KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2021/2022 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER
SUPPLEMENTARY EXAMINATIONS

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 212

COURSE TITLE: ORGANIC CHEMISTRY I

DATE: 20/7/2022 **TIME:** 8:00AM-10:00AM

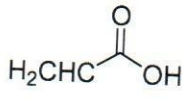
INSTRUCTIONS TO CANDIDATES

- 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

QUESTION 1 (30 MARKS)

a) Give the IUPAC names of the following compounds (5 marks)

i) $H_2C{=}CHCH_2OH$ ii) $HC{\equiv}CCH_2CH_2CH{=}CH_2$ iii)  iv) 

v) $(CH_3CH_2)_2CHCH_2CH(CH_3)_2$

b) Explain why:

i) The boiling point of thiols is lower than that of alcohols (2 marks)

ii) Carboxylic acids do not react with carboxylate ions (2 marks)

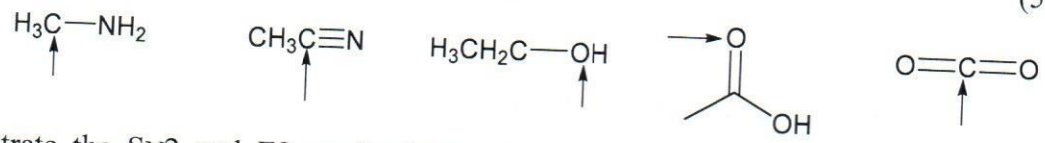
iii) Esters have lower boiling points than alcohols with a comparable molecular weight (2 marks)

c) Arrange in order of increasing basicity (1 mark)

d) Give the general formula of the following: (5 marks)

i) Alkanes ii) Aldehyde iii) Ester iv) Alkenes v) Alcohols

e) State the hybridization of the indicated atom. (5 marks)



f) Illustrate the SN2 and E2 mechanisms when 1-bromo-3-methylbutane reacts with sodium methoxide ($NaOCH_3$). (6 marks)

g) Define the term isomer (1 mark)

QUESTION 2 (20 MARKS)

a) By use of examples illustrate primary, secondary and tertiary:

i) Alcohols (3 marks)

ii) Carbons (3 marks)

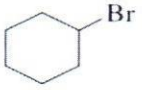
iii) Hydrogens (3 marks)

b) Draw the *ciz* and *trans* isomers of the following molecules. (6 marks)

i) 1-bromo-2-chloropropene
ii) 1-bromo-2-butene
iii) 1-bromo-2-chloroethene

c) Classify the following alkyl halide is primary, secondary, or tertiary. (4 marks)

a. $CH_3CH_2\underset{\displaystyle Cl}{\underset{|}{C}}HCH_3$

c. 

b. $CH_3\underset{\displaystyle CH_3}{\underset{|}{C}}HCH_2CH_2CH_2CH_2Cl$

d. $CH_3\underset{\displaystyle F}{\underset{|}{C}}HCH_3$

d) State how to distinguish Alkenes and alkanes with relevant chemical reactions (1 mark)

QUESTION 3

a i) Draw all the isomers of C_5H_{12}, give their IUPAC names and arrange them in order of decreasing boiling points. (7 marks)

ii) Give a reason for the order of boiling points (1 mark)

b) Complete the reactions below: (3 marks)

$$CH_3CH_3 \xrightarrow[UV]{Cl_2} A + B \xrightarrow{KOH} C$$

c) Name the steps that occur when one mole of HBr is added to 2-methylpropene in presence of a peroxide (ROOR). (9 marks)

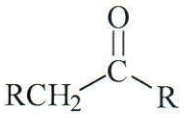
QUESTION 4

a) State three factors affecting an S_N2 reaction (4 marks)

b) Draw the resonance structures for CO_3^{2-} (3 marks)

c) 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)

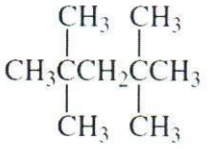
d) Give the mechanism for acid catalyzed keto-enol interconvertion of species below (5 marks)

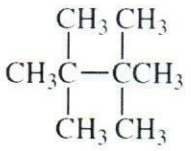


QUESTION 5

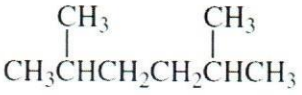
a) How many alkyl halides can be obtained from monochlorination of the following alkanes? **Name all** the alkyl halides formed in each case. (9 marks)

10

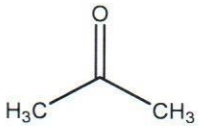
i) 

ii) 

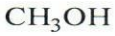
iii) 

iv) 

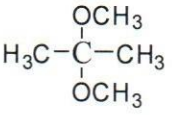
b) Using A and B as starting materials, illustrate by use of mechanism how C can be prepared using acid as a catalyst. (7 marks)



A



B



C

c) Draw the enol tautomer of the compound A using a base as catalyst. (4 marks)