



JARAMOGI OGINGA ODINGA UNIVERSITY OF SCIENCE AND TECHNOLOGY
SCHOOL OF BIOLOGICAL AND PHYSICAL SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
EDUCATION SCIENCE
4TH YEAR 1ST SEMESTER 2013/2014 ACADEMIC YEAR
MAIN SCHOOL BASED

COURSE CODE: SCH 405

COURSE TITLE: SYNTHETIC ORGANIC CHEMISTRY

EXAM VENUE: CR 1

STREAM: (SBPS)

DATE: 29/04/14

EXAM SESSION: 9.00 – 11.00 AM

TIME: 2.00 HOURS

Instructions:

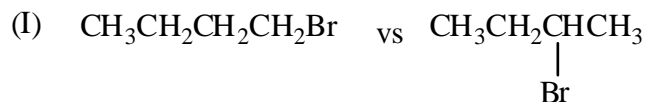
- 1. Answer ALL Questions in Section A and ANY other 2 questions**
- 2. Candidates are advised not to write on the question paper.**
- 3. Candidates must hand in their answer booklets to the invigilator while in the examination room.**

QUESTION 1

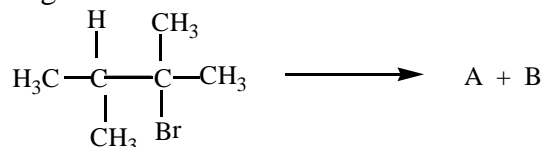
1. (a) Briefly discuss how the following factors affect the rate of organic synthesis reaction:
- (i) Temperature (6 marks)
 - (ii) Catalysis (4 marks)
- (b) What is the significance of “organic synthesis” (3 marks)
- (c) Name the four interrelated aspects which need to be considered in planning and designing synthesis. (2 marks)
- (d) What are the limitations of organic synthesis? (4 marks)
- (e) Write down all the basic unit processes in the nitration of benzene with a mixture of Sulphuric acid and name them. (6 marks)
- (f) Using a relevant example, explain what a regiospecific reaction is. (5 marks)

QUESTION 2

- (a) Which alkyl halide would you expect to react more rapidly by an SN^2 mechanism? Explain your answer. (6 marks)



- (b) With the aid of energy-reaction path diagrams, explain why the energy profile of SN^2 has only one transition state while SN^1 has two transition states. (8 marks)
- (c) State zaitsev's rule using the reaction below for illustration. (6 marks)



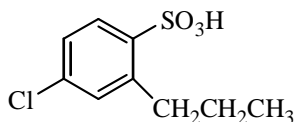
QUESTION 3

- (a) Outline the synthesis of 1-bromobutane from 1,2-dibromoethane and ethylbromide. Show all the necessary steps and the reaction mechanisms involved. (10 marks)
- (b) Synthesis of symmetrical ethers is achieved by dehydration of primary alcohols. An exception to this restriction is the synthesis of unsymmetrical ether from tert-butyl alcohol with a primary alcohol in sulphuric acid at room temperature. Give a likely mechanism for this reaction and explain why it is successful. (5 marks)
- (c) Give the products expected in the following reaction and, with reasons, predict the major product. (5 marks)



QUESTION 4

- (a) Define the following terms: (8 marks)
- (i) Nucleophile
 - (ii) Solvolysis
 - (iii) Electrophile
 - (iv) Hybridisation
- (b) Using examples, distinguish between heterolysis and homolysis. (6 marks)
- (c) A student required to synthesise 4-chloro-2-propylbenzenesulphonic acid in the laboratory.



Using retrosynthetic analysis, show how the specific synthons can be obtained. (8 marks)

QUESTION 5

- (a) Outline the mechanism and the expected products for the addition of Br₂ to *trans*-2-butene. (5 marks)
- (b) Briefly discuss the biosynthetic pathway that can be employed in the synthesis of the following compounds; (15 marks)
- (I) Quinines
 - (II) Nicotine