



(University of Choice)

**MASINDE MULIRO UNIVERSITY OF
SCIENCE AND TECHNOLOGY
(MMUST)**

(MAIN CAMPUSES)

**UNIVERSITY EXAMINATIONS
2022/2023 ACADEMIC YEAR**

FIRST YEAR SECOND END OF SEMESTER EXAMINATIONS

**FOR THE BACHELOR OF SCIENCE
IN
EPIDEMIOLOGY AND BIostatISTICS**

COURSE CODE: HEM 127

COURSE TITLE: ORGANIC CHEMISTRY

DATE: 14/04/2023

TIME: 3.00-5.00 PM

INSTRUCTIONS:

ANSWER ALL QUESTIONS IN SECTION A, AND ANY TWO IN SECTION B

TIME: 2 Hours

MMUST observes ZERO tolerance to examination
cheating

N/B

Avogadro's constant – 6.022×10^{23}

Molecular mass of Ca = 40, C = 12, O = 16, Cu = 63.5

SECTION A: ATTEMPT ALL THE QUESTIONS IN THIS SESSION (40 MARKS)

1. Define the following terms (4 marks)
 - a. Covalent bond:
 - b. Electronegativity:
 - c. Catenation Definition:
 - d. Nucleophile:
2. What is the importance of studying organic chemistry to Epidemiology and Statistics students (4 marks)?
3. Draw at least FOUR (4) structural isomers for hexane C_6H_{14} (4 marks)
4. Crude oil contains a mixture of hydrocarbons that boil at different temperatures. It is separated into useful fractions by fractional distillation. Describe how crude oil can be separated using a fractionating column. (4 marks)
5. You are given the electronic configuration of five neutral atoms – A, B, C, D and E. A- $1s^2 2s^2 2p^6 3s^2$; B- $1s^2 2s^2 2p^2 3s^1$; C- $1s^2 2s^2 2p^1$; D- $1s^2 2s^2 2p^5$; E- $1s^2 2s^2 2p^6$. Write the empirical formula for the substances containing: (4 marks)
 - I. A and D
 - II. B and D
 - III. Only D
 - IV. Only E
6. Calculate the mass of 12.044×10^{23} carbon atoms. (4 marks)
7. Using a structure of carbocations differentiate between primary, secondary and tertiary carbocations (4 marks)
8. Using a diagram differentiate between the Cis-trans isomerism and E and Z notation? (4 marks)
9. Calculate the number of sulphate (SO_4^{2-}) ions in 100 mL of 0.001 M H_2SO_4 solution (4 marks)
10. Name some of the rules of alkene nomenclature (4 marks)

SECTION B: ANSWER ANY OF THE TWO QUESTIONS IN THIS SESSION (30 MARKS)

1. a) When propane reacts with oxygen, energy is given out. Propane transfers 50 kJ/g when it burns. A propane burner is used to boil 200 g of water to make a cup of tea. The initial temperature of the water is 15°C. How many grams of propane are needed to heat this water? [5 marks]
- b) Draw the Lewis structure of the following molecules and ions and tell in which case/cases the octet rule is violated CO₂, SO₂, BeCl₂, NH₃, AlCl₃, PCl₅, CO₃²⁻ (10 marks)
2. In a tabular form differentiate between Alkane, Alkene and Alkyne (15 marks)
3. a) Which bond do you expect to be stronger in each of the following cases and why? (5 marks)
 - I. H-H, Cl-Cl
 - II. O₂, N₂
 - III. F-F, Cl-Cl
- b) A chemical analysis of a sample of methyl acetate provides the following elemental data: 48.64% carbon (C), 8.16% hydrogen (H), and 43.20% oxygen (O). If the molar mass of the compound is 138.204 g/mol, what is the molecular formula? (10 marks)

