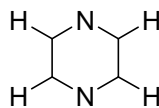
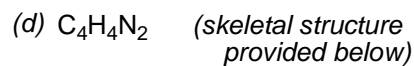
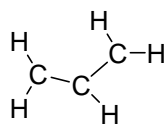
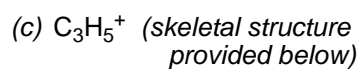
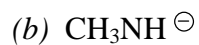


Test #1 Summer 2007  
Chemistry 2370.003

Name: \_\_\_\_\_ (2pts)

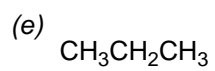
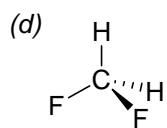
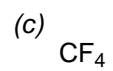
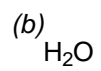
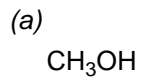
*In putting my name on this test and turning it in I am certifying that it is my work alone.*

1. Write a valid Lewis structure for each of the following: (12pts)

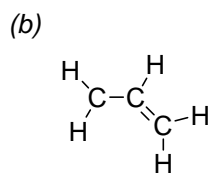
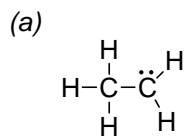


2. What is a “saturated compound”? (4pts)

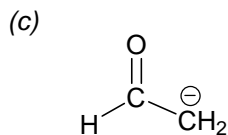
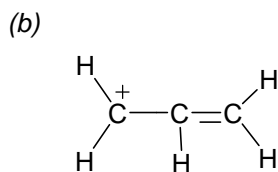
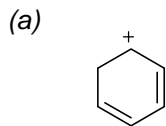
3. Indicate whether each of the following molecules are polar or non-polar. (10pts)



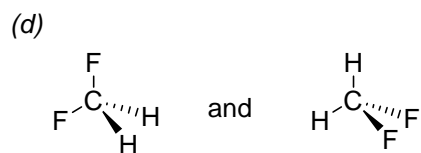
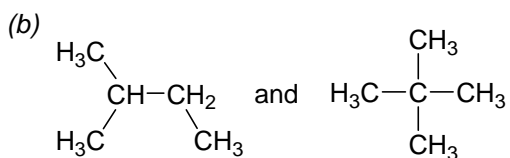
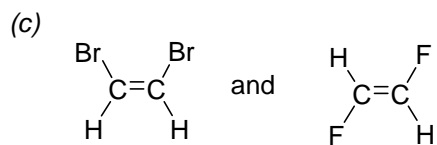
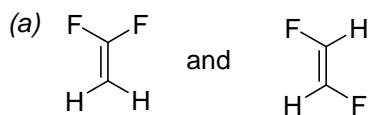
4. Calculate the formal charge on each carbon atom in the following Lewis structures: (10pts)



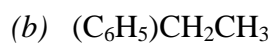
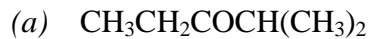
5. Write the contributing resonance structures for each of the following: (9pts)



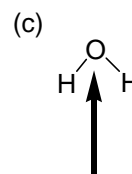
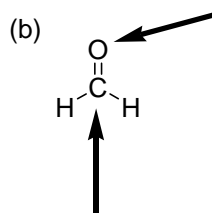
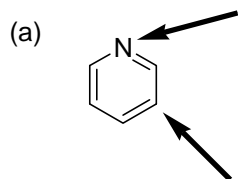
6. Consider each pair of structural formulas that follow and state whether the two formulas represent the same compound, constitutional isomers, stereoisomers, or different compounds that are not isomeric. (8pts)



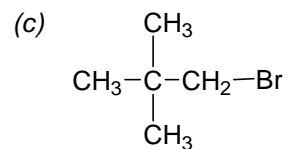
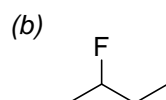
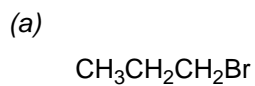
7. Draw a bond-line formula for the following: (6pts)



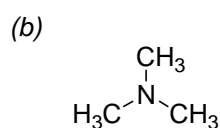
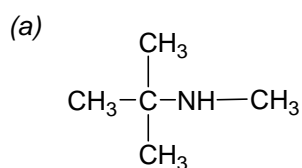
8. What is the hybridization ( $\text{sp}$ ,  $\text{sp}^2$ ,  $\text{sp}^3$ ) at the atoms indicated in the following molecules? (10pts)



