



Technical University of Mombasa

Faculty of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES
UNIVERSITY EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE IN
BUILDING & CIVIL, ELECTRICAL AND ELECTRONICS
ENGINEERING AND MECHANICAL & AUTOMOTIVE ENGINEERING

SCH 2108 : CHEMISTRY II

SPECIAL/SUPPLEMENTARY EXAMINATION

FEBRUARY 2013 SERIES

2

HOURS

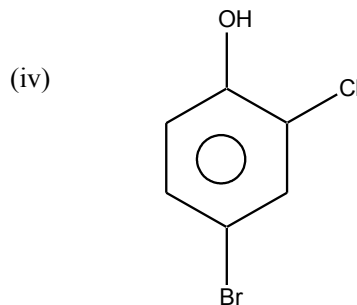
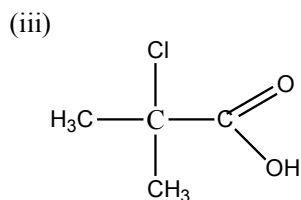
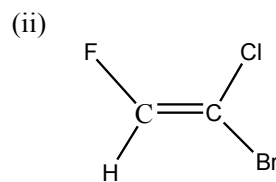
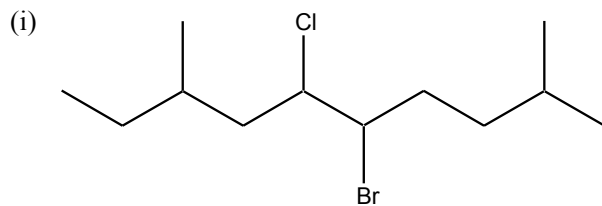
Instructions to candidates:

This paper consist of **FIVE** questions

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

Question ONE

- a) Give the IUPAC name to each of the following compounds, indicating stereochemistry where appropriate:



(4marks)

b) Draw the structure of each of the following compounds:

- (i) (E)-1-Bromo,-1,2-dichloroethene
- (ii) 4-Chloro-2-ethyl-1-methylcyclohexane
- (iii) 3-Hydroxy-4-iodo-4-methylpentan-2-one
- (iv) 2,3,4-Trimethyl pentanal

(4marks)

c) Give the structure of all possible dehydration products of 2,3-dimethyl-3-pentanol

(4marks)

d) A compound of carbon, boron and hydrogen was found to contain 32.77% carbon and 59.00% boron by mass.

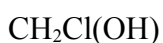
Determine its empirical formula. (C =12.01, B = 10.81, H = 1.008) **(3marks)**

e) Predict the hybridization of the indicated carbon atom in each of the following molecules :-

- (i) $\underline{\text{C}}\text{H}_2\text{O}$
- (ii) $\text{H}_2\underline{\text{C}}\text{CCH}_2$
- (iii) $\text{H}_3\underline{\text{C}}\text{CCH}$

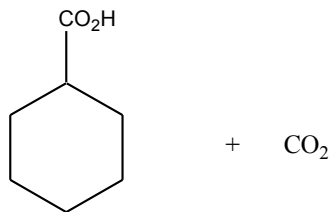
(3marks)

f) Draw the following molecule in three dimension



(1mark)

g) Give the structure of the compound that gives the following products upon reaction with ozone.

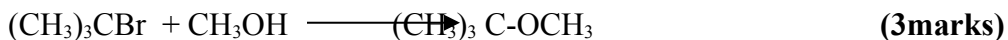


(2marks)

h) Explain why tertiary carbocations are more stable compared to other classes of carbocations **(3marks)**

i) Explain the term carbohydrate **(1mark)**

j) Write the reaction mechanism for the following transformation, using curly arrows:



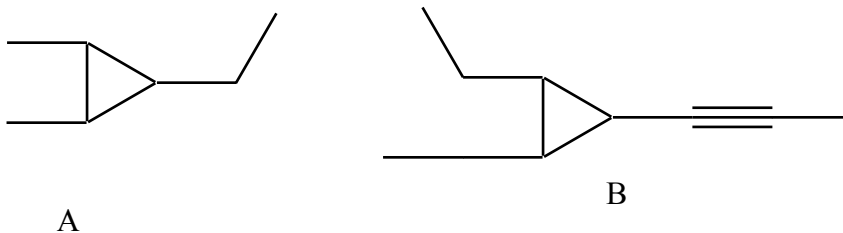
k) State the functional groups found in an amino acid. Hence, classify the following amino acids whether aromatic, aliphatic, acidic or basic:

- (i) Alanine
- (ii) Tryptophan

(2marks)

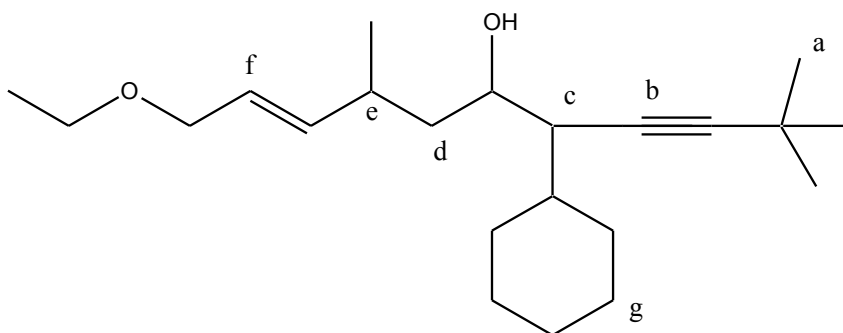
Question TWO

a) Give three simple visual tests you would perform to differentiate between the pair of the compounds below. Explain what happens in each case.



