



**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY**  
**SCHOOL OF BIOLOGICAL, PHYSICAL, MATHEMATICS AND ACTUARIAL SCIENCES**  
**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF**  
**BACHELOR OF EDUCATION (SCIENCE) WITH IT**  
**FOURTH YEAR FIRST SEMESTER EXAMINATIONS**  
**UNIVERSITY EXAMINATIONS: 2021/2022 ACADEMIC YEAR**  
**SPB 9419 (SCH 411): ORGANIC STEREOCHEMISTRY**

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**EXAM VENUE:** **STREAM: (BEd. Science)**

**DATE:** **EXAM SESSION:**

**TIME: 2.00 HOURS**

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**Instructions:**

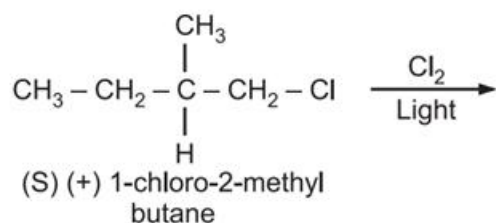
- 1. Answer question 1 (Compulsory) in Section A and ANY other 2 questions in Section B.**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

## QUESTION 1

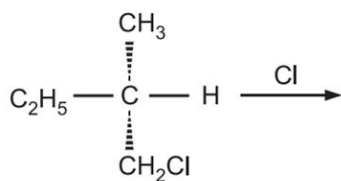
- a. Define the following terms as applied to Organic Stereochemistry: [10 marks]
- Absolute configuration
  - Stereoisomerism
  - Molecular geometry
  - Optical activity
  - Enantiotopicity

- b. Draw the chair and boat conformers of *cis* of 4-methylcyclohexanol. Comment on their relative stabilities. [5 marks]

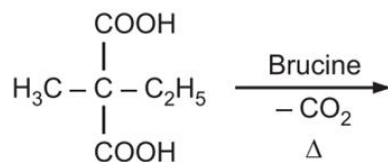
- c. Complete the following reactions and name the products: [6 marks]
- i.



ii.

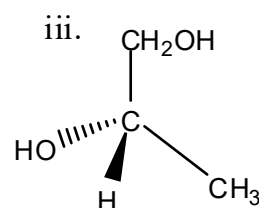
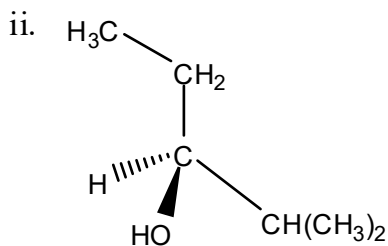
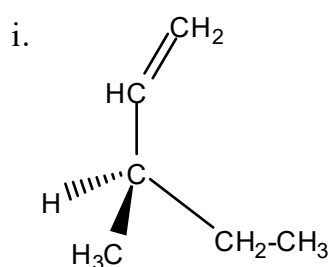


iii.



- d. Which of the compounds are optically active (Reactant/Product)? [3 marks]

- e. Assign priorities to the attached substituents in the following compounds and give the CIP name of the following compounds: (6 marks)



## SECTION B (40 MARKS):

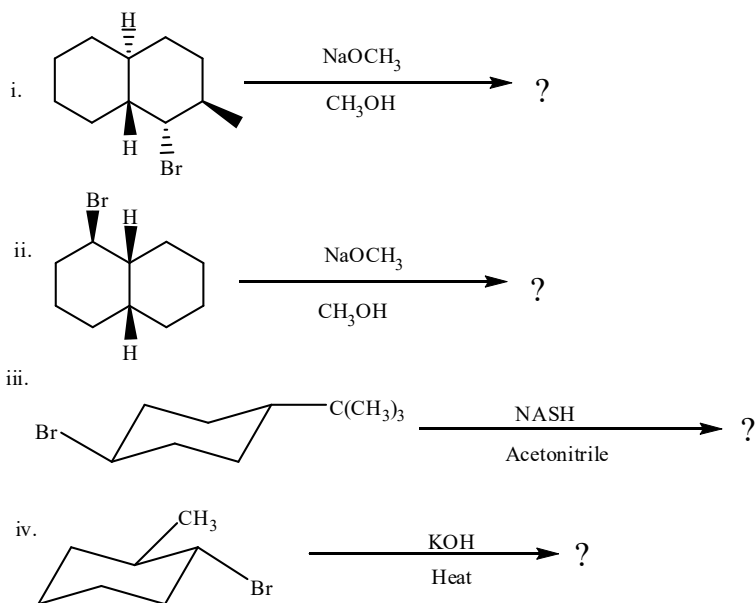
ANSWER ANY TWO QUESTIONS FROM THIS SECTION-EACH QUESTION CARRIES 20 MARKS

### QUESTION 2

- a. Draw Fischer projection of the following compound: [10 marks]
- 2-bromo-3-chloropentane
  - 2,3-dichlorobutane
  - 2-methylbutan-1-ol
  - Lactic acid
  - 2-bromo-2-iodohexane
- b. Draw an example of a compound with the following molecular structure. [10 marks]
- Linear
  - Trigonal planar
  - Bent
  - Tetrahedral
  - Octahedral