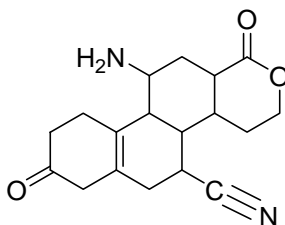
9. State whether each of the following alkyl halides are classified as primary, secondary, or tertiary. (6pts)



10. State whether each of the following amines are classified as primary, secondary, or tertiary. (4pts)



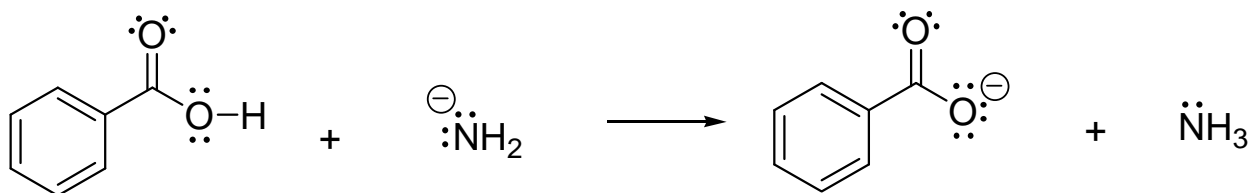
11. Circle and name all of the functional groups that are present in the following compound: (10pts)



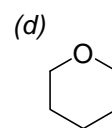
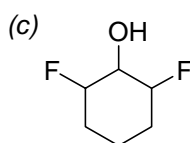
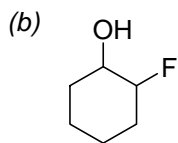
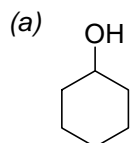
12. Draw three ethers with the formula  $\text{C}_4\text{H}_{10}\text{O}$  (9pts)

In putting my name on this quiz and turning it in I am certifying that it is my work alone.

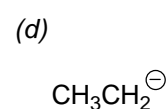
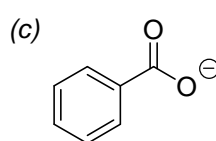
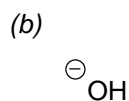
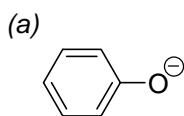
1. Draw the **mechanism** for the following acid-base reaction (in other words, supply the curved arrows necessary for the following reaction): (4pts)



2. Place the following compounds in order of increasing acidity (*least acidic first*): (8pts)

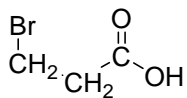


3. Place the following compounds in order of increasing basicity (*least basic first*): (8pts)

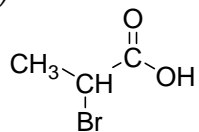


4. Place the following carboxylic acids in order of increasing acidity (*least acidic first*): (8pts)

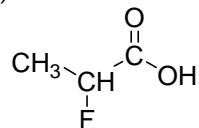
(a)



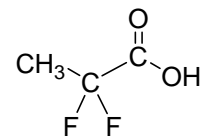
(b)



(c)



(d)

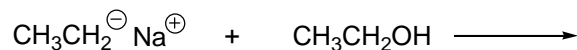


5. Complete the following acid-base reactions: (12pts)

(a)



(b)

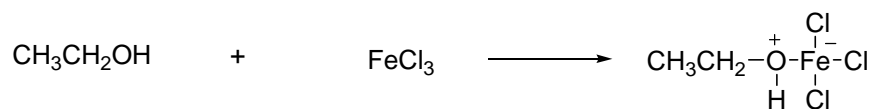


(c)

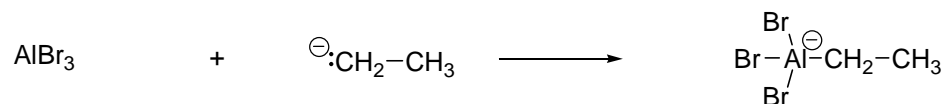


6. Designate the Lewis acid and the Lewis base in each of the following reactions: (4pts)

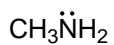
(a)



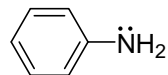
(b)



7. Both of the following amines are Lewis bases. Briefly explain why compound **A** is more basic than compound **B**. (4pts)

