KIBABII UNIVERSITY

UNIVERSITY EXAMINATIONS
2020/2021 ACADEMIC YEAR

SECOND YEAR FIRST SEMESTER
MAIN EXAMINATIONS

FOR THE DEGREE OF BSC (CHEMISTRY)

COURSE CODE: SCH 212

COURSE TITLE: ORGANIC CHEMISTRY I

DATE: 17/06/2021 **TIME: 8-10AM**

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.

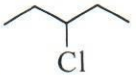
This paper consists of **3** printed pages. Please Turn Over

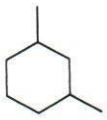
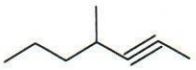
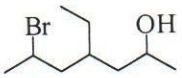
QUESTION 1 (30 MARKS)

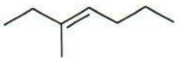
a) Give the general abbreviation for following functional (5 marks)

i) Alkanes ii) Akyl halides iii) Esters iv) Carboxylic acids v) Alkenes

b) Give the IUPAC names for each of the following compounds (5 marks)

i) 

ii)  iii)  iv) 

v) 

c) Draw the structures of the following compounds (3 marks)

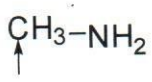
i) 1-hexen-5-yne ii) 2-propen-1-ol iii) 2-Methyl-4-ethylhexane

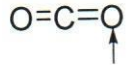
d) Draw **all** the possible resonance structures and the resonance stabilized hybrid to show the movement of electrons.

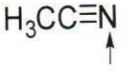
i) O_3 (3 marks)

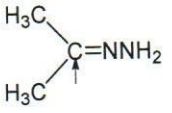
ii) CH_2NH_2 (3 marks)

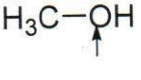
e) What is the hybridization of the indicated atom in each of the molecules below? (5 marks)

i) 

ii) 

iii) 

iv) 

v) 

f) Name and draw the isomers of but-2-ene (4 marks)

g) Carbon dioxide has two polar bonds, use a diagram to indicate these phenomenon and explain why the molecule has a dipole moment of zero. (2 marks)

QUESTION 2 (20 MARKS)

a) Name and show the steps involved in the tetrachlorination of methane in the presence of light (20 marks)

QUESTION 3 (20 MARKS)

a) Explain why:

i) Alkynes have higher boiling points than alkenes with the same number of carbon atoms. (3 marks)

ii) Steric factors contribute to the greater reactivity of both aldehyde and ketones. (3 marks)

iii) Aldehydes are more reactive than a ketones (3 marks)

iv) The melting points and boiling points of carboxylic acids are higher than those of hydrocarbons of comparable size.

(3 marks)

b) For each of the following pairs of S_N2 reactions, indicate which reaction occurs faster and give explanation. (8 marks)

a. $CH_3CH_2Br + H_2O$ or $CH_3CH_2Br + HO^-$

b. $CH_3\underset{\underset{CH_3}{|}}{C}HCH_2Br + HO^-$ or $CH_3CH_2\underset{\underset{CH_3}{|}}{C}HBr + HO^-$

c. $CH_3CH_2Cl + CH_3O^-$ or $CH_3CH_2Cl + CH_3S^-$
(in ethanol)

d. $CH_3CH_2Cl + I^-$ or $CH_3CH_2Br + I^-$

QUESTION 4 (20 MARKS)

a) How many alkyl halides can be obtained from monochlorination of the following alkanes? (12 marks)
Name all the alkyl halides formed in each case.

i) $CH_3CH_2CH_2CH_2CH_3$ ii) $CH_3\underset{\underset{CH_3}{|}}{C}HCH_2CH_2\underset{\underset{CH_3}{|}}{C}HCH_3$ iii) 

b) Use δ^- or δ^+ symbols to indicate polarity in these covalent bonds (3 marks)

i) N-O ii) H-S iii) C-N

c) Differentiate between an S_N1 and an S_N2 reaction. (5 marks)

Question 5 (20 marks)

a) State Zaitsev's rule (1 mark)

b) State the rate law for the E1 and E2 reactions respectively. (2 marks)

c) The reaction below undergoes an E_1 reaction. Write the mechanism of this reaction (5 marks)

$$\underset{\text{tert-butyl bromide}}{CH_3-\overset{\overset{CH_3}{|}}{\underset{\underset{Br}{|}}{C}}-CH_3} + H_2O \longrightarrow \underset{\text{2-methylpropene}}{CH_2=\overset{\overset{CH_3}{|}}{C}-CH_3} + H_3O^+ + Br^-$$

d i) Write an equation showing the products of reaction 2-bromopentane in methanol proceeding via an E2 reaction mechanism. (1 mark)

e) Show all the carbocations formed, processes involved and name the products produced when 3-bromo-2,2-dimethylbutane undergoes S_N1 reaction with H_2O and also when it undergoes S_N2 with
^-OH. (11 marks)