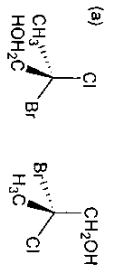


(E)-2,2,4-trimethyl-3-hexene

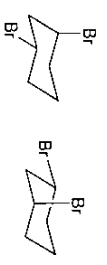
3. Shown below are a number of pairs of structural formulas. In the box below each pair, place the number (related to one of the terms listed below) that best describes the relationship between the two structures.

NOTE: Each term may be used more than once and not all of the terms need be used.

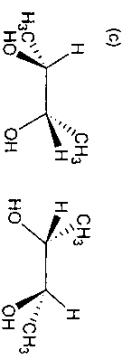
- 1. constitutional isomers
- 2. diastereomers
- 3. identical
- 4. enantiomers



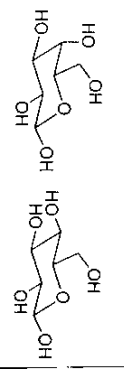
4



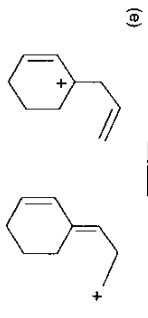
4



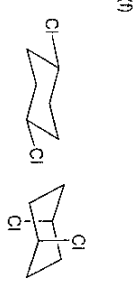
3



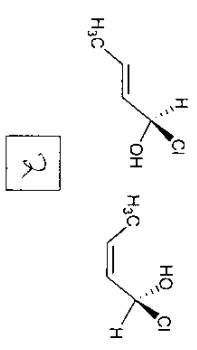
2



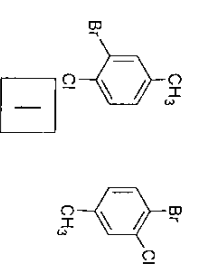
2



3



2



1

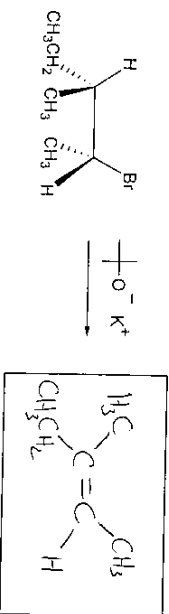
4. a) Draw the most stable stereoisomer of 4-isopropylcyclohexanol shown in its most stable conformation.



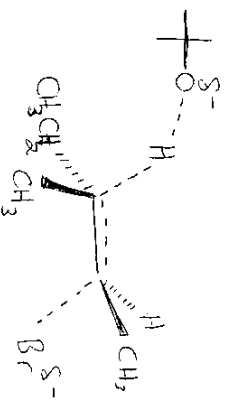
b) Draw the least stable stereoisomer of 4-isopropylcyclohexanol shown in its most stable conformation.



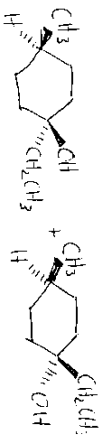
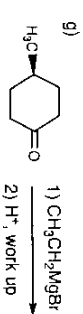
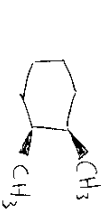
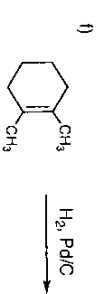
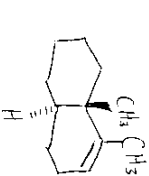
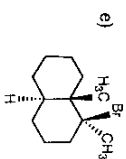
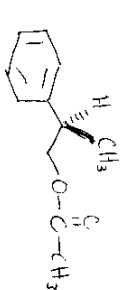
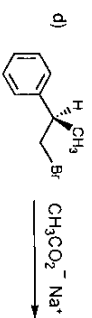
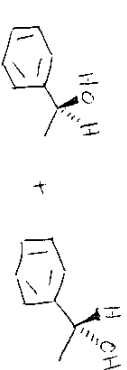
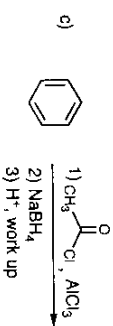
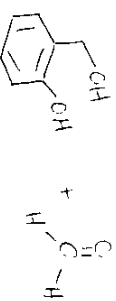
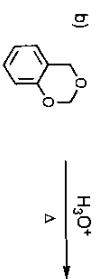
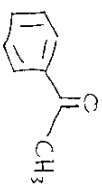
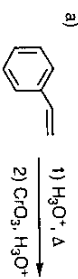
c) Draw the product of the following reaction.



d) Draw the transition state for the reaction shown above. Clearly show the appropriate geometry and partial charges in this diagram.

