



# TECHNICAL UNIVERSITY OF MOMBASA

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FACULTY OF APPLIED AND HEALTH SCIENCES

DEPARTMENT MEDICAL ENGINEERING

**UNIVERSITY EXAMINATION FOR:**

**BACHELOR OF TECHNOLOGY MEDICAL ENGINEERING:**

**BTMD 2016/S**

**ACH 4151: CHEMISTRY II**

**SEMESTER EXAMINATION**

**SERIES: DECEMBER 2016**

**TIME: 2 HOURS**

**DATE:** Pick Date Select Month Pick Year

## Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

This paper consists of five questions. Answer question ONE (Compulsory) and any other TWO questions.

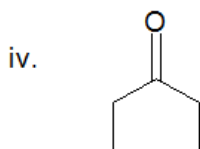
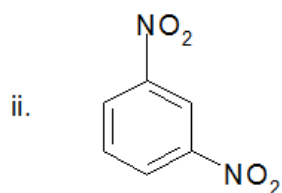
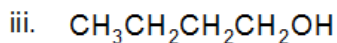
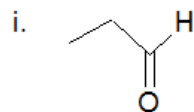
**Do not write on the question paper.**

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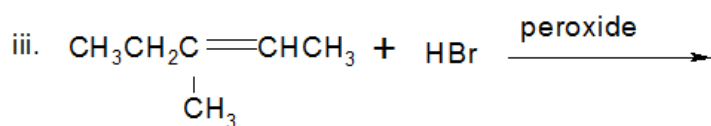
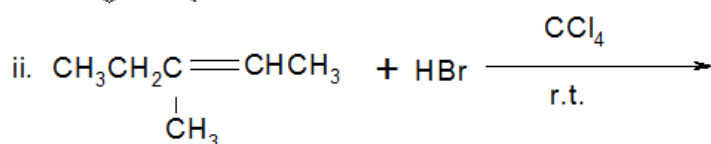
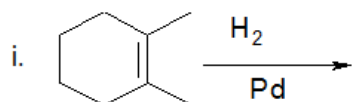
## **Question ONE**

- (a) Define the following terms: (6 marks)
- i) Reforming
  - ii) Functional group
  - iii) Cetane number
- (b) Provide the correct structures for the following compounds (4 marks)
- (i) 2-methylhexane
  - (ii) 2-methylbut-1-ene
  - (iii) Succinic acid (butanedioic acid)
  - (iv) Methyl butanoate

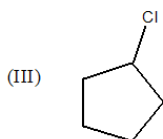
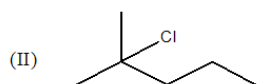
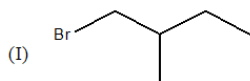
(c) Provide the correct IUPAC names for the following structures (4 marks)



(d) Complete the following reactions: (6 marks)



(e) (i) Classify the following alkyl halides as primary secondary or tertiary (3 marks)



(ii) State with a reason which of the alkyl halides in (ii) above will be more reactive towards:

(I)  $\text{S}_{\text{N}}2$ ?

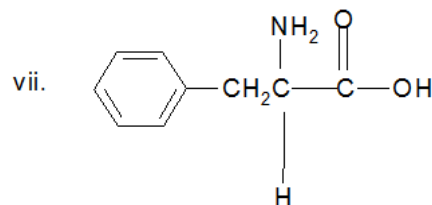
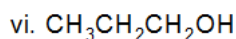
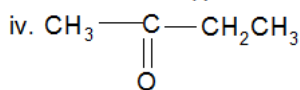
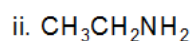
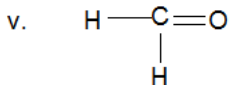
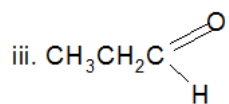
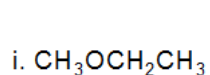
(II)  $\text{S}_{\text{N}}1$

(3 marks)

(f) Distinguish between a copolymer and a homopolymer and give one example in each case. (4 marks)

## Question TWO

(a) Classify each of these molecules as alcohol, aldehyde, ketone, carboxylic acid, amine or ether. (7 marks)



(b) i) Define the term enantiomers (optical isomers). (2 marks)

ii) Draw the three isomers of  $\text{C}_2\text{H}_6\text{O}$  and name them. (6 marks)

(c) i) Draw the chemical structure of the product and name the type of reaction when a **1-propanol** is heated with concentrated sulphuric acid. (2 marks)

ii) Give **THREE** uses of alcohols. (3 marks)

## Question THREE

(a) Draw the structure of the aldehyde or ketone formed from the oxidation of each of the following alcohols.

