

Chem 141  
Fall 2005  
Final Exam  
12/9/05

NAME: \_\_\_\_\_

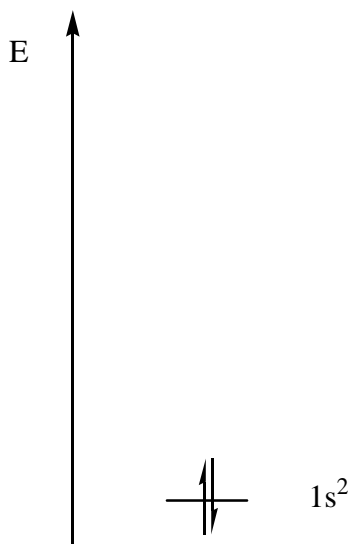
Problems	Pages	Points	Grader	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	TOTAL _____points
				% _____

1.a) What is the charge on a cyanide ion (1 point),  $:\text{C}\equiv\text{N}:$  ? \_\_\_\_\_

b) What is the hybridization of the carbon and nitrogen ? (2 points)

Carbon=\_\_\_\_\_ Nitrogen=\_\_\_\_\_

c) Draw an electron energy level diagram to represent the hybridization of the carbon. Also draw a diagram of the carbon and the nitrogen clearly illustrating the electron orbital (or orbitals) which were not hybridized and the effect on bonding between them. (8 points)



d) Which end of the molecule is more nucleophilic? Carbon or nitrogen? Explain this in a few sentences. It may be useful to consider the basicities of either end of the molecule. (2 points)

2) Draw line-bond structures of the following compounds? (2 points/question)

a) Propanol

b) 2-(S)-chloro-butanoic acid

c) ethylamine

d) ethyl-cyclopropane

3)a) Draw a chair conformation of cis-1,3-dimethyl-cyclohexane with the substituents equatorial. (3 points)

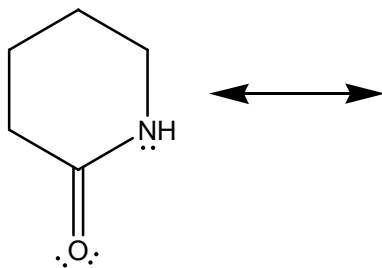
b) Draw the ring-flipped cyclohexane with the substituents axial. (2 points)

c) Circle the more favored structure.(1 point)

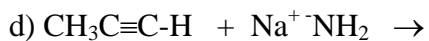
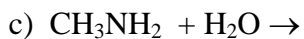
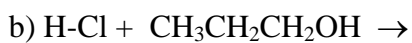
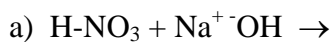
d) Label the absolute configurations of any chiral carbons in the structures , R/S, on one of your drawings. (2 points)

e) Does the absolute configurations of either chiral carbon change when the chair conformations are ring-flipped?\_\_\_\_\_ (yes/no) (1 point)

4) Draw a contributing resonance structure for the amide below. Include the arrow-push required to generate the resonance structure. (4 points)



5) Provide the products for the following acid/base reactions. Provide arrows to illustrate the flow of electrons and any charges where appropriate. If the starting materials are favored just write "reactants favored". (2 points/question)



6) Define the following terms. What does each letter and number mean? Use sentences. (2 points/question)

$\text{S}_{\text{N}}1$

$\text{S}_{\text{N}}2$

E1

E2

7) Provide a full mechanism for the addition of bromine to cyclohexene. Arrow push the electrons for each step. (6 points)

8) Write a brief definition of the following terms, in sentences. (2 points)

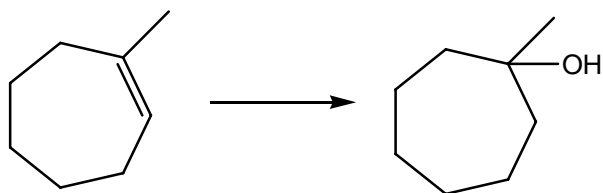
a) enantiomer

b) diastereomer.

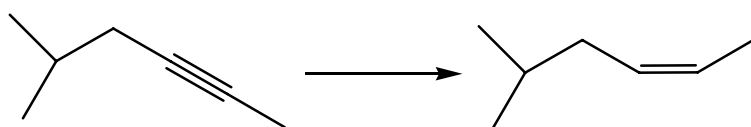
9) What reagents would be required for the following reactions?

