LAIKIPIA UNIVERSITY

UNIVERSITY EXAMINATIONS

SECOND SEMESTER 2023/2024 ACADEMIC YEAR

FIRST YEAR EXAMINATION FOR THE DEGREES OF BACHELOR OF EDUCATION (SCIENCE), BACHELOR OF SCIENCE (GENERAL), BACHELOR OF SCIENCE (AGED) BACHELOR OF SCIENCE (ENSC) BACHELOR OF SCIENCE (BIOMED)

CHEM 122: ORGANIC CHEMISTRY I

STREAM: R ***TIME: 2 HRS***

DAY: THURSDAY [8.30 -10.30 A.M] ***DATE: 11/04/2024***

THIS QUESTION PAPER CONSISTS OF FOUR (4) PAGES

PLEASE DO NOT OPEN UNTIL THE INVIGILATOR SAYS SO.

INSTRUCTIONS: Attempt **ALL t**he Questions

QUESTION ONE (30 MARKS)

a). Draw the structures of each of the following compounds **(3 Marks)**

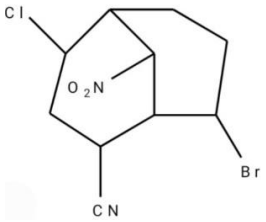
i. 1-Bromo-2-chloro-5-fluoro-6-methyloctane

ii. 2,3- Dibromo-4-methylheptanal

iii. 4- Chloro-2-fluoro-7-methylbicyclo[3.2.2]nonane

b). Use IUPAC naming system to name the following compounds **(3 Marks)**

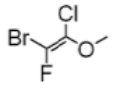
i)



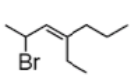
ii) $CH_3CH_2CH(Br)CCCH_2CH_2CH_2CH_3$

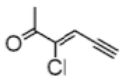
iii) $CH_3CH_2CH_2CCl_2CH_2CCCH_2CH_2CH_3$

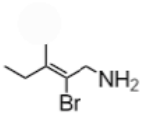
c). Assign E or Z configuration to the following compounds. **(5 Marks)**

(i) 

(ii) 

(iii) 

(iv) 

(v) 

d). i). What is hybridization? **(1 mark)**

ii). Draw the energy level diagrams of sp^3, sp^2 and sp hybridization by using ethane, ethene and ethyne respectively as examples. Give their characteristics and predict their shapes. **(9 Marks)**

e). A compound was found to contain 54.53% Carbon, 9.15% Hydrogen and X% Oxygen by weight. Find its molecular formula given that its molecular weight is 132.16 g/mol.

(5 marks)

(Atomic masses, C=12.01, H=1.008, O=15.99)

f). Describe any one simple chemical test that would distinguish between each of the following compounds. **(4 Marks)**

i). Pentane and Pentene

ii). Butanal and Butanone

QUESTION TWO (20 MARKS)

a). State Markovnikov's rule. **(1 Mark)**

b). By use of an example, give a chemical reaction that exhibits Markovnikov's rule. **(2 Marks)**

c). Use appropriate examples to explain the following reactions of alkenes. **(6 Marks)**

i) Hydrogenation

ii) Polymerization

iii) halogenation

d). Explain 1^o, 2^o, 3^o and 4^o Carbon by giving an appropriate example of each. **(4 Marks)**

e). i. What is an isomer? **(1 Mark)**

ii. Give the structural formulae and IUPAC names for the isomers of Pentane.

QUESTION THREE (20 MARKS) **(6 Marks)**

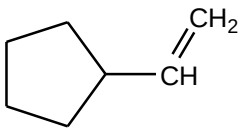
Clearly explain the initiation, propagation and termination mechanism of free radical substitution in halogens and alkanes to form haloalkanes. **(6 Marks)**

b). Draw and give the IUPAC names for the products A-F in the following reactions **(9 Marks)**

i, $CH_3CH_2CCCH_3$ → (H_2/Pd → A; $Na/NH_{3(l)}$ → B)

ii, $CH_3CH_2CH_2CH_2CH(OH)CH_3 \xrightarrow[170^oC]{20\%\ H_2SO_4} C + D + H_2O$

iii, $CH_3C(CH_3)CH_2 \xrightarrow[H_2O_2]{HBr} E$

iv,  $\xrightarrow{H_2,\ Pt}$ F

c). Define the term catenation with respect to the carbon atom. **(1 Mark)**

d). State the physical properties of Alkynes. **(4 Marks)**