



# Technical University of Mombasa

Faculty of Applied and Health Sciences

**DEPARTMENT OF PURE AND APPLIED SCIENCES**  
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF  
TECHNOLOGY IN APPLIED CHEMISTRY

## **ACH 4105: ORGANIC CHEMISTRY I**

SPECIAL/SUPPLEMENTARY EXAMINATION

MARCH 2014 SERIES

2 HOURS

Instructions to candidates:

This paper consist of **FIVE** questions

Answer question **ONE** (compulsory) and any other **TWO** questions

### Question ONE

a) State the functional groups of the following homologous series

- (i) Alkynes
- (ii) Amines
- (iii) Ketones
- (iv) Aldehydes
- (v) Carboxylic acids
- (vi) Alkanols

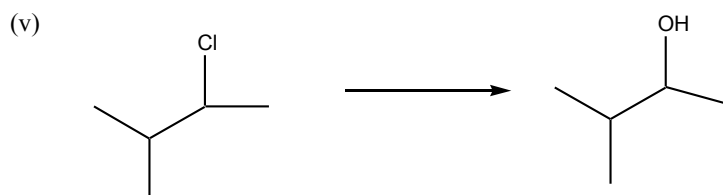
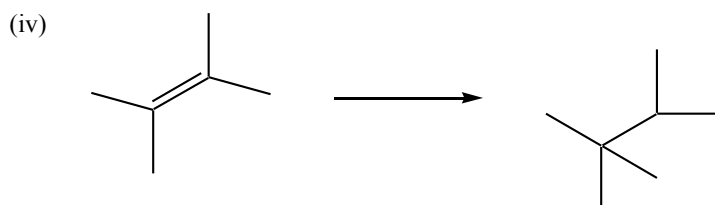
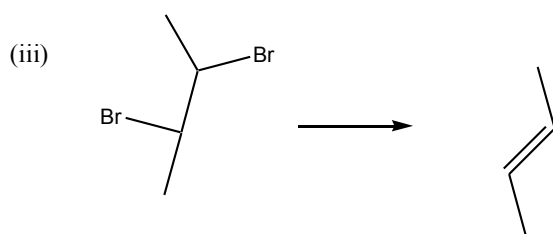
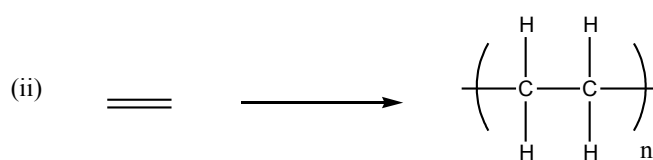
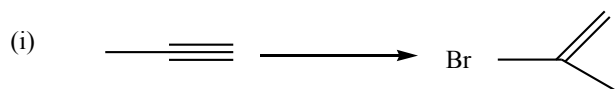
(6marks)

b) Draw the arrows corresponding to the following as used in organic chemistry

- (i) Resonance
- (ii) Equilibrium
- (iii) Movement of a pair of electrons
- (iv) Movement of one electron

(4marks)

c) State the reagents that can be used to accomplish the following conversions



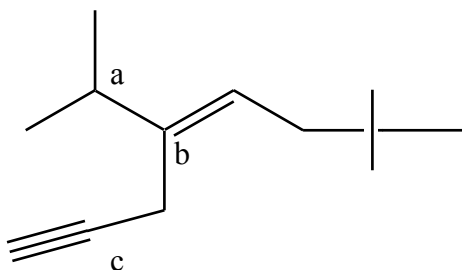
(5marks)

d) Draw the Lewis structures (Stricks for bonds and dots for lone pairs) for the two molecules below.



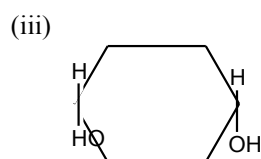
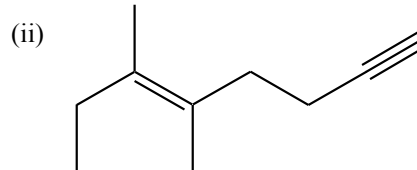
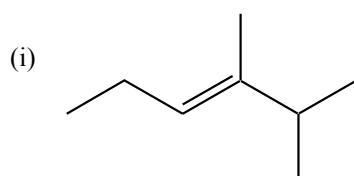
(4marks)

- e) For the compound below, explain the type of hybridization adopted by the labeled carbon atoms



(3marks)

- f) Name the following compounds using IUPAC system indicating stereochemistry where appropriate



(6marks)

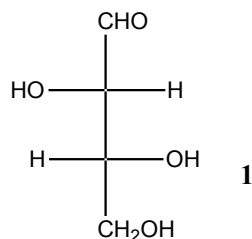
- g) Draw the structures of the following compounds indicating stereochemistry where appropriate.

