THE CATHOLIC UNIVERSITY OF EASTERN AFRICA

A. M. E. C. E. A

P.O. Box 62157
00200 Nairobi - KENYA
Telephone: 891601-6
Fax: 254-20-891084
E-mail:academics@cuea.edu

MAIN EXAMINATION

MAY – JULY 2015 TRIMESTER

FACULTY OF SCIENCE

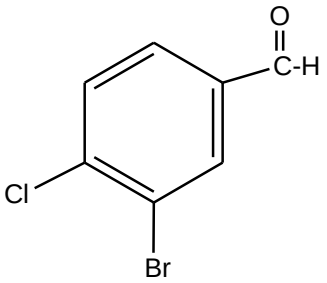
DEPARTMENT OF CHEMISTRY

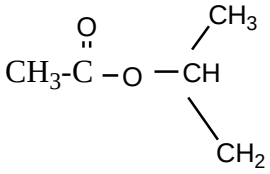
CHEM 105: ORGANIC CHEMISTRY II

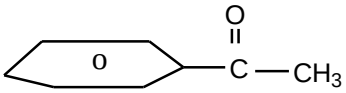
SCHOOL FOCUSED PROGRAMME

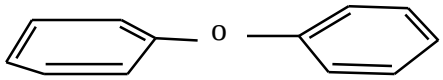
Date: JULY 2015	**Duration: 2 Hours**
INSTRUCTIONS: Answer Question ONE and ANY OTHER TWO Questions	

Q1. a) Name each of the following compounds using IUPAC rules.

i 

ii 

iii 

iv 

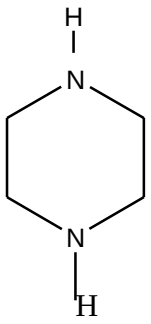
v $(CH_3)_2CHCOCl$

vi $NH_2\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2$

b) Draw the structural formulae of the following organic compounds.

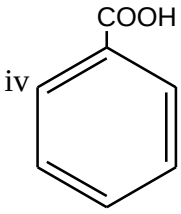
i P-nitrotoluene
ii Thiophene
iii Tetramethyl
iv 2, 3, 4, 5, 6 pentahydroxyhexanal **(6 marks)**
v Ethanoic acid
vi Dimethyldisulphide

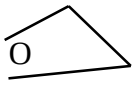
c) Complete the following equations by writing the missing structures labeled A to L

i  + 2 CH_3COOH ⟶ A

ii $RCH_2COOH \xrightarrow{NH_3}$? B $\xrightarrow{Heat}$ $RCH_2CONH_2 \xrightarrow[Reaction]{Hoffman}$? C $\xrightarrow{HNO_2}$?D

iii $RCOOH \xrightarrow[LiAlH_4]{Reduction}$?E $\xrightarrow{PBr_3}$ F $\xrightarrow{KNC}$ $RCH_2CN \rightarrow$ G

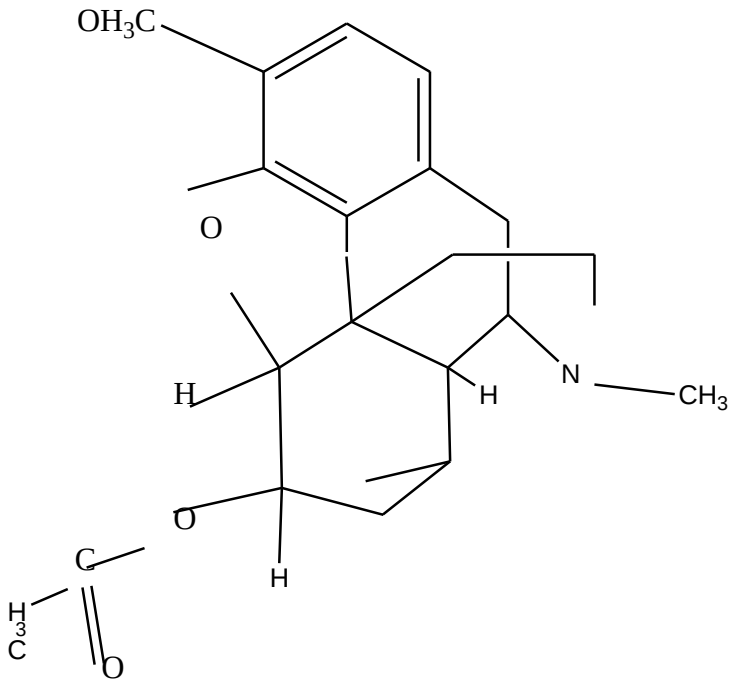
iv  $\xrightarrow{PCl_3}$?H $\xrightarrow[Heat]{NH_3}$?I

v  + NH_3 ⟶ ?J

vi $CH_3-C(=O)-CH_3 + 2CH_3OH$ ⟶ ?K

vii $(NH_2)_2CO + H_2O + H_2O$ ⟶ ?L

d) Heroin is an analgesic. Examine its structure and identify all the functional groups present.



e) Show how hydrogen bonds can be formed in an aqueous solution of ethanoic acid. **(2 marks)**

f) Draw structures showing the following organic compounds:
   i A hydrocarbon with three fused benzene rings.
   ii An imine with 3 carbon atoms. **(2 marks)**

Q2. Ethers, esters and acid anhydrides have structures that contain two alkyl (R) groups. Discuss the chemistry of the three families under the following sub headings:
   i Preparation **(3 marks)**
   ii Physical properties **(3 marks)**
   iii Chemical reactions **(14 marks)**

Q3. Compare and contrast the chemistry of phenol and ethanol under the following subheadings:

i Preparation (2 different methods) **(4 marks)**
ii Physical properties. **(4 marks)**
iii Chemical properties. (3 similarities and 3 differences) **(12 marks)**

Q4. a) Describe briefly how the following organic compounds can be prepared in the laboratory (include equations)

i Propanal from an alkene
ii Dimethysulphide from methane thiol
iii Trimethylamine from chloromethane. **(6 marks)**

b) Discuss the chemical reactions of ketones under the following subheadings:

i Addition reactions
ii Condensation reaction
iii Oxidation
iv Reduction.

Q5. a) $RCONH_2$, RCOCl, RCOOR, $(RCOO)_2O$, and RCN are all classified as acid derivatives.

i Draw the structures and give the names of the acid derivatives that contain the lowest number of carbon atoms. **(5 marks)**

ii Outline one method of preparing each of the acid derivative listed above. **(5 marks)**

b) Discuss the chemistry of amines under the following subheadings:

i Classification of amines. **(4 marks)**
ii Reaction of amines. **(6 marks)**

END