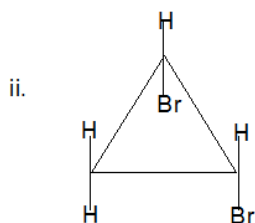
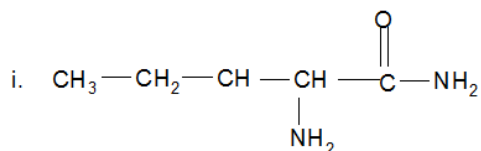
(Assume that reaction conditions are sufficiently mild that any aldehyde produced are not oxidized further to carboxylic acids.) (6 marks)

i) 1-hexanol

ii. 2-methylcyclopentanol

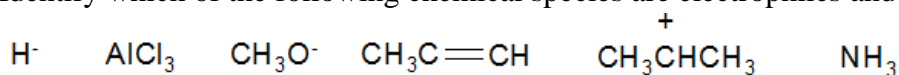
iii. 2,2-dimethylpropanol

(b) i) Indicate the chiral carbon atoms in these compounds: (3 marks)



ii) Explain what is meant by the terms saturated and unsaturated hydrocarbon. Give **ONE** example in each case. (5 marks)

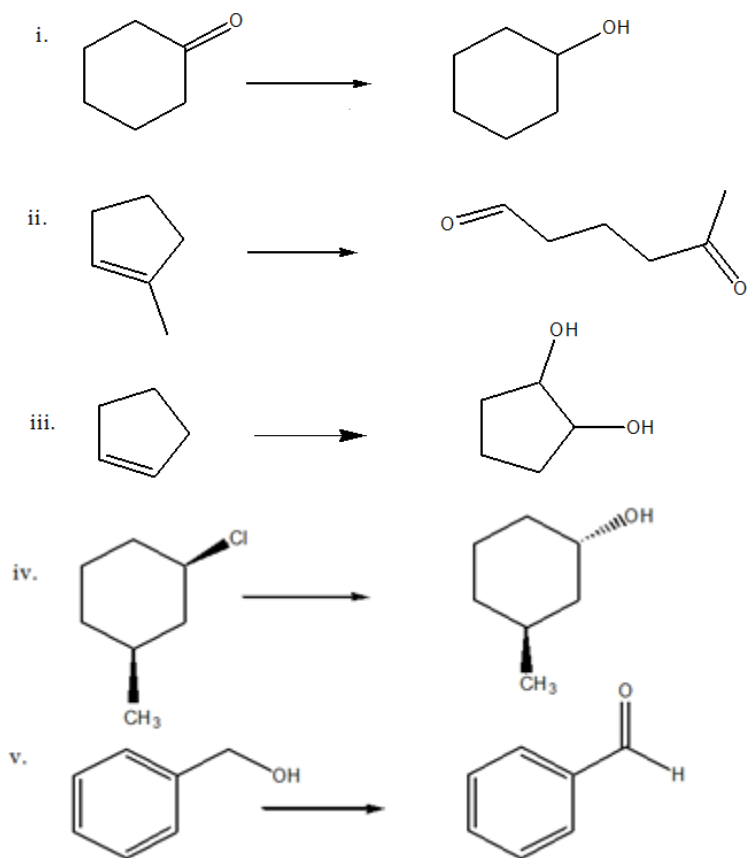
(c) Identify which of the following chemical species are electrophiles and which are nucleophiles: (6 marks)



## Question FOUR

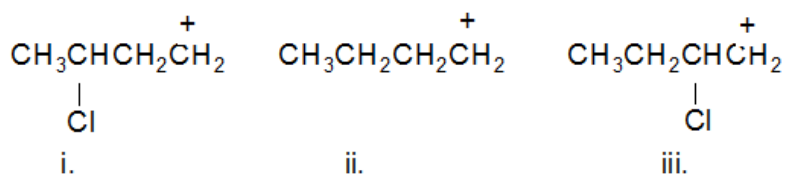
(a) Provide the reagents and conditions necessary to effect the following transformations.

(10 marks)



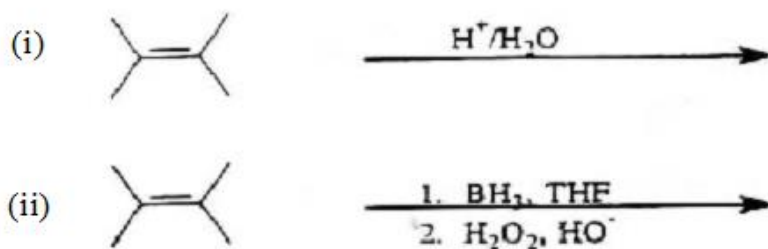
(b) List the following carbocations in order of decreasing stability:

(2 marks)



(c) Draw the organic product (s) of each reaction (R = alkyl, aryl or H):

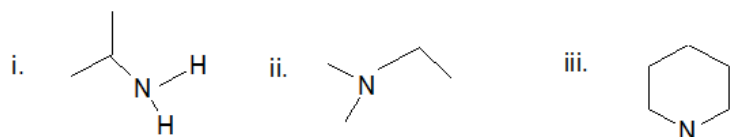
(8 marks)





### Question FIVE

a) Classify the amines below as primary, secondary or tertiary amine. (3 marks)



(b) i) Name TWO main sources of alkanes. (2 marks)

ii) Describe the **Bergius Process** used to manufacture synthetic petroleum. (7 marks)

(c) Write down the chemical structure of the starting materials A to E in the following reactions: (10 marks)