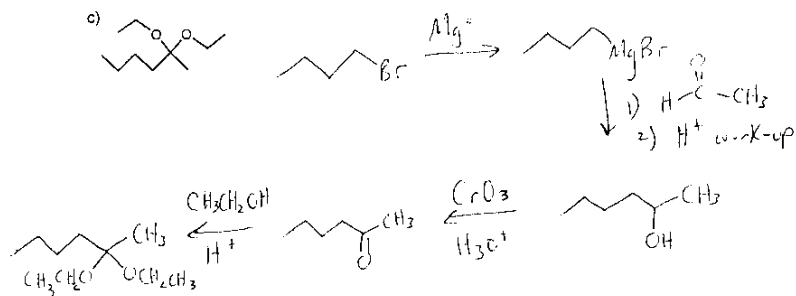
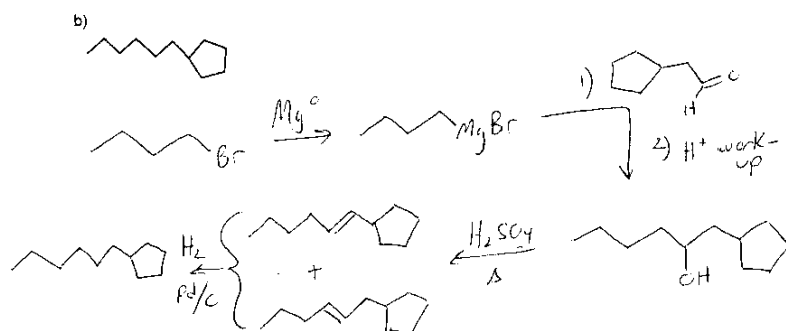
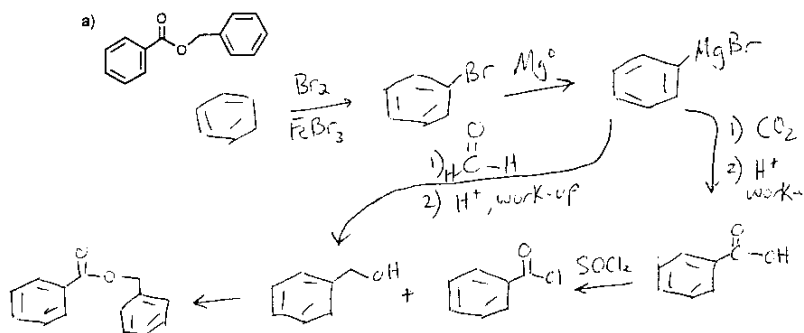
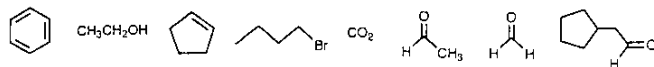


5. Show the product(s) formed in the following reactions. Be sure to clearly show stereochemistry (including enantiomers) of all major products where appropriate.

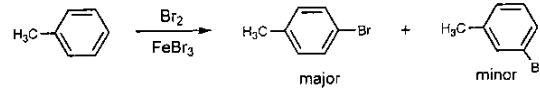


6. Using any of the starting materials shown below as the ONLY carbon sources, as well as any additional inorganic reagents you require, outline syntheses of the following compounds. No mechanistic information is required. There may be more than one correct answer in some cases.

Available Organic Starting Materials



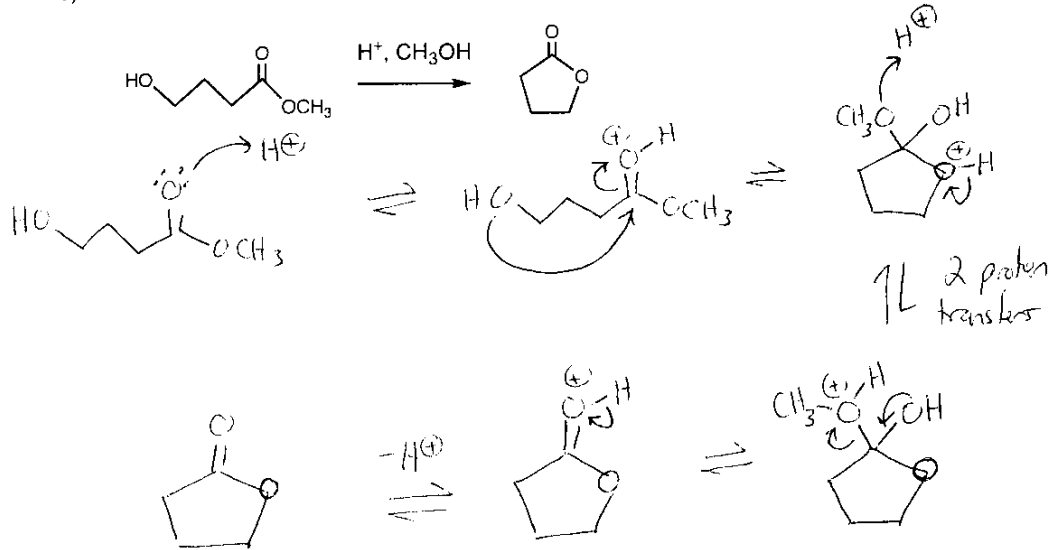
7. a) The bromination of toluene gives more para-product than meta-product.