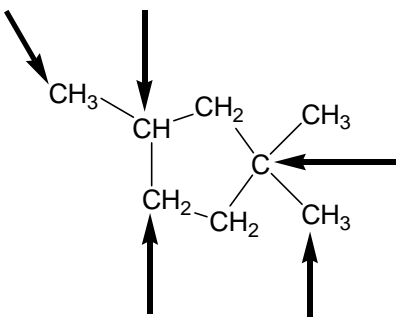


compound **A**



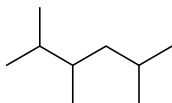
compound **B**

8. Classify the indicated carbon atoms in the following molecule as primary ( $1^\circ$ ), secondary ( $2^\circ$ ), tertiary ( $3^\circ$ ), or quaternary ( $4^\circ$ ). (5pts)

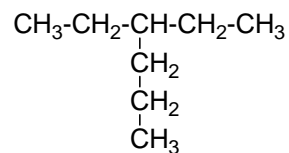


9. Give IUPAC names for the following alkanes: (12pts)

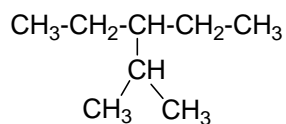
(a)



(b)

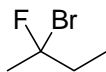


(c)

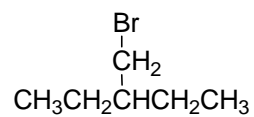


10. Give IUPAC names for the following alkyl halides: (8pts)

(a)

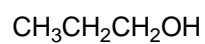


(b)

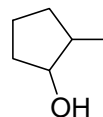


11. Give IUPAC names for the following alcohols: (8pts)

(a)



(b)



12. Draw structures for the following named compounds: (16pts)

(a) 1,3-butanediol

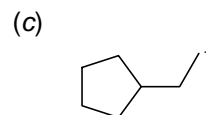
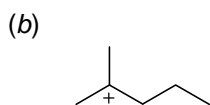
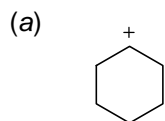
(b) 4-isopropylheptane

(c) methylcyclopropane

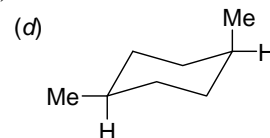
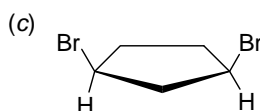
(d) 2,2-dimethyl-1-pentanol

*In putting my name on this quiz and turning it in I am certifying that it is my work alone.*

1. Place the following carbocations in order of increasing stability (*least stable first*): (6 pts)



2. For the following molecules, indicate if they are chiral or achiral: (8pts)

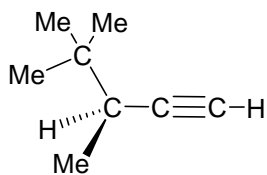


3. Draw the potential energy diagram for the bond rotation about the C1—C2 bond of propane. Also label the diagram with the appropriate Newman projections. (8pts)

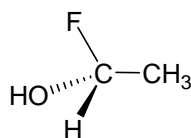
4. (a) Draw the two possible chair conformations of *cis*-1-Bromo-4-fluorocyclohexane.  
 (b) Indicate which of these two conformations is more stable. (6pts)

5. Assign (*R*) or (*S*) designations to each of the following compounds: (6pts)

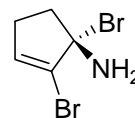
(a)



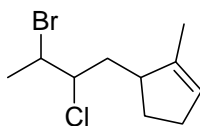
(b)



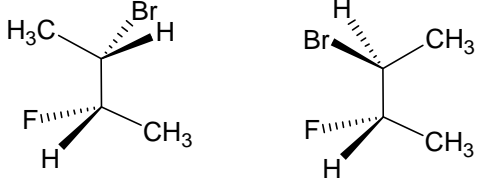
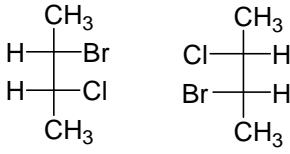

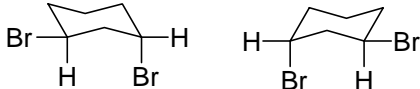
(c)