(6marks)

b) You are provided with the structure of an organic compound 1 below.

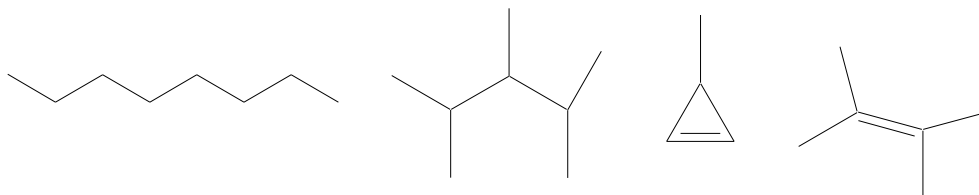


Compound 1

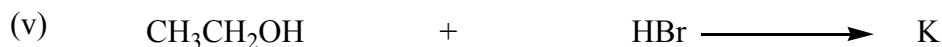
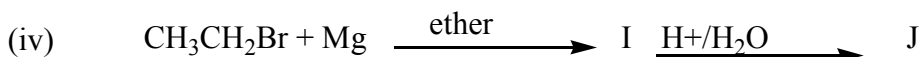
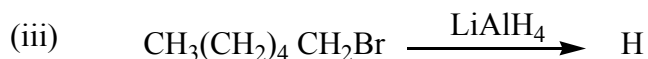
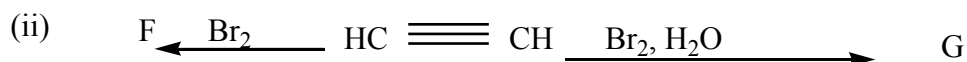
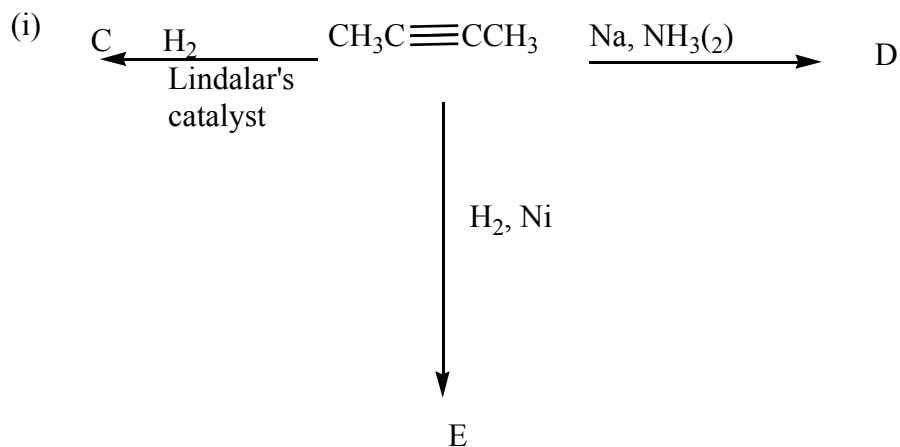
- (i) Indicate the type hybridization present on the carbon labeled a **(1mark)**
 - (ii) Show diagrammatically how electrons are hybridized in carbon b **(3marks)**
 - (iii) Using letters, name a tertiary carbon in **1** **(1mark)**
 - (iv) Draw and label all functional groups in compound **1**. **(2marks)**
 - (v) Arrange the carbon-carbon bonds in compound **1** in the increasing order of bond length.
(1mark)
 - (vi) Indicate the carbon atoms which might be affected when the compound is exposed to ozone (O₃) **(1mark)**
- c) When 7.36mg of carbon tetrachloride (CCl₄) was heated in a bomb with sodium peroxide, the chloride ion liberated yielded 25.43mg silver chloride. (Cl = 35.45, Ag = 107.87, C= 12.01)
- (i) Calculate the % of chlorine indicated by this analysis. **(3marks)**
 - (ii) Determine the % of chlorine that would be expected from CCl₄ **(2marks)**

Question THREE

- a) You are provided with the following compounds

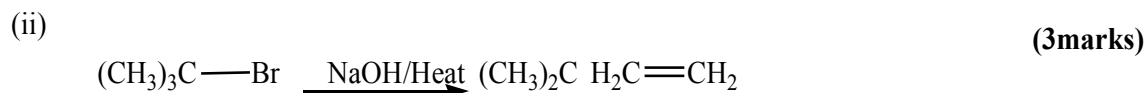
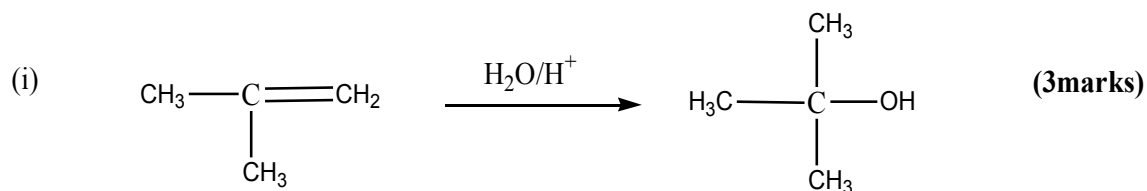


