

Chem 141
Fall 2006
Exam 3
10/25/06

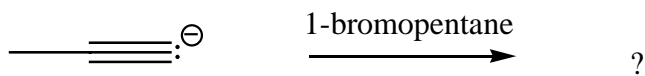
NAME: _____

LECTURE SECTION
(Daytime or Evening): _____

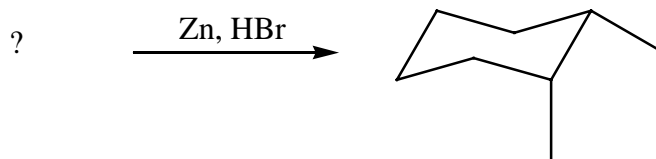
Problems	Pages	Points	Grader	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	
_____	_____	_____	_____	TOTAL _____ points
				% _____

1) Fill in the gaps. Add either, reactant, reagent or product for the following reactions. (3 points each)

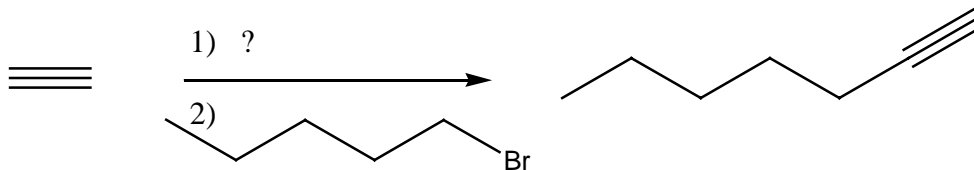
a)



b)



c)



2) Show all reactants and reagents you would require (the forward synthetic strategy) to synthesis 1-octylcyclohexane using an alkylation of an alkyne as your key carbon-carbon bond forming step. You may use any alkyne. (8 points).

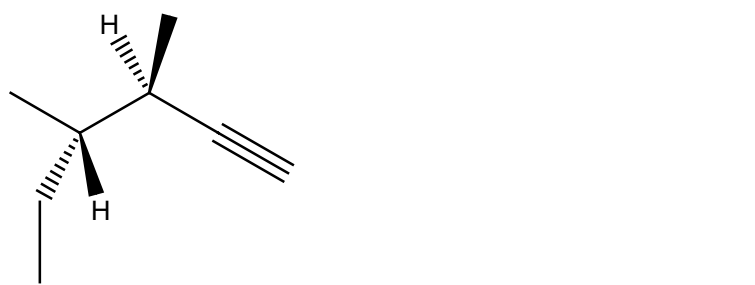
3) Define the concept of retrosynthetic analysis? (2 points).

4) Name the following compounds. Include all appropriate designations (R/S and/or *cis/trans*). (3 points each)

a)



b)



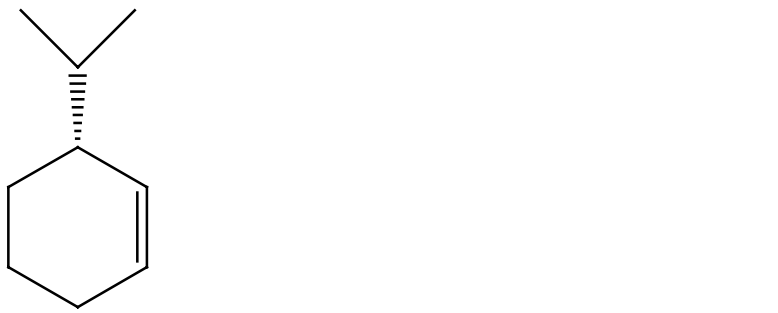
c)



d)



e)



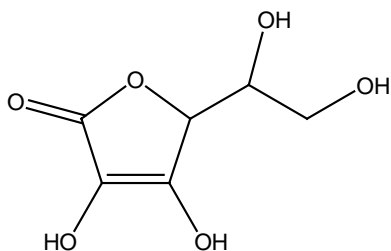
5) Draw illustrations to represent the following relationships. (3 points each).

a) The enantiomer of 4a)

b) The diastereomer of 4b)

c) A Newman projection between carbon 2 and carbon 3 of structure 4c)

6)a) How many stereoisomers of Vitamin C are possible? (1 point)