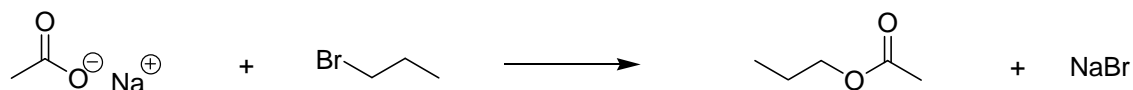
6. Calculate the maximum number of stereoisomers possible for the following molecule: (3 pts)



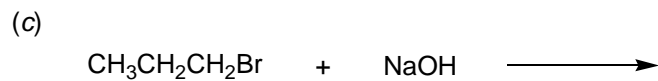
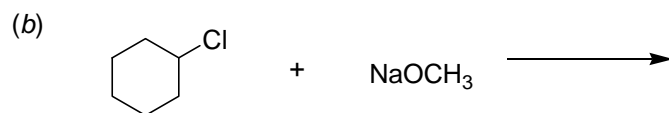
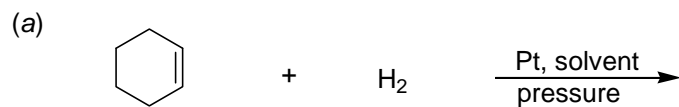
7. Circle the term that describes the relationship between the pairs of structures below. (8pts)

 <p>same compound            enantiomers            diastereomers            constitutional isomers</p>	 <p>same compound            enantiomers            diastereomers            constitutional isomers</p>
 <p>same compound            enantiomers            diastereomers            constitutional isomers</p>	 <p>same compound            enantiomers            diastereomers            constitutional isomers</p>

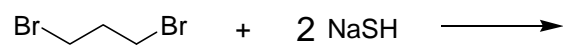
8. Using curved arrows, write a **mechanism** for the following substitution reaction: (5pts)



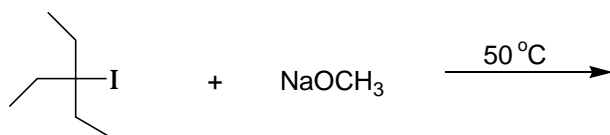
9. Give structures for the major organic product(s) for each of the following reactions: (35pts)



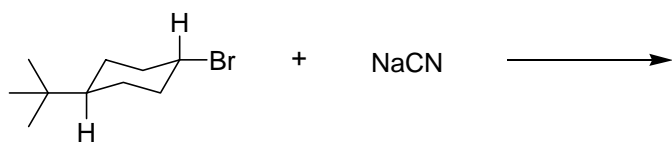
(e)



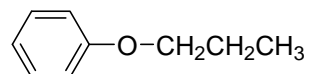
(f)



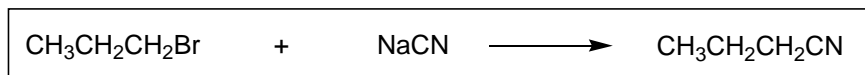
(g)



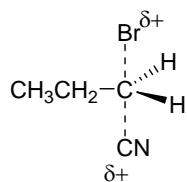
10. Using any reagents necessary, outline a synthesis of the following compound via S<sub>N</sub>2 reaction: (5pts)



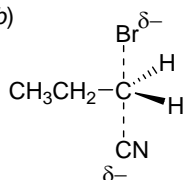
11. Circle the structure that best depicts the transition state for the following reaction: (3pts)



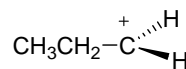
(a)



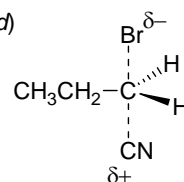
(b)



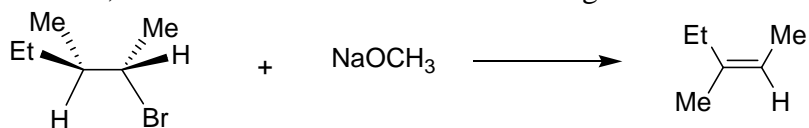
(c)



(d)