(i) 4-Bromohept-2E,4E – diene (1mark)

(ii) Cis -4-Bromocyclohexan-1-ol (1mark)

## Question TWO

- a) (i) Draw and indicate by an asterick the asymmetric carbon atoms in the compound I below



**(2marks)**

(ii) Draw and name two geometric isomers derived from dehydration at carbons 2 and 3 of compound 1 **(5marks)**

b) Draw and name the two of the most common conformations of ethane molecule using Newman projection. **(4marks)**

c) (i) Explain the term nucleophile giving an example **(3marks)**

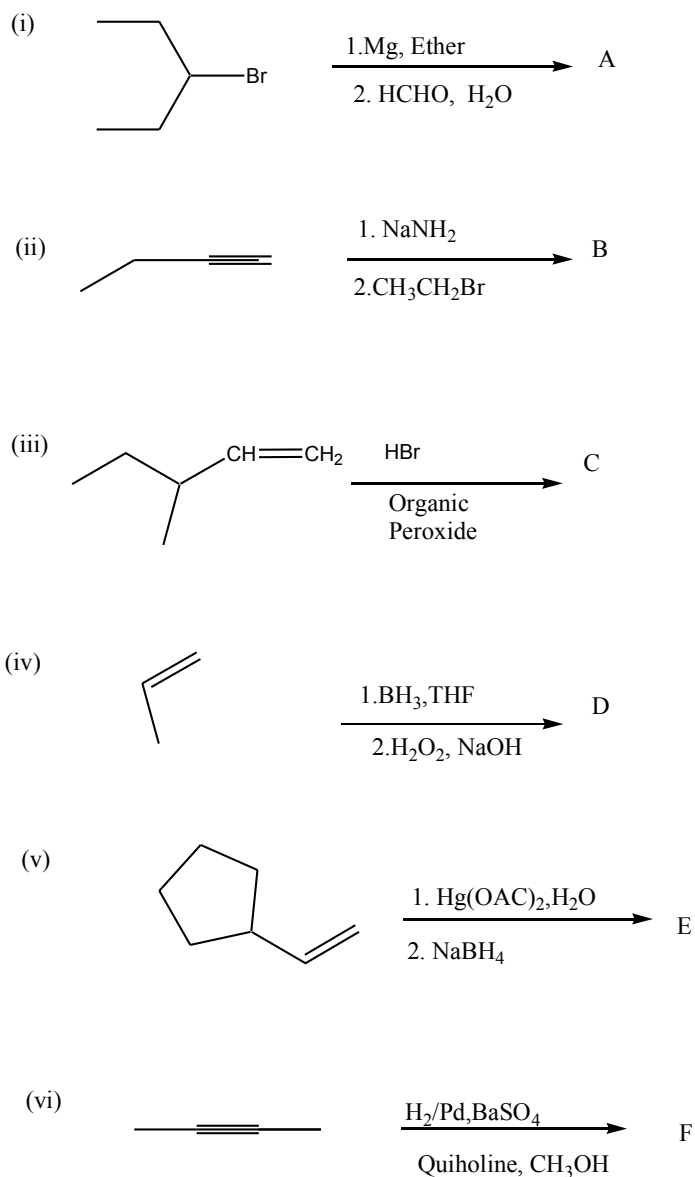
(ii) Provide a mechanistic explanation for the observed product in the following reaction.



**(6marks)**

### Question THREE

a) Draw the structure and name the major products A – F of the following reactions



b) Write the mechanism for the addition reaction in a (iii) above **(6marks)**

c) (i) Ethene and ethanes can be differentiated by using acidified potassium permanganate.

**(2marks)**

(ii) State all the steps in free radical monobromination of ethane in U.V. light.

**(6marks)**

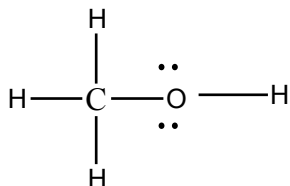
#### Question FOUR

a) Suggest the type of reaction that causes the following transformations

- b) (i) Give the IUPAC names of the four reactants in 4(a) above **(4marks)**  
 (ii) Suggest the possible reagents for reaction a(i) to (iv) above **(4marks)**
- c) Write the mechanism for the dehydration of 1-propanol using sulphuric acid **(7marks)**

### Question FIVE

- a) Explain the following terms
- (i) Structural isomerism  
 (ii) Alicyclic compound  
 (iii) Aliphatic compound **(6marks)**
- b) Analysis of indigo dyestuff gave 73.3% C 3.8% H, 10.7% N and the rest oxygen by mass. (C=12, H = 1, O = 16, N = 14 RFM = 254). Work out the
- (i) Empirical and molecular formulae of the compound. **(6marks)**  
 (ii) Double bond equivalence for the compound in (b) above **(2marks)**
- c) Work-out the formal charge for each of the atoms in the compound below.

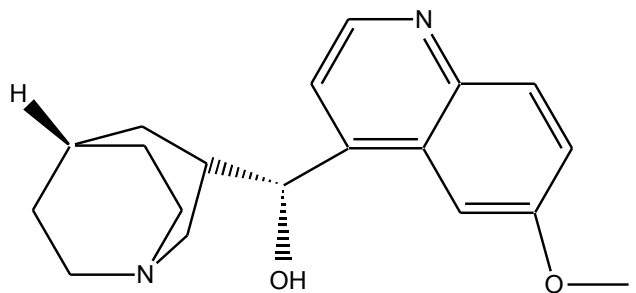


**(3marks)**

d) Identify any three functional groups in alkaloid guanine show below

Compound 2 isolated from the bark of a variety of cinchona trees used to treat malaria.

**(3marks)**



2