





# **KIBABII UNIVERSITY**

## UNIVERSITY EXAMINATIONS 2017/2018 ACADEMIC YEAR

SECOND YEAR SECOND SEMESTER SUPLEMETARY EXAMINATIONS

FOR THE DEGREE OF B.ED (SCIENCE)

**COURSE CODE:** 

**SCH 212** 

**COURSE TITLE:** 

**BASIC ORGANIC CHEMISTRY** 

**DURATION: 2 HOURS** 

DATE:

11/10/2018

TIME: 3-5PM

#### 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 4 printed pages. Please Turn Over



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## **QUESTION ONE (30 MARKS)**

a) Draw the structures of the following compounds

(5 marks)

- i) 1,1,2-trimethylcyclopentane
- ii) propan-1-ol

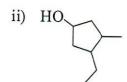
iii) diethylamine

iv) 2-butene

- v) 2-chlorohex-3-yne
- b) Give the IUPAC names of the following

(5 marks)

 $\begin{array}{ccc} \text{i)} & \underset{\text{Pr}}{\text{Br}} \\ & \text{CH}_{3}\text{CHCH}_{2}\text{CHCH}_{3} \\ & & \text{N(CH}_{3})_{2} \end{array}$ 



iii)(CH<sub>3</sub>CH<sub>2</sub>)<sub>2</sub>CHCH<sub>2</sub>CH(CH<sub>3</sub>)<sub>2</sub>

- iv) HC≡CCH<sub>2</sub>CH<sub>2</sub>CHCH<sub>2</sub>
- v) H<sub>2</sub>C=CHCH<sub>2</sub>OH
- c) Draw the trans and cis isomers of C<sub>4</sub>H<sub>8</sub> and give their names

(3 marks)

d) What is the hybridization of the indicated atom in each of the molecules below

(3 marks)

H<sub>3</sub>C OH

e) Which of the following molecules have a dipole moment of zero?

(3 marks)

- i)
- ii)
- iii)
- iv)
- )

vi)

H<sub>3</sub>C-Br

- CO<sub>2</sub>
- CH<sub>4</sub>
- $NH_3$
- CH<sub>3</sub>—OH
- CCI4
- f) Draw the condensed structures of a compound that contains only carbon and hydrogen atoms and that has:
- i) Three sp3 hybridized carbons

(1 mark)

ii) One sp3 hybridized carbon and two sp2 hybridized carbons

(1 mark)

iii) Two sp3 hybridized carbons and two sp hybridized carbons

(1 mark)

g) Draw Lewis structures of the following:

(5 marks)

- i) CH<sub>3</sub>NH<sub>3</sub><sup>+</sup>
- ii) CO3<sup>2</sup>-
- iii) OH
- iv) C<sub>2</sub>H<sub>2</sub>
- v) H<sub>2</sub>O
- h) Arrange the following alkyl halides in order of decreasing reactivity in an SN1 reaction

2-bromopentane, 2-chloropentane, 1-chloropentane, 3-bromo-3-methylpentane

(2 marks)

**QUESTION TWO (20 MARKS)** 

a) Assign formal charges to each atom.

(4 marks)

i) HNO<sub>3</sub>

ii) H<sub>3</sub>O<sup>+</sup>

iii) CH<sub>4</sub>

b) Using the symbols  $\delta^-$  and  $\delta^+$ , indicate the direction of polarity of the bonds.

(3 marks)

i) C-O

ii) Mg-C

iii) N-H

b) Complete the reactions below:

$$CH_3CH_3 \xrightarrow{Cl_2} A+B \xrightarrow{KOH} C marks)$$
 (3

c) Compare the reactions below.

(3 marks)

$$H_{3}C$$
 $+$ 
 $CH_{3}OH$ 
 $+$ 
 $H_{3}C$ 
 $OCH_{3}$ 
 $+$ 
 $HSCH_{2}CH_{2}CH_{3}$ 

c) Show all the carbocations formed, processes involved and name the products produced when 3-bromo-2,2-dimethylbutane undergoes  $S_{\rm N}1$  reaction with  $H_2O$  and also when it undergoes  $S_{\rm N}2$  with

OH.

(7 marks)

### **QUESTION THREE (20 MARKS)**

- a) Write the initiation, propagation and termination steps that occur when one mole of HBr is added to 2-methylpropene in presence of a peroxide (ROOR). (10 marks)
- b) The following are shapes that some molecules form. In each case give an example of a molecule that forms the shape and approximate the bond angles. (10 marks)
  - i) Bent

- ii) trigonal planer
- iii) trigonal pyramidal
- iv) tetrahedral
- v) linear

## **QUESTION FOUR (20 MARKS)**

a) Draw the E and Z isomers of the following molecules.

(6 marks)

- i) 1-bromo-2-chloropropene
- ii) 2-bromo-3-chlorobutene
- iii) 1,2-dichloroethene
- b) Draw Lewis structures for the four alcohols with molecular formula  $C_4H_{10}O$ . Classify each as a  $1^0$ ,  $2^0$  or  $3^0$  alcohol and give their names (8 marks)
- c) Which of the following carbocations would you expect to rearrange? Show and name the types of rearrangements that lead to products (6 marks)

i)

ii)

iii)

iv)

V)

ĊH<sub>2</sub>

CH:

CH<sub>3</sub>

CH₃CHĊHCH₃ I H