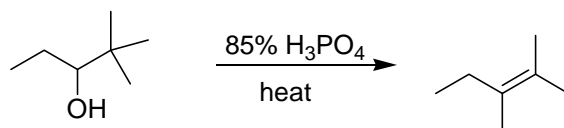


12. Using curved arrows, write a **mechanism** for the following elimination reaction: (5pts)

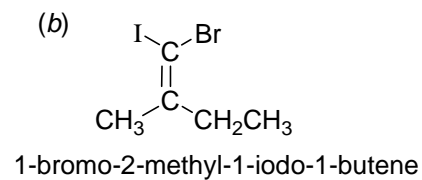
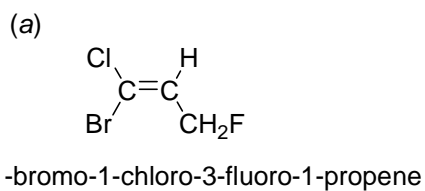


*In putting my name on this exam and turning it in I am certifying that it is my work alone.*

1. Using curved arrows, draw the complete **mechanism** for the following elimination reaction (show all steps involved): (7pts)

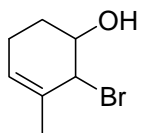


2. Designate the following alkenes as an (**E**) or (**Z**) isomer: (4pts)

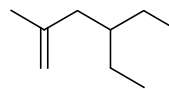


3. Give the IUPAC name for the following compounds: (12pts)

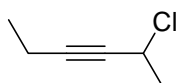
(a)



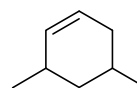
(b)



(c)



(d)



4. Draw bond-line formulas for the following: (9pts)

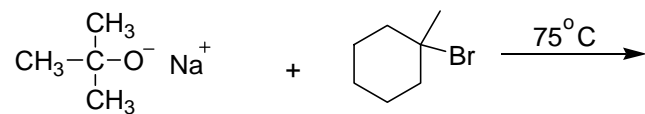
(a) *trans*-2-hexene

(b) 1,2-dichlorocyclohexene

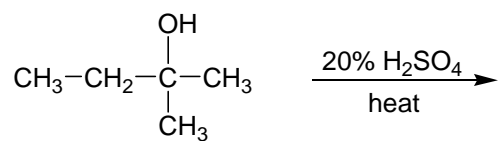
(c) 2-methyl-4-pentyn-2-ol

5. **Reactions.** Give the major organic product for the following reactions: (60pts)

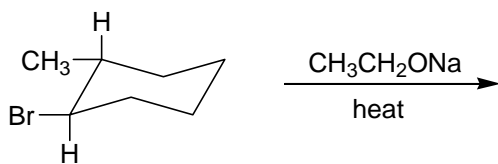
(a)

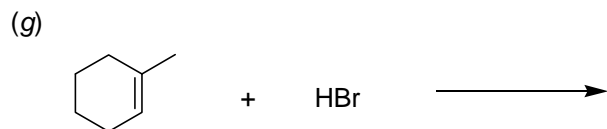
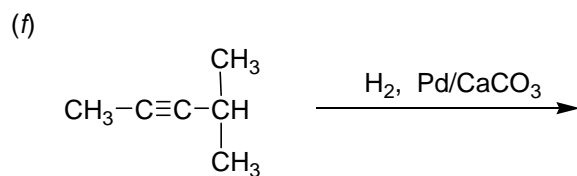
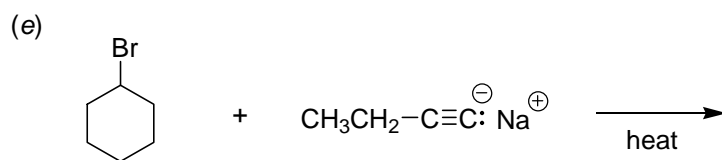
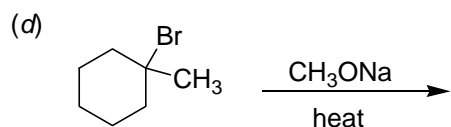


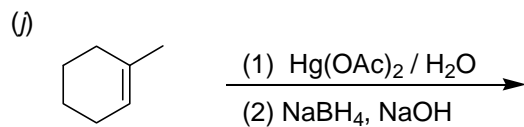
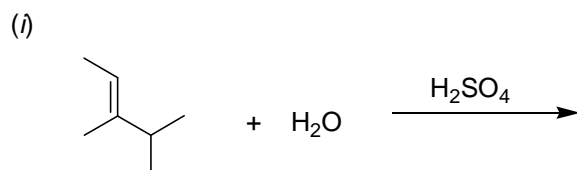
(b)



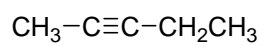
(c)







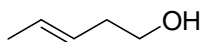
6. **Synthesis.** Starting with an alkyldihalide and any other necessary reagents, outline a synthesis of the following molecule (in other words, how would you make this product): (7pts)



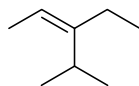
In putting my name on this exam and turning it in I am certifying that it is my work alone.

