



# MACHAKOS UNIVERSITY COLLEGE

(A Constituent College of Kenyatta University)  
University Examinations for 2015/2016 Academic Year

SCHOOL OF PURE AND APPLIED SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES

FIRST SEMESTER EXAMINATION FOR DIPLOMA IN EDUCATION

SCH 0202: ORGANIC CHEMISTRY II

DATE: 10/7/2016

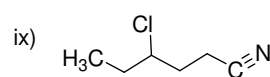
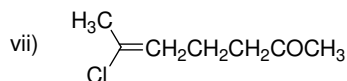
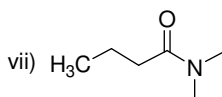
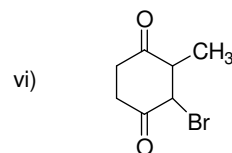
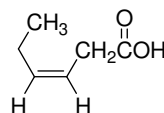
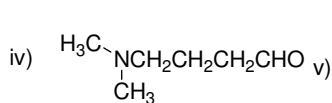
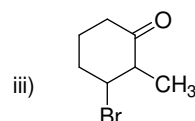
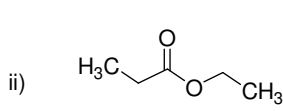
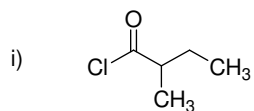
TIME: 8:30 – 10:30 AM

## INSTRUCTIONS:

Answer question **ONE** which is compulsory and any other **TWO**

## QUESTION ONE

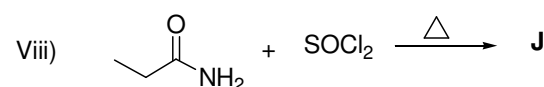
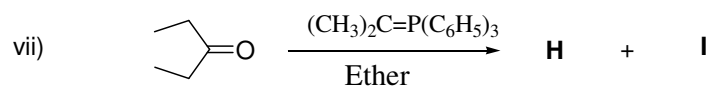
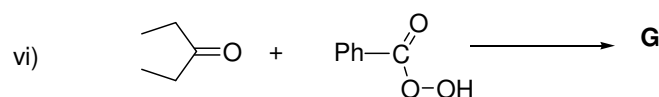
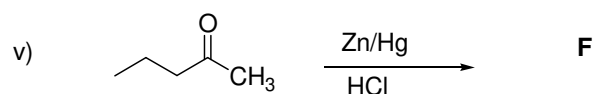
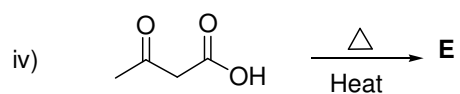
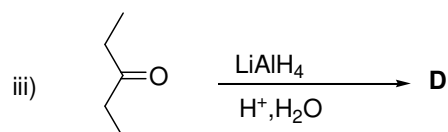
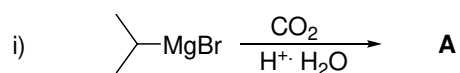
- a) Give the IUPAC names of each of the following compounds including the stereochemistry where appropriate. (9 marks)



- b) Draw the structures of each of the following compounds including the stereochemistry where appropriate. (8 marks)

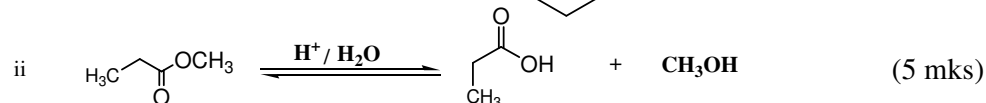
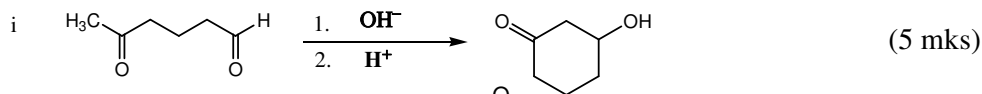
- i. 2-Bromo-4-methyl-5-hexenal

- ii. Ethanoic butanoic anhydride
  - iii. 2-Bromobutane dioic acid.
  - iv. 3-Bromo-4-methylpentanenitrile
  - v. 2-Nitro-3-bromo-4-iodocyclohexanone
  - vi. 2-Iodo-2E-pentenal
  - vii. Benzyl propanoate
  - viii. *N,N*-Dimethyl-3-hydroxypentanamide
- c) Explain why ketones have lower boiling points than alcohols but higher boiling points than hydrocarbons of comparable molecular weights. (3 marks)
- d) Predict the major organic compounds (**A-J**) in the following reactions. (10 marks)



## QUESTION TWO

a) Using curly arrows, write a possible reaction for the following reactions.



