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**JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY SCHOOL OF BIOLOGICAL & PHYSICAL SCIENCES**

**UNIVERSITY EXAMINATION FOR DEGREE OF BACHELOR OF EDUCATION SCIENCE WITH IT**

**4th YEAR 1st SEMESTER ONE 2015/2016 ACADEMIC YEAR**

**REGULAR**

**COURSE CODE: SCH 411**

**COURSE TITLE: ORGANIC STEREOCHEMISTRY**

**EXAM VENUE: LAB 16 STREAM: (BEd. Science)**

**DATE: 19/12/16 EXAM SESSION: 9.00 – 11.00 AM**

**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 0NE (30 MARKS)**

1. Describe the following terms (5 marks)
   1. Chirality
   2. Enantiomers
   3. Racemic mixture
   4. Specific rotation
   5. Isomerism
2. In the following molecules assign priorities to the attached substituents. (3 marks)



1. Arrange the following in their order of priority (lower to higher): chloro, methyl, nitro, isopropenyl, methoxy, fluoro, iodo, hydrogen. (4 marks)
2. Define the following terms (6 marks)
   1. Molecular formula
   2. Rational formula
   3. Structural formula
3. Draw the structures of three *meso* diastereomers of C6H12Br2 (6 marks)
4. Explain why substitution reactions are not very common for substituted cyclohexane (2 marks)
5. Draw the structures of *cis* and *trans* isomers of 1,2-difluorocyclopentane and 1,3 dibromocyclobutane. (4 marks)

**QUESTION 2 (20 MARKS)**

1. i. There is a liquid compound **1** whose molecular formula is C4H10O. Does the molecular formula of **1** exactly describe its structure and properties? (2 marks)

ii. When a piece of sodium is added to compound 1, it dissolves while generating a good deal of gas. Write the rational formula of **1** and draw four of its possible structures. (5 marks)

1. Define the term conformational isomers and illustrate how they can be represented (5 marks)
2. What does asymmetric synthesis mean and what is its importance in the pharmaceutical industry? (4 marks)
3. Draw the two conformations of 1-isopropyl-4-methylcyclohexane at equilibrium showing the most favoured one giving reason for your answer. (4 marks)

**QUESTION 3 (20 MARKS)**

1. State two main approaches to asymmetric synthesis and offer their definitions (4 marks)
2. Draw the conformations of 1,3-dichlorocyclohexane at equilibrium and give a brief explanation about their optical activity and chirality status. (6 marks)
3. Define resolution as known in stereochemistry and name and briefly explain three types of resolutions. (6 marks)
4. Name and define the two phenomenon which constitute ring strain in cycloalkanes (4 marks)

**QUESTION 4 (20 MARKS)**

1. With an example explain whether geometrical isomerism is possible for single bonded compounds. (3 marks)
2. By drawing Newman projection formulas show how potential energy changes occur in chloroethane (use energy diagram) when the molecule is rotated around C2-C3 bond axis through a complete cycle. (8 marks)
3. Describe optical isomerism and with an explanation tell whether the following compound is optically active (6 marks)



1. Consider each of the following conformational structures and tell which is *cis* or *trans*: (3 marks)



**QUESTION 5 ( 20 MARKS)**

1. Draw the conformers of *trans*-1,3-dimethylcyclohexane and *trans-*1-tert-butyl-3-methycyclohexane at equilibrium and explain their difference in stability. (10 marks)
2. Using an example explain factors required to enhance substitution reaction in a substituted cyclohexane. (5 marks)
3. Deduce the structural formula for an optically active alkene, C6H12, which reacts with H2 to form an optically inactive alkane, C6H14 explain the reason for the loss of optical activity . (5 marks)