1. Give the IUPAC name for the following compounds: (6pts)

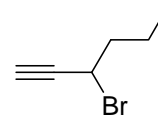
(a)



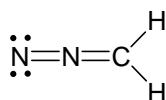
(b)



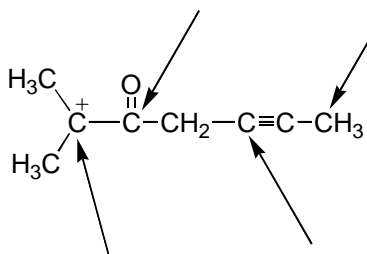
(c)



2. Calculate the formal charge on each nitrogen atom in the Lewis structure given. (2 pts)

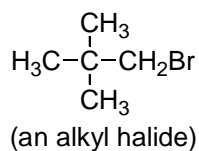


3. Give the hybridization of each of the arrowed carbon atoms in the compound shown. (4pts)

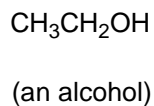


4. Classify each of the following functional groups as primary, secondary, or tertiary. (3pts)

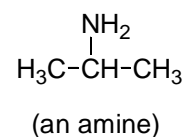
(a)



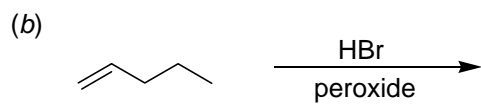
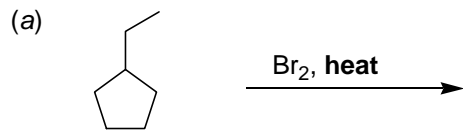
(b)



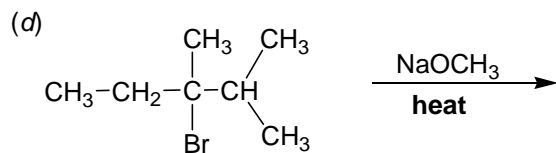
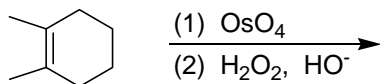
(c)

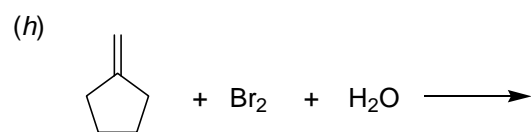
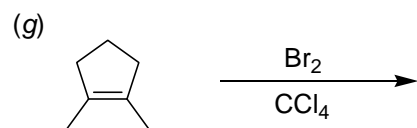
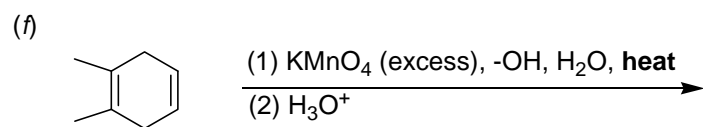
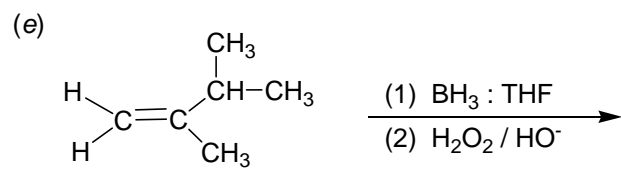


