



KENYATTA UNIVERSITY
UNIVERSITY EXAMINATIONS 2010/2011
INSTITUTIONAL BASED PROGRAMME - DECEMBER SESSION
EXAMINATION FOR THE DEGREE OF BACHELOR OF SCIENCE
SCH 303: STEREOCHEMISTRY AND CONFORMATIONAL ANALYSIS

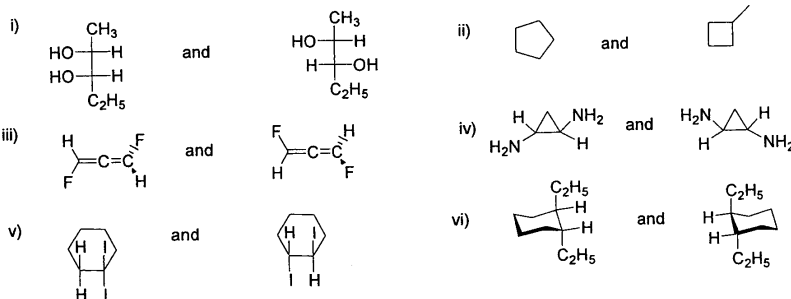
DATE: Thursday 28th April, 2011

TIME: 4.30 p.m. – 6.30 p.m.

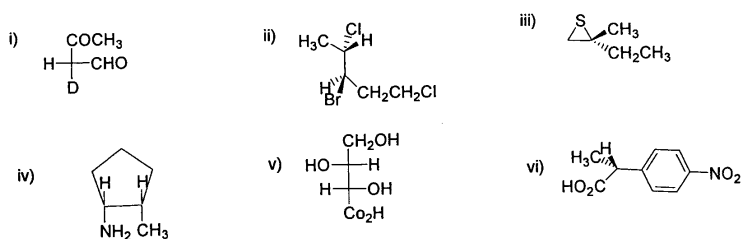
INSTRUCTIONS: Answer ALL questions.

1a Cinnamic acid, $C_6H_5CH=CHCO_2H$, exist as a pair of stereoisomers. The cis isomer is a plant growth stimulant, while the trans isomer is not. Write formulas for the two isomers of cinnamic acid and label them. **[2 Marks]**

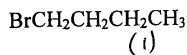
b) Indicate whether each of the following pairs of compounds are identical, enantiomers, diastereomers or constitutional isomers. **[6 Marks]**



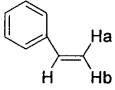
c) Indicate the configuration of the stereogenic centres in the following compounds **[8 Marks]**



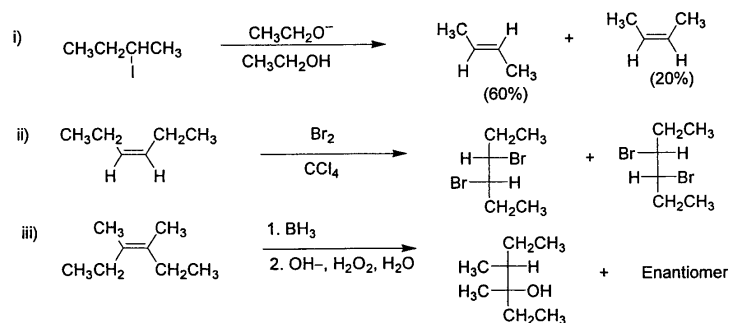
2a) (i) Draw the staggered and eclipsed conformers for the rotation about C-2 – C-3 bond of 1-bromopentane (1) **[5 Marks]**



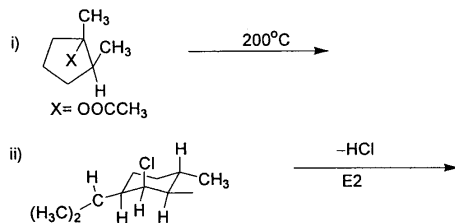
(ii) Which conformer is the most stable

- (iii) Which conformer is the least stable.
- b) Using Newman projections, draw the preferred conformation(s) of the following compounds and give reasons for your choice. [6 Marks]
- $\text{BrCH}_2\text{CH}_2\text{Cl}$
 - $\text{FCH}_2\text{CH}_2\text{OH}$
 - $\text{CH}_3\text{CO}_2\text{CH}_2\text{CH}_2\text{N}^+(\text{CH}_3)_3$
- c) In ethane, all the staggered or eclipsed conformations are of equal energy. Explain why in 1,2-dibromoethane the staggered or eclipsed conformations have different amounts of energies or different stability. [6 Marks]
- 3a) Draw the chair conformations of each of the following compounds and indicate with reasons which will be the most stable in each case. [8 Marks]
- Cis 1,3-dimethylcyclohexane
 - Trans-1,4-dibromocyclohexane
 - Cis-4-butyl-1-methylcyclohexane
 - Trans-1-ethyl-3-methylcyclohexane
 - Cis-1-ethyl-2-isopropylcyclohexane
- b) The specific rotation of (R)-(+)-glyceraldehyde is $+8.7^\circ$. If the observed specific rotation of a solution of a mixture of (R)-glyceraldehyde and (S)-glyceraldehyde is $+1.4^\circ$:
- Calculate the percent optical purity of (R)-glyceraldehyde in the solution. [2 Marks]
 - What percentage of the following is present in the solution. [3 Marks]
 - R-isomer
 - S-isomer
 -
- d) Indicate whether the Ha and Hb protons in each of the following compounds are homotopic, enantiotopic or diastereotopic, [5 Marks]
- $$\begin{array}{c} \text{Ha} \\ | \\ \text{HOCH}_2\text{C}-\text{CH}_2\text{CH}_3 \\ | \\ \text{Hb} \end{array}$$
 - 
 - 
 - $$\begin{array}{c} \text{Ha} \\ | \\ \text{H}_2\text{NCH}_2\text{C}-\text{CH}_2\text{NH}_2 \\ | \\ \text{Hb} \end{array}$$
 - $$\text{CH}_3\text{CH}_2\text{CH}_2-\text{C}-\text{CH}_3$$

$$\begin{array}{c} \text{Ha} \\ | \\ \text{Hb} \end{array}$$
- e)
4. Classify the following reactions as being stereospecific or stereoselective. Give reasons for each case. [3 Marks]



- b) When Br_2 adds to cis-2-heptene (92), equal amounts of the two threo enantiomers are obtained. Using the reaction mechanism for this reaction, explain why equal amounts of the stereoisomers are obtained. [6 Marks]
- c) Write the structure of the major products of elimination from each of the following reactions. Give reasons for your choice in each case. [4 Marks]



- d) Determine whether the following molecules are chiral (optically active) or not. [6 Marks]