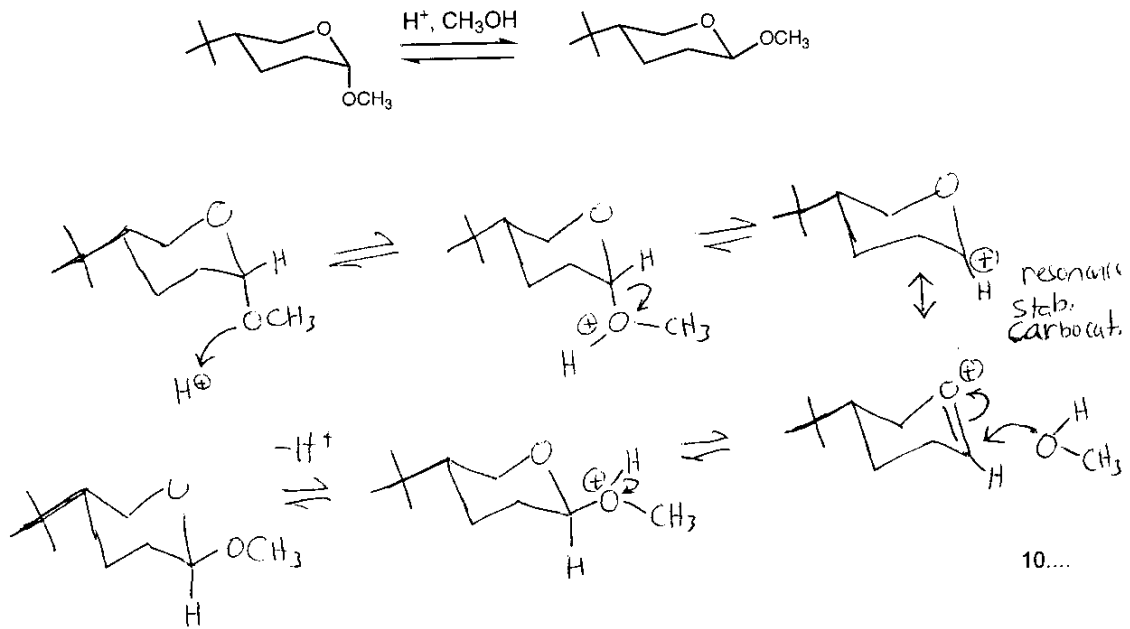
Draw the intermediates that lead to each of the two products and show all of their resonance structures. Use these structures to explain why the para-product is formed in a greater amount.

see prob. set 4 answers

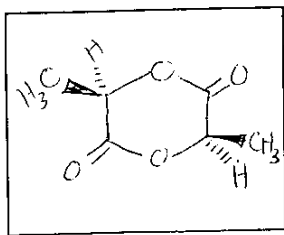
b) Draw a mechanism for the transesterification reaction shown below.



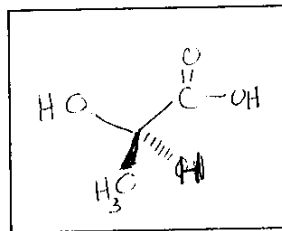
c) Draw a mechanism that explains the interconversion shown below.



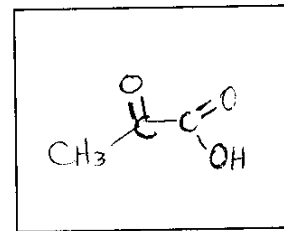
8. Compound **A** has a structural formula  $\text{C}_6\text{H}_8\text{O}_4$  and is chiral. Treatment of compound **A** with  $\text{NaOH}$  followed by an acidic work-up gives two equivalents of compound **B** ( $\text{C}_3\text{H}_6\text{O}_3$ ) as the only product. Compound **B** is also chiral and is formed as a single enantiomer. Treatment of compound **B** with  $\text{CrO}_3/\text{H}_3\text{O}^+$  gives compound **C** ( $\text{C}_3\text{H}_4\text{O}_3$ ) which is achiral. Draw the structures of the compounds in the boxes below.



Compound **A**  
(you may start with either enantiomer in this box)



Compound **B**  
(the enantiomer shown here should be consistent with that shown for **A**)



Compound **C**