

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

FOURTH YEAR EXAMINATION FOR THE AWARD OF BACHELOR OF  
EDUCATION (SCIENCE) AND BACHELOR OF SCIENCE

CHEM 436: ADVANCED STEREOCHEMISTRY AND REACTION MECHANISMS

STREAMS: B.ED (SC), B.SC

TIME: 2 HOURS

DAY/DATE: THURSDAY 7/12/2017

8.30 A.M - 10.30 A.M

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INSTRUCTIONS:

- Answer Question ONE and any other TWO Questions
- Do not write on the question paper

QUESTION ONE: [30 MARKS]

(a) Name the following molecules according to R and S and IUPAC system of nomenclature.

[10 Marks]

(b) Draw the structures of the products of the following reactions (showing mechanisms in each case) [8 Marks]

**CHEM 436**

(c) Which sigmagraphic rearrangement do the following reactions represent? [5 Marks]

(d) Draw a meso compound of the following molecules using Fisher's projection. [3 Marks]

- (i) 3, 4-dichlorohexane
- (ii) 1,2-dimethylcyclohexane
- (iii) 1,3-diiodocyclopentane

## CHEM 436

- (e) The enantiomeric excess of one compound in a mixture of a pair of enantiomer is 67.5%.  
how much of each enantiomer is present? [2 Marks]
- (f) A pure compound has a rotation of  $+13.2^\circ$ . If a sample has a specific rotation of  $2.64^\circ$  what  
is enantiomeric excess of this sample? [2 Marks]

### QUESTION TWO [20 MARKS]

- (a) (i) Draw ordinary structures and Newman projection of chair and boat conformers of  
cyclohexane and clearly show flagpole hydrogens where applicable. [5 Marks]
- (ii) Discuss stability of chair and boat conformers. [5 Marks]
- (b) Discuss conformations of disubstituted cyclohexanes (with relevant structures) [10 Marks]

### QUESTION THREE [20 MARKS]

- (a) With clear illustrations of a  $4n$  system, describe how molecular orbitals are formed and show  
ground state and excited state configuration. [8 Marks]
- (b) Trans, cis, trans-2, 4, 6-octatriene (a  $4n+2$  system) undergoes electrocyclic reaction. Show  
clear mechanisms how this works under thermal and photochemical conditions. [8 Marks]
- (c) Briefly describe the two modes of orbital overlap during formation of two sigma bonds.  
[4 Marks]

### QUESTION FOUR [20 MARKS]

- (a) Exposure to uv light causes skin cancer. Explain how this happens and why the problem is  
not too much widespread. [10 Marks]
- (b) With examples, discuss classification of isomers. [10 Marks]
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