



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 - Meru-Kenya.

Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293

Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2020/2021

FIRST YEAR, SECOND SEMESTER EXAMINATION FOR THE DEGREE OF
BACHELOR OF SCIENCE BIOLOGICAL, BIOCHEMISTRY,
CHEMISTRY, PHYSICAL SCIENCES AND BACHELOR OF EDUCATION

SCH 3152: ORGANIC CHEMISTRY I

DATE: JULY 2021

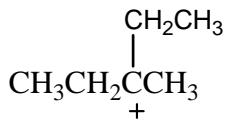
TIME: 2 HOURS

INSTRUCTIONS: Answer question **one** and any other **two** questions.

USEFUL DATA : ATOMIC NUMBERS : H=1, C= 6; O=8; N=7; F=9; Br=35; I=53; Cl=17

QUESTION ONE (30 MARKS)

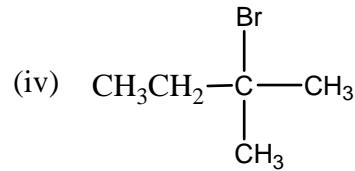
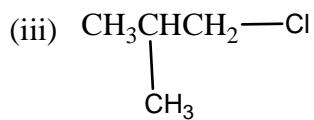
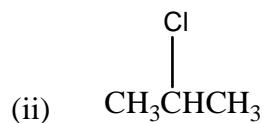
- a) Explain the following terms concisely: (4 Marks)
- Homologous series
 - Functional group
 - Catenation
 - Substitution reaction
- b) Draw all the constitutional isomers of $C_4H_{10}O$ and give their systematic (IUPAC) name. (4 Marks)
- c) Write down the systematic name of the following molecule.
- (i)
$$\begin{array}{c} \text{CH}_3 \\ | \\ \text{CH}_3\text{CH}_2\text{CHCH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \\ | \\ \text{CH}_2\text{CH}_3 \end{array}$$
- (ii)
$$\text{CH}_3\text{C}\equiv\text{C}—\underset{\text{H}_2}{\text{C}}—\text{C}\equiv\text{C}—\text{CH}_3$$
- d) Which of the following carbocations is more stable than the other? Explain. (2 Marks)



- e) (i) What is a hybrid orbital? (1 Mark)
- (ii) What shapes are associated with the sp , sp^2 and sp^3 hybrid orbital? (1 Mark)
- (iii) On the basis of the concept of hybridization of atomic orbital, predict the shapes and bond angle of BeF_2 , CO_2 and BF_3 (3 Marks)
- f) Distinguish between inductive and electrometric effect, giving one example in each case (3 Marks)
- g) Describe simple chemical tests that would distinguish between an butane and an butane (2 Marks)
- h) Explain the following observations.
- (i) The melting point of hexane is higher than of heptanes (2 Marks)
- (ii) Chlorination of methane is an exothermic process yet UV light is required (2 Marks)
- i) Give the necessary condition(s) to effect the transformation;
- (i) $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_3 \xrightarrow{?} \text{C}_6\text{H}_6 + 4\text{H}_2$ (1 Mark)
- (ii) $\text{CH}_3\text{CH}_2\text{CH}=\text{CHCH}_3 \longrightarrow \text{CH}_3\text{CH}_2\text{CH}(\text{OH})\text{CH}(\text{OH})\text{CH}_3$ (1 Mark)
- j) A sample of CH_4 weighing 9.67mg produced 26.53mg of CO_2 and 21.56mg of H_2O . Determine the percentage of C and H in the sample. (2 Marks)

QUESTION TWO (20 MARKS)

- a) Arrange the following in the order of increasing acidity CH_4 , CH_3 , H_2O and HF . Explain your answer. (4 Marks)
- b) Explain the observation “ phenol is more acidic than alcohol” (1 Mark)
- c) Show the initiation, propagation and termination steps for the monochlorination of ethane. (5 Marks)
- d) (i) What are alkyl halides? (1 Mark)
- (ii) Give the common and IUPAC names of the following alkylhalides



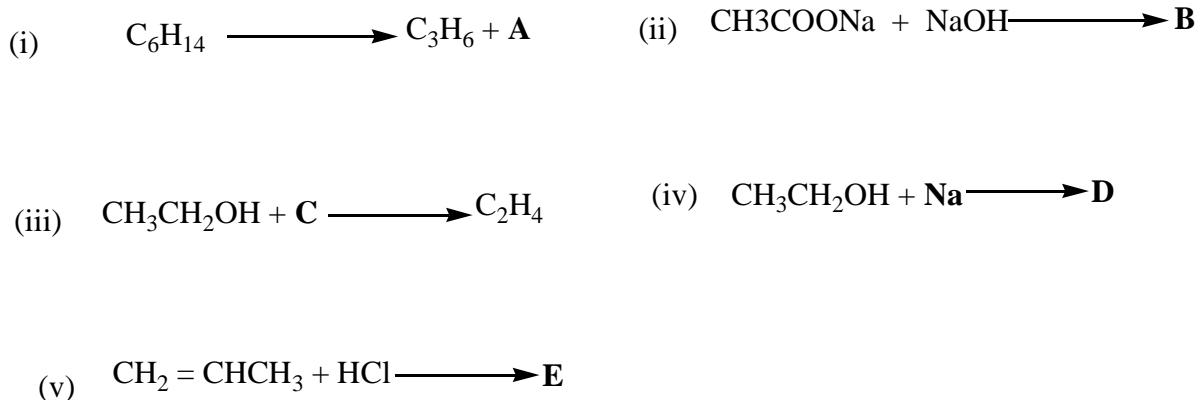
- e) Write the conjugate base of (i) $\text{C}_2\text{H}_5\text{OH}$ (ii) HCO_3^- (iii) $[\text{Al}(\text{H}_2\text{O})_6]^{3+}$ (3 Marks)

QUESTION THREE (20 MARKS)

- a) Distinguish between heterolytic and homolytic fission of a covalent bond (2 Marks)
b) The table below shows how the boiling points of alkanes vary as the number of carbon atoms in the chain increases.

<u>Alkane</u>	<u>B.P (°C)</u>
Methane	-161
Ethane	-89
Propane	-42
Butane	0
Pentane	36
Hexane	69

- (i) Sketch the graph to show the trend in b.p of these alkanes (4 Marks)
(ii) Explain the trend in the graph (2 Marks)
c) Describe Lassaigne's test to detect nitrogen in an organic compound containing halogen (3 Marks)
d) Describe briefly how you would separate a mixture of amino-acids chromatographically. (4 Marks)
e) Identify the reagent or product A,B,C, D and E in the reaction below (5 Marks)



QUESTION FOUR (20 MARKS)

- a) Briefly explain the following intermolecular forces. (6 Marks)
- (i) Dipole – dipole forces
 - (ii) Hydrogen bonds
 - (iii) London forces
- b) Give two criteria of purity of organic compounds (2 Marks)
- c) 0.20g of an anhydrous acid gave on combustion 0.04g H_2O and 0.195g CO_2 . The acid is found to be dibasic and 0.5g of its silver salt leaves on ignition 0.355g silver. Determine the ;
- (i) Empirical formula (3 Marks)
 - (ii) Molecular formula (2 Marks)
 - (iii) Structural formula (2 Marks)
- d) Using Newman's projection draw the conformations of 1,2 dichloromethane(5 Marks)