TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT OF PURE & APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

DIPLOMA IN ANALYTICAL CHEMISTRY

ACH 2I07: ORGANIC CHEMISTRY I

ORDINARY EXAMINATION

SERIES: December 2024.

TIME: 2 HOURS

DATE: Pick Date December 2024.

Instructions to Candidates

1. You should have the following for this examination

-Answer Booklet, examination pass, scientific non-programmable calculator and student ID

2. This paper consists of **FIVE** questions. Attempt all questions in **QUESTION ONE** and any other **TWO** questions.

3. **Do not write on the question paper.**

QUESTION ONE - (30 MARKS)

a) Define the following terms;

(i) Hybridization (**2 marks**)

(ii) Hydrocarbon (**1 mark**)

(iii) Catenation **(1 mark)**

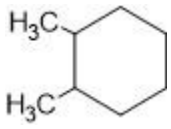
(iv) Tertiary carbon **(1 mark)**

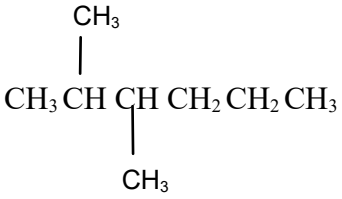
(v) Carbanion **(1 mark)**

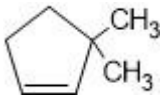
(vi) Carbocation **(1 mark)**

(vii) Nucleophile **(1 mark)**

b) Give the IUPAC names of the following compounds; **(8 marks)**

i. 

ii. 

iii. 

iv. 

c) Caffeine has an elemental analysis of 49.48% carbon, 5.190% hydrogen. 16.47% oxygen and 28.85% nitrogen. It has a molar mass of 194.19 g/mol. Determine the molecular formula of caffeine. (C= 12.0, H = 1.0, O = 16, N = 14) **(10 Marks)**

d) Indicate the functional group of the following compounds. **(4marks)**

(iii) Alkynes. (iv) Alkenes. (v) Ketones. (iv) Aldehydes.

Question two (15 marks)

a) By use of barbed arrows (fish hook arrows) to show the flow of an electron, describe the mechanism for the monobromination of ethane. Name each step involved in the mechanism. **(10 marks)**

b) Define the term functional group. **(2 marks)**

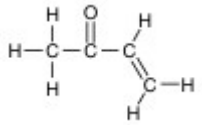
c) Show the polarity of the C-O, C-N and C-Cl in the following molecules: **(3 marks)**

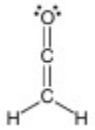
(i) $CH_3 CH_2 OH$ **(ii)** $CH_3 CH_2 NH_2$ **(iii)** $CH_3 CH_2 Cl$

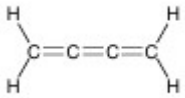
Question three (15 marks)

a. Using the idea of hybridization, illustrate the bonding in ethane. **(10 marks)**

b. Indicate the type of hybridization for each of the carbon atoms in the following molecules (5 marks)

i. 

ii. 

iii. 

Question four (15 marks)

a) Briefly explain the following observations and where appropriate use chemical equations for clarity;

(i) Pentane is a liquid while butane is a gas. **(2 marks)**

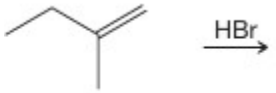
(ii) Hexane does not dissolve in water while methanol does. **(2 marks)**

(iii) Ethane decolorize bromine solution in presence of light while Ethene decolorize the same in absence of sunlight. **(4 marks)**

b) Give the products of each of the following reactions;

i. 

(2.5 marks)

ii. 

(2.5 marks)

c) State Markovnikov's rule **(1 mark)**

d) Explain the limitation of Wurtz reaction in the preparation of alkanes. **(1 mark)**

Question five (15 marks)

a. Draw all the constitutional isomers of $C_4H_{10}O$ and give their systematic (IUPAC) names **(4marks)**

b. Briefly explain the following intermolecular forces. **(6 marks)**
(i) Dipole – dipole forces **(ii)** Hydrogen bonds **(iii)** London forces

c. Using Newman's projection draw the conformations of 1,2 dichloromethane **(5 marks)**