NAME the reactant and products for each reaction? (4 points/ question)

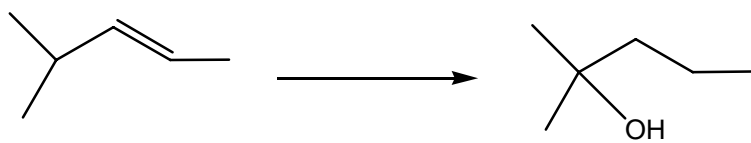
a)



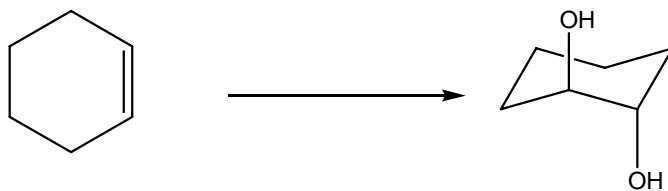
b)



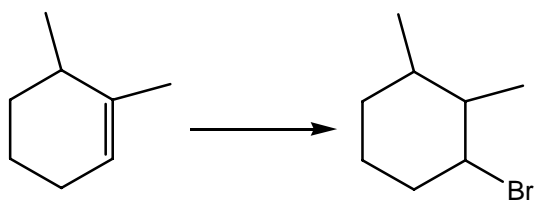
c)



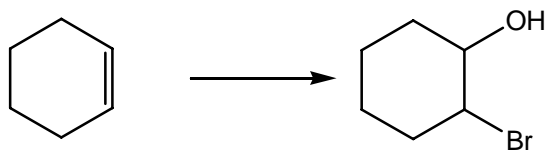
d)



e)

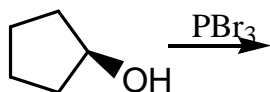


f)

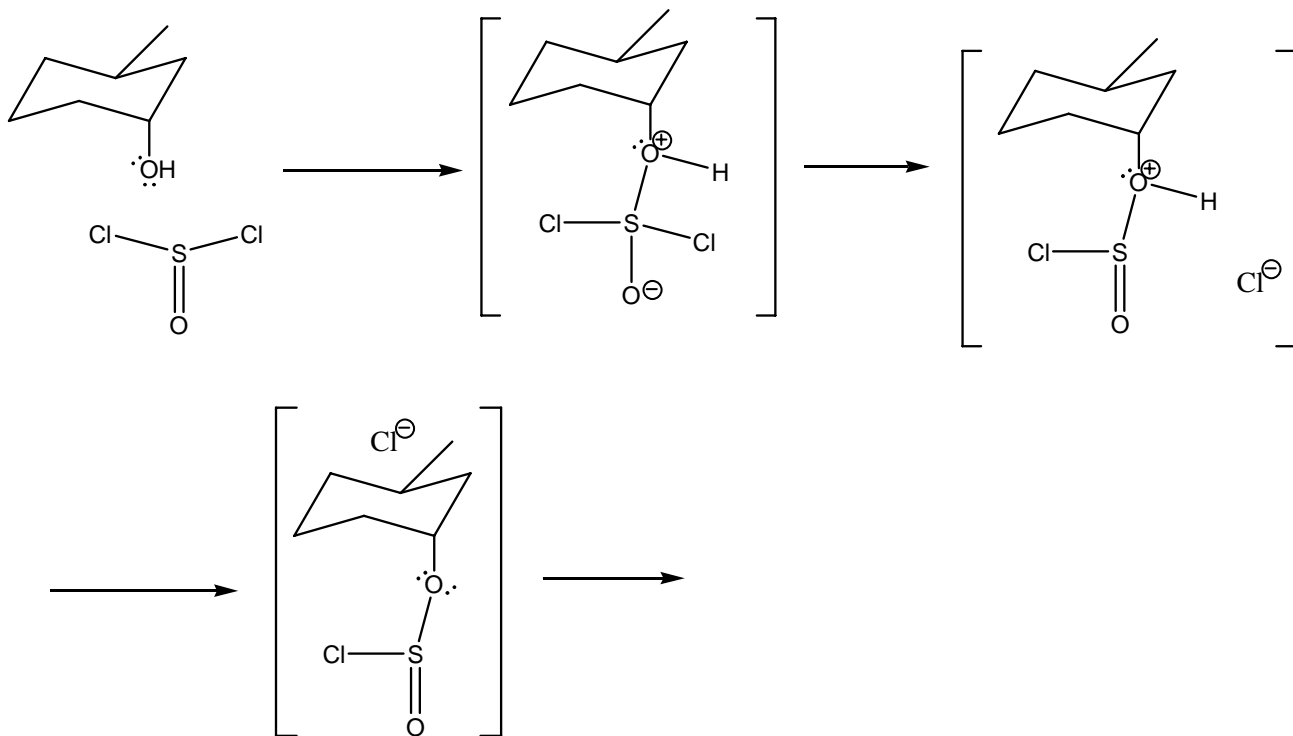


Did you remember to name the reactant and the product for a-f?

