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

(BTAC)

ACH 4107 ORGANIC CHEMISTRY II

Special/Supplementary Examination

March 2014 series **2 hours**

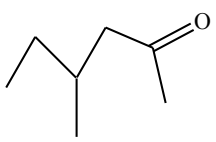
Instructions

Answer THREE questions, Question ONE (compulsory) and any other two

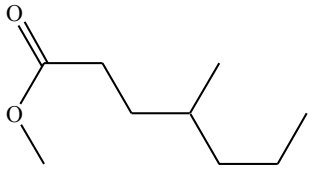
This paper consist of 5 printed pages

Q1. (a) Give systematic (IUPAC) names of the following compounds indicating the stereochemistry where possible.

(i)



(ii)



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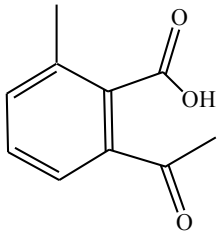

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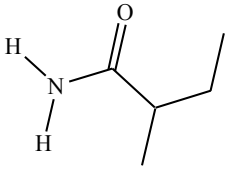

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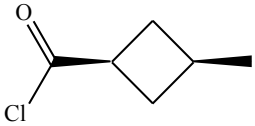
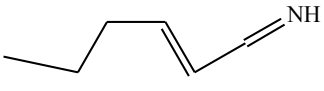


(vi)



(7 marks)

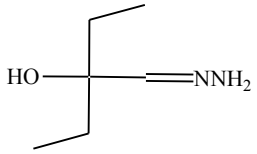
(b) Draw the structures of each of the following organic compounds indicating the stereochemistry where possible.

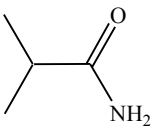
(i) 2,2,4-Trimethylhex – 4Z- en-3-one

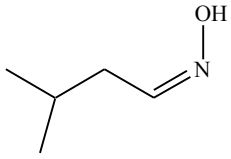
(ii) 3- Methoxyhexanenitrile
(iii) 3-Isopropyl pent-2E-enoic acid
(iv) 5-Hydroxyhexanoic acid lactone
(v) 4-Methyl-3-Oxohexanoic ethanoic anhydride
(vi) 2-Chloro-3-cyclopropylbutanoyl bromide
(vii) N-Methylpentanamide

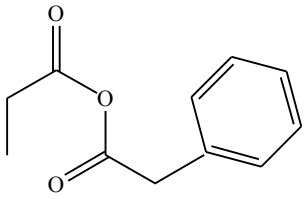
(7 marks)

(c) Suggest the starting reagents for the formation of the following compounds.

(i) 

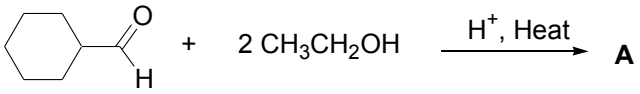
(ii) 

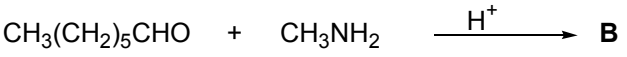
(iii) 

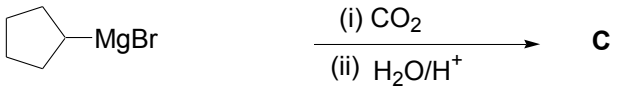
(iv) 

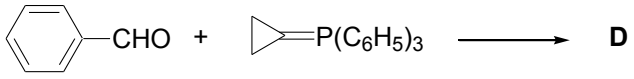
(8 marks)

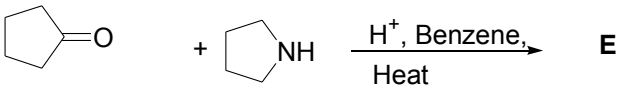
(d) Predict the major organic compounds (**A-H**) in the following reactions.

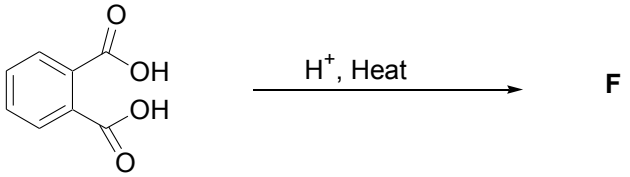
(i) 

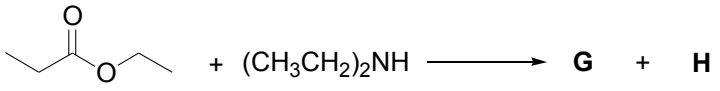
(ii) 

(iii) 

(iv) 

(v) 

(vi) 

(vii) 

(8 marks)

2. (a) Draw the structure and arrange, with reasons, the following compounds in decreasing order of boiling point.