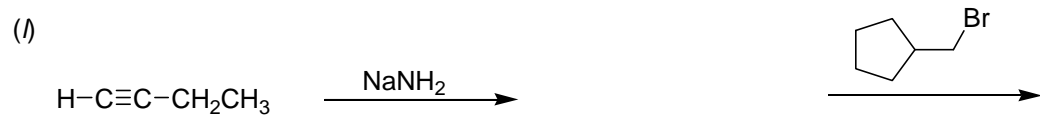
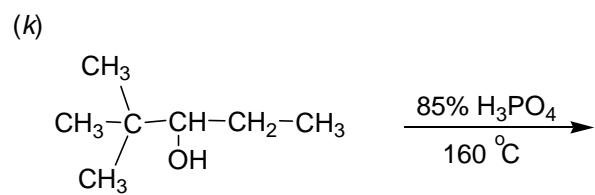
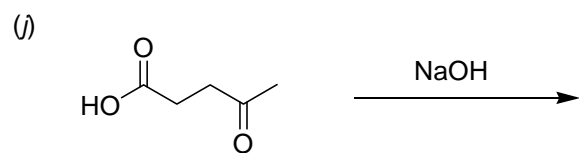
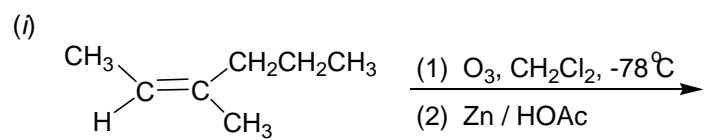
5. **Reactions.** Give the major organic product for the following reactions: (64pts; 4pts each)

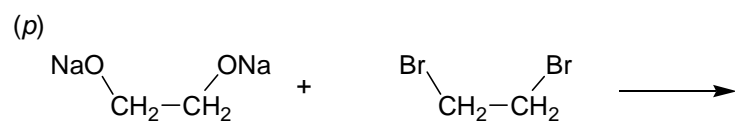
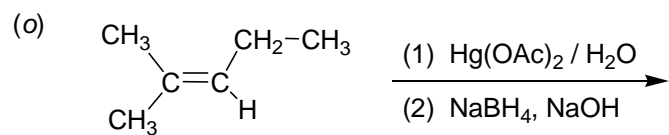
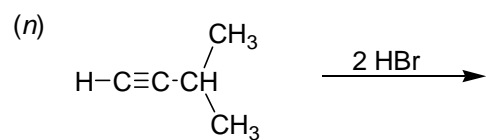
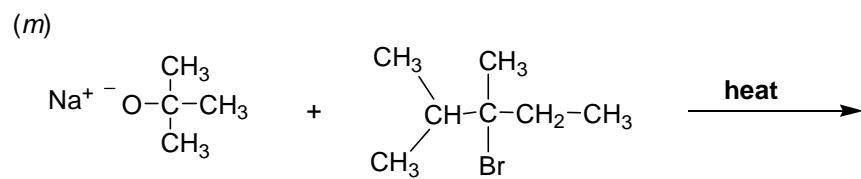


(c) (show the appropriate stereochemistry for product)

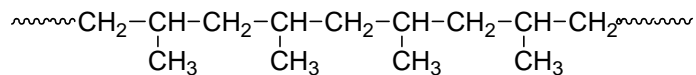




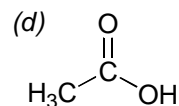
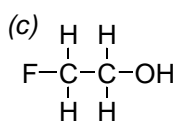
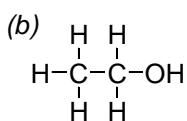
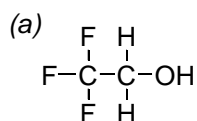




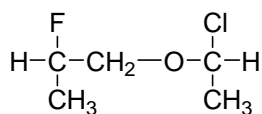
6. **Synthesis.** Using any necessary reagents, outline a synthesis of the following polymer (in other words, what starting materials would you use to make this product): (4pts)



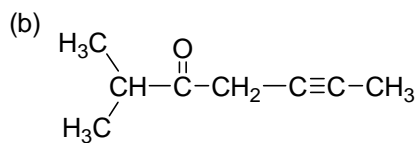
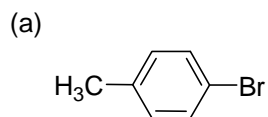
7. Place the following acids in order of decreasing acidity (most acidic molecule first). (2pts)



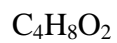
9. How many stereoisomers are possible for the following structure? (2 pts)



10. How many **carbon** peaks would you expect to see in the  $^{13}\text{C}$  NMR spectra for each of the following molecules: (4pts)



11. Determine the structure of the following unknown compound based on its molecular formula and its IR and  $^1\text{H}$  NMR spectra. (4pts)



12. Determine the structure of the following unknown compound based on its molecular formula and its  $^1\text{H}$  NMR spectrum. (4pts)