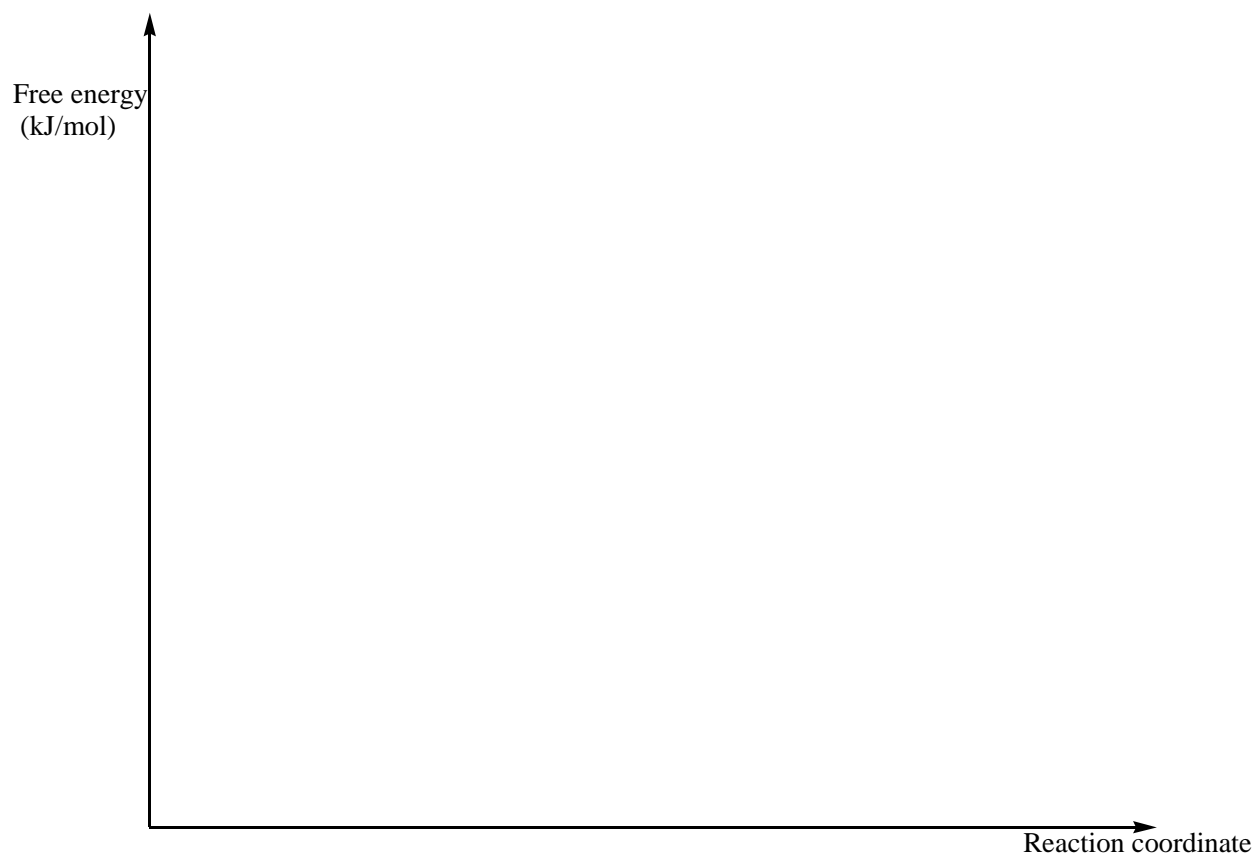
b) Draw two different stereoisomers of Vitamin C and assign the R/S configuration of the stereogenic carbons. Define the relationship between the two stereoisomers you have drawn. (7 points).

7) At the end of this semester you will synthesize 1-bromobutane from butanol. You will use sodium bromide as your source of (Br^-) and sulfuric acid to activate the alcohol. This is a $\text{S}_{\text{N}}2$ reaction.

a) Why is it easier to perform this reaction when the hydroxyl ($-\text{OH}$) is protonated ($-\text{OH}_2^+$)? Consider the Chemistry of leaving groups. Include two reaction equations to substantiate your arguments (6 points)

b) This reaction is heated to boiling for 45 minutes. Does this imply that the reaction has a high or low activation energy? Explain in a few concise sentences. (2 points)

c) Draw the reaction coordinate diagram of 1-butanol to 1-bromobutane assuming this reaction is endergonic. Include an illustration of the transition state and draw an arrow to the related position on the free energy diagram. Also label the position of the starting material and the product. (6 points)

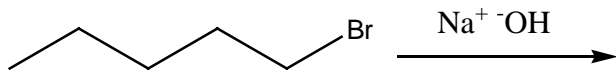


8)a) Define the term “stepwise” and mention a style of mechanism that is “stepwise”. (2 points)

b) Define “concerted”. Mention a mechanism that is “concerted”. (2 points).

9) Show curved arrows to illustrate the likely mechanism and the product formed in each of the following reactions. If multiple steps are required show each step of the mechanism. (5 points each).

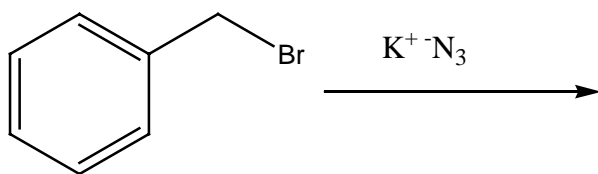
a)



b)



c)



10) Monosodium glutamate (MSG) is a flavor enhancer used in many foods. Some people have an allergic reaction to MSG. You are working in a lab trying to determine if either one of the enantiomers is more harmful than the other. You have order the biologically active (*S*)-(+)-MSG. The specific optical rotation is $+25^\circ$. You are checking a recently delivered sample and have an observed optical rotation in the polarimeter of $+20^\circ$.

a) What is the specific optical rotation of the (*R*) enantiomer? (2 points)

b) What is the enantiomeric excess of the (*S*) isomer? (4 points)

c) What are the absolute concentrations (as %) of the enantiomers? (4 points)

11) Show a full mechanism for the following reaction including all the arrows for the electrons in motion. No transition states need be included. (10 points)