### QUESTION 3

- a. Give the major organic products in the following reactions; [8 marks]



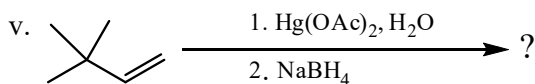
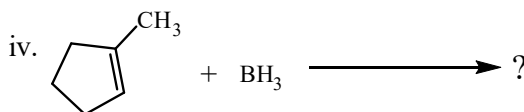
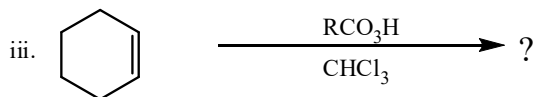
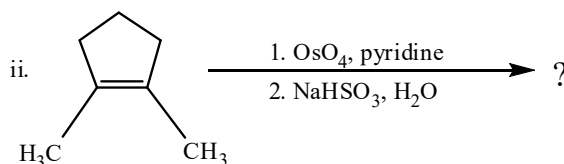
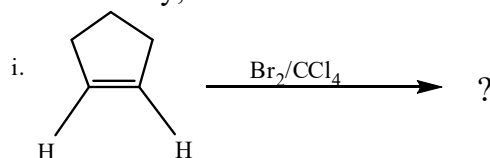
- b. A reaction of a racemic mixture  $A^R$  and  $A^S$  with resolving agent  $X^R$  yields diastereomers  $A^R-X^R$  and  $A^S-X^R$ . Isomer  $A^S-A^R$  is less soluble than  $A^R-X^R$ .
- Describe the experimental results of reacting the mixture to  $X^S$  as a resolving agent. [4 marks]
  - Describe how the experimental results in 3b.i. above can be used to separate the two enantiomers. [4 marks]
- c. Enantiomeric resolution of a racemic mixture  $A^R$  and  $A^S$  yields one enantiomer with a specific rotation of  $+44^\circ$  and  $-33^\circ$ ; respectively.

- i. Suppose one enantiomer is obtained in excess of the other. Identify the optically pure form. Give a reason for your answer. [2 marks]
- ii. Determine the optical purity of the pure enantiomer. [2 marks]

### QUESTION 4

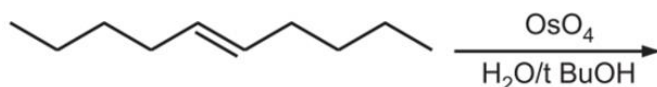
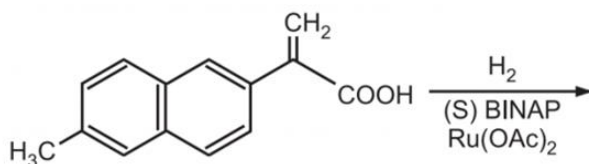
- a. Draw the structures of the following compounds and indicate their stereochemical details; [10 marks]
- (2*R*,3*S*)-2,3-dibromopentane
  - (*S*)-2-bromobutane
  - A meso form of 1,3-dichlorocyclopentane
  - 1-chloro-3-methylcyclohexane
  - 2-methylbicyclo[2.2.1]heptane

- a. Complete the following reactions and give the structure of the major product including its stereochemistry; [10 marks]



### QUESTION 5

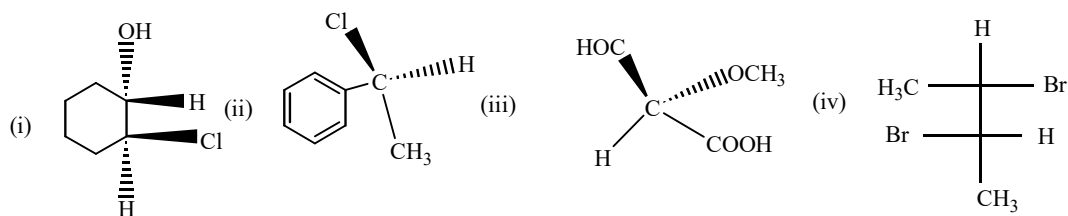
- a. Complete the following reactions and name the products: [4 marks]



- b. Which of the compounds are optically active (Reactant/Product)? Explain [4 marks]

c. Outline the conformational analysis of ethane [6 marks]

d. Assign R and/or S configuration to the stereogenic centres in the molecules [6 marks]



***E\*\*\*\*\*N\*\*\*\*\*D***