- (i) Arrange the compounds in order of decreasing octane number. **(2marks)**
 - (ii) Explain your answer in (a) (i) above **(2marks)**
- b) Provide the structures of the major organic products (C-L) obtained from the following reactions, showing stereochemistry where possible:



(10marks)

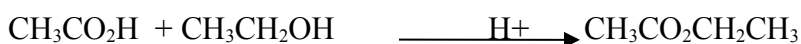
c) Write the reaction mechanism for the following transformations



Question FOUR

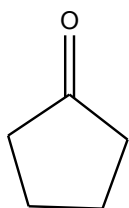
- a) A reaction of 42.5ml of ethanoic acid (density 1.049g/ml) and 87.9ml of ethanol (density 0.785g/ml) in a small amount of conc.acid(1ml) yielded 43.6g of ethanoate according to

the following equation:

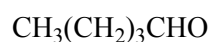


- (i) Give the name of the reaction above. **(1mark)**
- (ii) Calculate the % yield of the ethanoate **(4marks)**
- (iii) Give reasons why 100% yield of the ethanoate is not practicable. **(2marks)**
- (iv) State the limiting reagent in the reaction above. **(1mark)**

b) Give three simple visual chemical tests you would perform to differentiate between the following compounds:

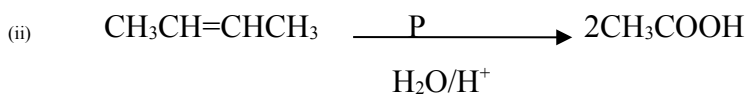
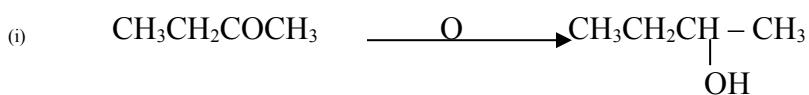


Compound M



Compound N

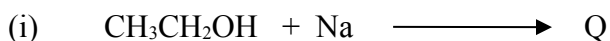
- c) Compare the reactivity of the two compounds in (b) above, (M and N) stating with reason which one is more reactive towards nucleophilic addition **(3marks)**
- d) Arrange the following aldehydes in terms of increasing reactivity and give reasons for your answer **(4marks)**
 Cl_2CHCHO , ClCH_2CHO , Cl_3CCHO , CH_3CHO
- e) Give the reagents (O & P) required to carry out the following transformations:

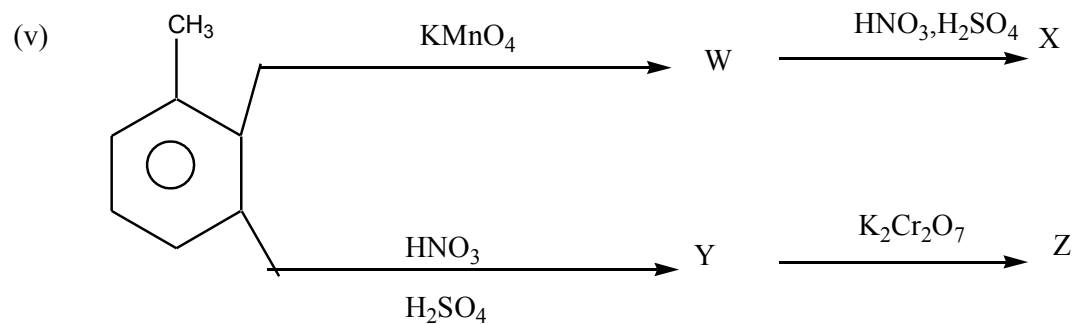
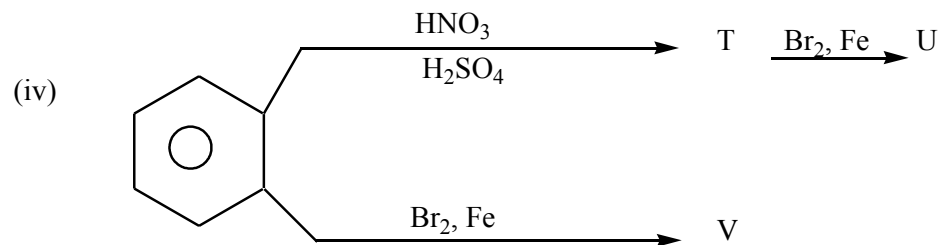


(2marks)

Question FIVE

a) Provide the structures of the major organic products (Q – Z) obtained in each of the following reactions:





(10marks)

b) Using Fischer Projections, draw the structure for each of the following sugars:

(i) D-Glucose

(ii) D-Fructose

(4marks)

c) Give any 2 examples of aliphatic amino acids

(2marks)