# KIBABII UNIVERSITY

## UNIVERSITY EXAMINATIONS
## 2016/2017 ACADEMIC YEAR

### SECOND YEAR SECOND SEMESTER
### SUPPLIMENTRY EXAMINATIONS

**FOR THE DEGREE OF B.ED (SCIENCE)**

**COURSE CODE:** SCH 212

**COURSE TITLE:** INTRODUCTION TO ORGANIC CHEMISTRY

**DURATION: 2 HOURS**

**DATE: 21ST SEPTEMBER 2017 TIME: 3 – 5PM**

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**INSTRUCTIONS TO CANDIDATES**

- Answer **QUESTION ONE** (Compulsory) and any other two (2) Questions.
- Indicate **answered questions** on the front cover.
- Start every question on a new page and make sure question's number is written on each page.

This paper consists of **3** printed pages. Please Turn Over

**QUESTION ONE**

a. Define the following terms and in each case give atypical example. ( **10 marks**)

i. Electrophile

ii. Nuctrophile

iii. Inductive effect

iv. Hybridization

v. A free radical

b) When 25 $cm^3$ of the gaseous hydrocarbon, A, where exploded with 200 $cm^3$ of oxygen, the residual gas occupy 150 $cm^3$. After shaking the residual gas with excess gases with excess aqueous sodium hydroxide the final volume was 50 $cm^3$. (All volumes were measured at r.t.p).

i. Why was there a decrease in volume when the residual were shaking with aqueous sodium hydroxide, give the question. (**1 mark**)

ii. Calculate the molecular formula of A. Explain your working. (**2 marking**)

iii. Write the structural formulae of six possible compounds (cyclic and non cyclic) which A could be and give the systematic names for each of the six formulae. ( **8 marks**)

iv. Which of the six structural formulae shows compound which are ( **3 marks)**

a. Structural isomer

b. Stereoisomer

c. Optical

v. States the Markownikoff rule the predicting the direction for Electrophile addition of HBr to alkenes.(**2 Marks**)

a. Explain in details the rule in terms of relative stability of primary, secondary and tertiary carbanium ions.

b. Propene reacts with hydrogen bromide to give a compound A ($C_3H_7Br$). Compound A when heated with aqueous KOH gives alcohol B.

i) Derive structure for compound A and B. (**2 marks)**

ii) Explain and illustrate the meaning of the term base, nucleophile, and inductive effect by referring to the reaction of compound A with KOH under varies conditions. ( **7 marks**)

**QUESTION TWO 20 MARKS**

a. Write structure formula for a substrate that could be used to make $C_6H_5C_2H_5$ by an $SN_2$ reaction and show the nucleophile that would be used. ( **3 marks**)

b. Explain any three reasons why carbon is uniquely important (**3 marks**)

c. Write structural formulae for

i) Heptane

ii) 2- chloro-3-methyl-hexane

iii) 3-bromo -2-chloro-heptane

iv) Pentan-2-ol

v) Hex-2-ene

vi) Butanoic acid (**6 Mark**)

c)Explain the differences between

i) Homolytic fission and Heterolytic fission, give typical examples of each.( **3 Marks**)

ii) Substitution reaction and additional reaction give example of each reaction. ( **5 marks)**

## QUESTION THREE 20 MARKS

a. Explain carefully the following terms illustrating each by one example of your own choice.( **5 marks**)

i) Photochemical reaction in alkanes

ii) Reaction with trioxygen in alkenes

iii) Hydrogenation

iv) Cracking of alkanes

v) Saponification

b)Write the formulae to show the structures of the products in the reaction between the substances mentioned below.

i) Ethanol and concentrated sulphuric acid.

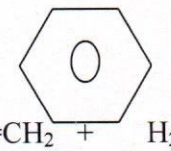
ii) Benzene and fuming sulphuric acid

iii) Ethanol and sodium hypochlorite

Iv) Phenyl amine, HCL, and sodium nitrite at 0 $^{o}$c

v) Propanone and sodium hydrogen sulphate (**5marks**)

c) Complete the following equations and write down the mechanism where possible (**10 marks**)

i)  $+ \ H_2SO_4 \longrightarrow$

ii) $CH_2{=}CH_2 + H_2SO_4 \ H_2O \longrightarrow$

iii) $CH_3CH_2CH_2Br + KOH \longrightarrow$

iv) $CH_3CH_2CH_2OH \xrightarrow{Cu/500\ ^{0}C}$

v) $CH_2=CH_2 + \frac{1}{2}O_2 \longrightarrow$

**QUESTION FOUR 20 MARKS**

i) State two properties of carbonium ions (**2 Marks**)

ii) What formula of the carbonium ion formed when propene reacts with hydrogen bromide to form 2- bromo propane?. (**2 Marks**)

iii) State class of carbonium ion formed above. (**1 Mark**)

iv) How does carbonium ion theory explains the fact that the principal product of the reaction between propene and HBr is 2- bromoprppane rather than 1-bromopropane?. (**3 Marks**)

v) In what way would you alter the condition in (iv) in order to prepare propene rather than propan-2-ol ( **3 Mark**)

vi) Predict the product of the following reaction, which takes place by the mechanism $S_N2$ (**4 Marks**)

$CH_3CH_2O^- + CH_3CH_2CH_2Br \longrightarrow$

vii) Write and name the possible isomers of $C_2H_4Cl_2$ (**4 Marks**)

viii) Explain how one of the isomers above reacts with potassium hydroxide. Indicate the equation of reaction and mechanism for the reaction (**4 Marks**)