



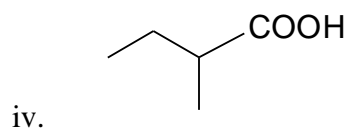
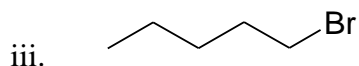
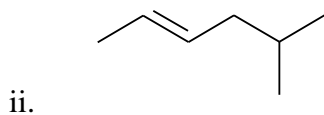
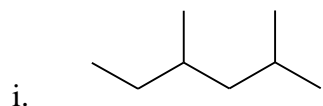
UNIVERSITY EXAMINATIONS
JARAMOGIOGINGAODINGAUNIVERSITY OF SCIENCE AND TECHNOLOGY
BACHELOR OF SCIENCE IN COMMUNITY HEALTH AND
DEVELOPMENT/PUBLIC HEALTH
FIRST YEAR SECOND SEMESTER EXAMINATIONS
SCH 3112/3121: BASIC ORGANIC CHEMISTRY
(KISUMU LEARNING CENTRE)

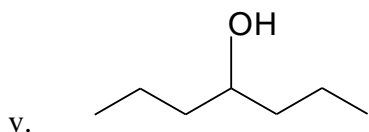
ANSWER ALL QUESTIONS IN SECTION A AND ANY TWO QUESTIONS IN SECTION B

SECTION A: ANSWER ALL QUESTIONS IN THIS SECTION (30 MARKS)

QUESTION 1 (30 marks)

- a) Define the following terms:
- i. Constitutional isomerism (2 marks)
 - ii. Hybridization (2 marks)
 - iii. Covalent bond (2 marks)
- b) (i) State and explain THREE rules which are followed when writing electronic configuration of atoms. (6 marks)
- (ii) Illustrate the simplest electronic configuration of carbon atom (Atomic no. = 6) (2 marks)
- (c) Give the systematic names of the following organic compounds:





(4 marks)

a) Define the following terms used in chemical reactions:

- i. Thermal cracking
- ii. Hydrogenation
- iii. Ozonolysis
- iv. Esterification

(4 marks)

b) Draw the structures of the organic compounds given below:

- i. Neohexane
- ii. 5-ethyl-3-methyloctane
- iii. 3-Aminopentanoic acid
- iv. 3,3-dimethyl-1-butene

(4 marks)

c) Write down the structural formulas for alkylbromides of the molecular formula C_4H_9Br . Name each according to the IUPAC system.

(4 marks)

QUESTION 2 (20marks)

a) Using methane explain why carbon atom is usually tetravalent in its compounds.

(4 marks)

b) A compound A, C_4H_8 , reacts with bromine to form $C_4H_8Br_2$.

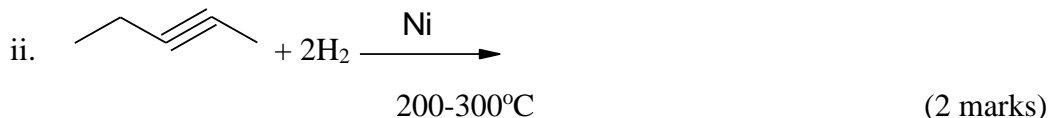
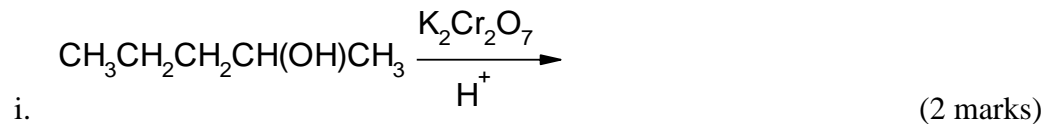
- i. Give one test (apart from ozonolysis) which will confirm the class of compounds to which A belongs. (1 mark)
- ii. Give the formula and systematic names of the isomers of A (3 marks)
- iii. An unsaturated compound A when treated with ozone it only gave one organic product B. Give the structure of A and B. (2 marks)

c) Explain the following observations:

- i. Aldehydes and ketones have higher boiling points than alkanes and alkenes of comparable atomic masses. (2 marks)
- ii. Alkanols can exhibit basic properties (2 marks)

iii. Carboxylic acids are stronger acids than alkanols of comparable number of carbon atoms. (2 marks)

d) Complete the reactions below and give the IUPAC name of the products:

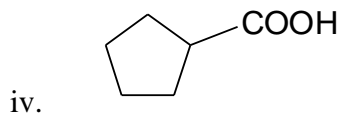
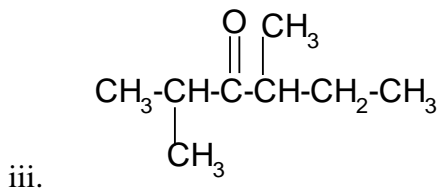
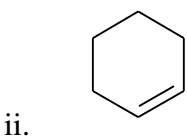
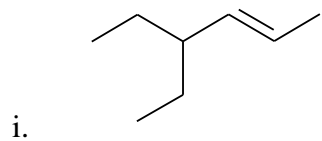


QUESTION 3(20marks)

a) Substances P and Q are carbonyl compounds of molecular formula C₃H₆O. P gives a positive test with Fehling's solution: Q gives a negative result with Tollen's reagent.

- Give the structural formula of P and Q (4 marks)
- Give the IUPAC names of the substances P and Q (2 marks)
- Give the mechanism for the reaction between 2-Butanone and hydrogen cyanide (HCN) (3 marks).

b) Give the systematic names of the following organic compounds:

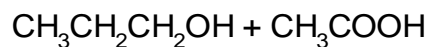


(4 marks)

c) (i) Starting with propene and HBr, show how you can synthesize propan-2-ol

(2 marks)

(ii) Complete the following reaction and name the product:



(2 marks)

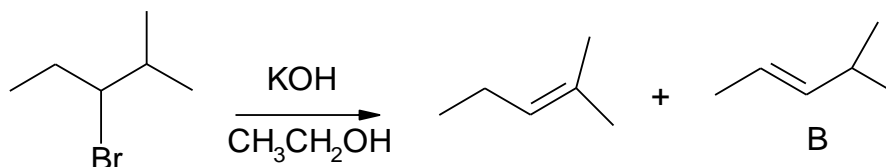
d) Draw the shorthand formula for the following compounds:

- i. 4,4-diethyl-2,3-dimethyldecane (1 mark)
- ii. 2-Iodopentane (1 mark)
- iii. Propyl alcohol (1 mark)

QUESTION 4 (20 marks)

a) (i) Explain the Zaitsev's rule (2 marks)

(ii) Study the reaction below and answer the questions that follow:



- I. Name the reaction above (1 mark)
- II. Identify with reasons which of the two products is predominant (2 marks)

b) Draw the structures of the following compounds:

- i. Ethylcyclohexane (2 marks)
- ii. 2,2,4-Trimethylheptane (2 marks)
- iii. 2-heptanone (2 marks)

c) Under appropriate reaction conditions, 2-bromo-3methylbutane can be converted into an alcohol

- i. Name the type of reaction taking place (1 mark)
- ii. Give the role of the reagent potassium hydroxide when it reacts with 2-bromo-3-methylbutane (1 mark)
- iii. Draw the structure of the alcohol (1 mark)
- iv. Outline a mechanism for the reaction (3 marks)

d) Arrange the following compounds in order of increasing acidity and explain your answer



(3 marks)

QUESTION 5 (20 marks)

a) (i) State Markovnikov's rule (2 marks)

(ii) Give the mechanism for the reaction of $\text{CH}_3(\text{CH}_3)\text{C}=\text{CH}_2$ with hydrogen halide (HCl). (3 marks)

(iii) Name the product formed in a (ii) above (1 mark)

(iv) Draw the structural formulae of the products formed when $\text{CH}_3\text{CH}_2\text{CH}_2(\text{CH}_3)\text{C}=\text{CHCH}_3$ reacts with ozone, water and zinc powder. (2 marks)

b) Illustrate the three main steps involved in the photo chlorination of methane (6 marks)

c) Complete each of the reactions below and give the systematic name of the product.

i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{OH} \xrightarrow{\text{Al}_2\text{O}_3, 623\text{K}}$ (2 marks)

ii)  $\xrightarrow{\text{Na}/\text{NH}_3}$ (2 marks)

iii) $\text{CH}_3-\overset{\text{Br}}{\underset{|}{\text{CH}}}-\overset{\text{Br}}{\underset{|}{\text{CH}}}-\text{CH}_3 \xrightarrow[\text{Alcohol, Heat}]{\text{Zn}}$ (2 marks)