N-MethylPropanamine; N,N-Dimethyl propanamine; Butanamine; Propanamine.

(4 marks)

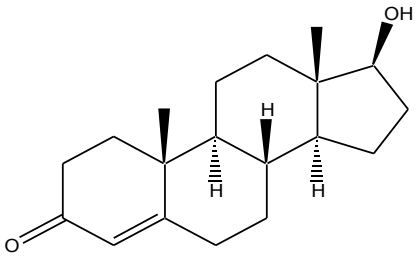
(b) (i) The reaction between Propanoic acid and a mixture of ethylamine and propylamine form two amides. Draw the structures of the amides and give their systematic names.

(3 marks)

(ii) Explain why only one amide is obtained from the reaction of Butanoyl Chloride with a mixture of ethylamine and triethylamine?

(3 marks)

(c) Testosterone is a naturally occurring compound with the structure below.



(i) Name any two functional groups represented by the compound

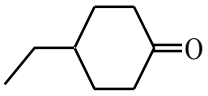
(2 marks)

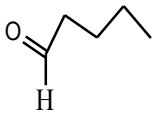
(ii) What compound would you expect to be formed on oxidation of Testosterone? **(2 marks)**

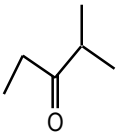
(iii) What compounds would you expect to be formed by reaction of Testosterone with ethanoic anhydride in presence of an acid?

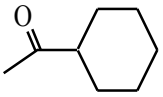
(2 marks)

(d) Give a simple visual chemical test, including the observations, you would use to differentiate between the following pair of compounds.

i) 

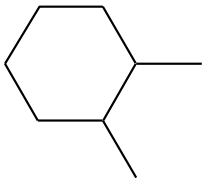
and 

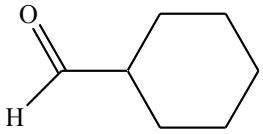
ii) 

and 

(4 marks)

Q3. (a) Draw the structure and name the major organic compounds (**A-D**) in the following reactions

i)  $\xrightarrow[\text{ii) } H_2O/H^+]{\text{i) } H_2CO}$ A + Mg(OH)Br

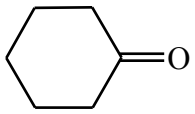
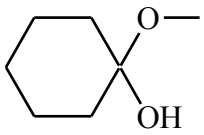
ii)  + $CH_3OH \xrightarrow{H^+,\ \text{Heat}}$ B

iii) $CH_3(CH_2)_6CHO + NH_2NHC_6H_5 \longrightarrow C + H_2O$

iv) $CH_3CHO + CH_3NH_2 \longrightarrow D$

(8 marks)

(b) Using Curly arrows, write a possible reaction mechanism for each of the following transformations.

(i)  + $CH_3OH \xrightarrow{H^+}$ 

(ii) $2\ HCHO + NaOH \longrightarrow CH_3OH + HCOONa$

(12 marks)

4. (a) (i) Explain the tollens test on propanal and propanone

(4 marks)

(ii) With the Condensation reaction mechanism for the formation of 3-hydroxybutanal from ethanal in presence of sodium hydroxide.

(6 marks)

(b) Explain the formation of secondary amines by ammonolysis of alkyl halides. **(4 marks)**

(c) How will you distinguish between primary, secondary and tertiary amines by the Hinsberg test ?

(6 marks)

5. (a) Use the following sequence of reactions to answer the questions below.

$$CH_3CH_2CH(CH_3)COOH \xrightarrow[(2)\ H_2O]{(1)\ LiAlH_4} Q \xrightarrow{PCl_3} R \xrightarrow[DMSO]{KCN} S \xrightarrow[heat]{H_2O,\ H+} T$$

(i) Name any two examples of reagents that can be used as Oxidizing agent.

(1 mark)

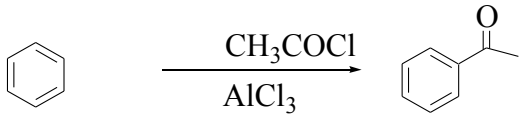
(ii) Suggest the major products Q, R, S and T.

(4 marks)

(iii) Explain the mechanism for the transformation of S to T

(7 marks)

(b)



(i) Name the type of reaction represented by the reaction above. **(1 mark)**

(ii) Write the mechanism for the reaction in b (i) above. **(7 marks)**