10) Draw a free energy diagram and include the transition state diagrams of the structures which would be associated with each peak and trough of the following reaction. (6 points)

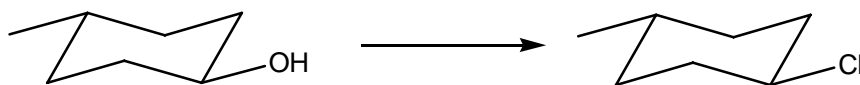


11) Provide all the electron arrow-push mechanism for each of the following transformations and show the products formed. (10 points)

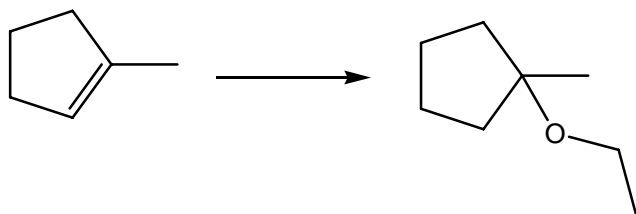


12) Provide reagents for the following reactions. Multiple reactions may be required for some products. (3 points/ question)

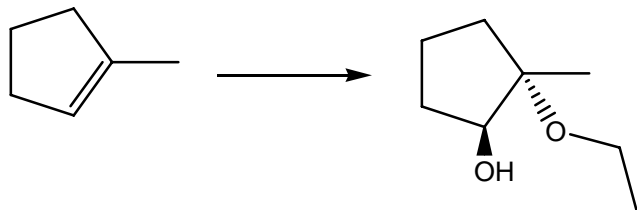
a)



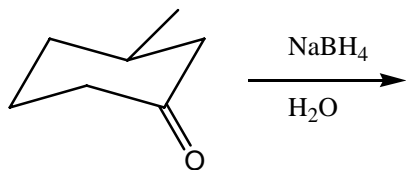
b)



c)

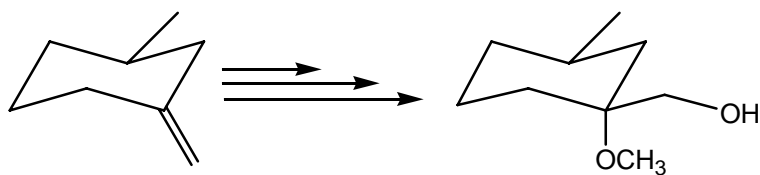


13) Provide a full mechanism and the product of the following reaction. Include the electron arrow push mechanism for each step. (6 points)

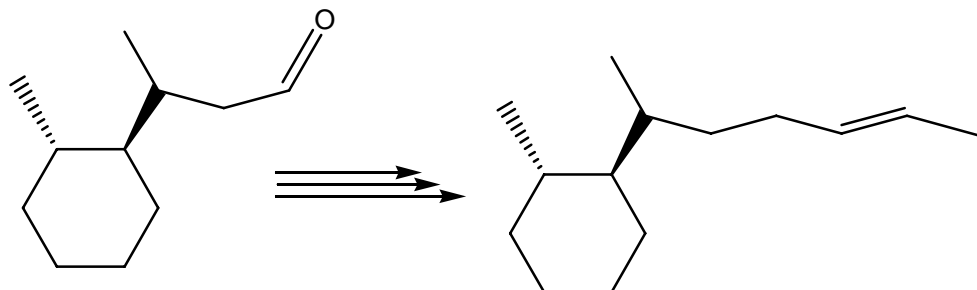


14) Provide the reagents required for the synthesis of the following compounds starting with reactant provided.

a) (4 points)



b) (6 points)



15)a) Draw an arrow-push mechanism for the key step in the epoxidation of an alkene by an peroxy-acid. (4 points)

b) Show the transition state for this reaction in the square brackets. (4 points)

c) Draw in the product. (2 points)