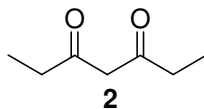
b) Explain the following observations using appropriate equations or structures

i. Alcohols have lower boiling points than carboxylic acids of comparable molecular weight. (2 marks)

ii. Aldehydes are more reactive towards nucleophilic attack when compared with ketones. (2 marks)

iii. Amines are more basic than amides. (2 marks)

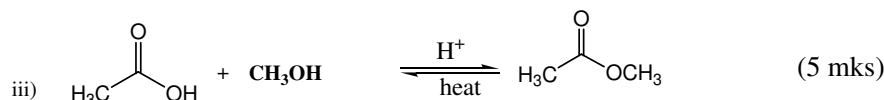
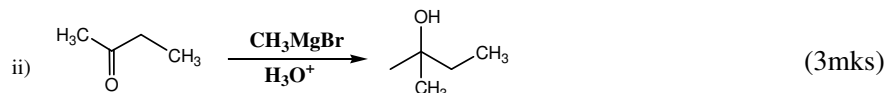
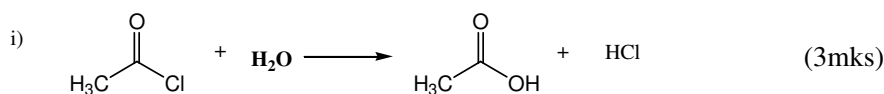
iv. Explain why in keto-enol tautomerism the enol form of 3,5-heptanedione (**2**) is about 80% while the keto form is about 20%. (2 marks)



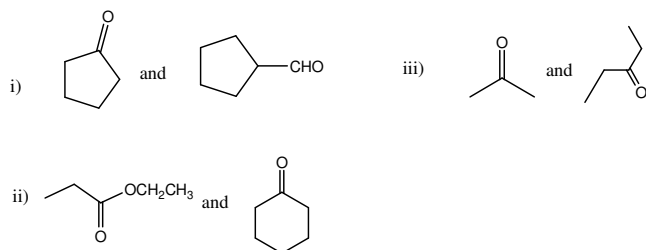
v. Esters have lower solubility in water when compared to alcohols. (2 marks)

## QUESTION THREE

a) Using curly arrows write a possible reaction mechanism for the following reactions

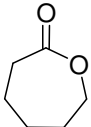
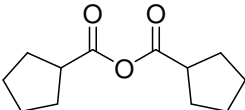


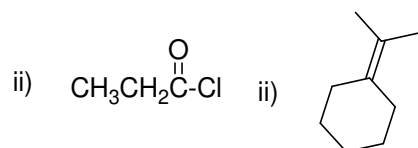
b) Give a simple visual chemical test including the observations you would use to differentiate the following pairs of compounds. (6 marks)



- c) When compound **M**,  $C_4H_8O_2$  which turns blue litmus paper red was reacted with  $SOCl_2$  it yielded compound **N**,  $C_4H_7OCl$ . When **N** was reacted with Ammonia it produced compound **O**,  $C_4H_9NO$ . Deduce possible structures for compound **M**, **N** and **O** and show your reasoning. (4 marks)

#### QUESTION FOUR

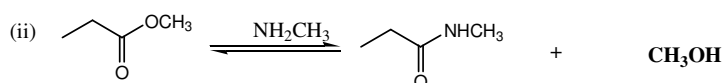
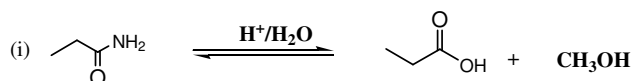
- a) Compound **N**,  $C_4H_8O_2$ , turns moist blue litmus paper red and on reaction with  $PCl_3$ , it yielded compound **P**,  $C_4H_7OCl$ . Compound **P** reacts with  $(CH_3)_2CuLi$  to give compound **Q**,  $C_5H_{10}O$ . Compound **Q** gives positive test with 2,4-dinitrophenylhydrazine and gives a +ve iodoform test. **Q** may be reduced by refluxing with  $H_2NNH_2$ ,  $OH^-$ , to a straight chain compound **R**,  $C_5H_{12}$ . Deduce the possible structures for **N**, **P**, **Q**, and **R** and state or show your reasoning. (6 marks)
- b) Explain why carboxylic acid **7** is more reactive than **8**. (2 marks)
- (7)  $CH_3CH(Cl)COOH$ , (8)  $CH_3CH_2COOH$
- c) i) Draw all possible straight chain isomers of carbonyl compounds with formula  $C_5H_{10}O$ . (3 marks)
- ii) Compound **X** one of the Isomer in (i) gave a positive iodoform test (iodone in aq.  $NaOH$ ) to give major compounds **Y** and **Z**. Identify compounds **X**, **Y** and **Z**. (3 marks)
- d) Name the functional group classification of each the structure below
- i)  ii)  (2mks)
- e) Suggest the starting reagents which can be used to prepare the following compounds. (4 marks)



### QUESTION FIVE

a) Using curly arrows write a possible reaction mechanism for the following reactions.

(10 marks)



b) Explain the following observations

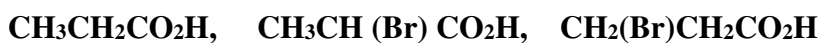
i. Special oxidants are used in preparation of aldehydes from primary alcohols.

(2 marks)

ii. Propanoic acid has a lower boiling point than propanedioic acid.

(2 marks)

c) Arrange with reasons the following compounds in decreasing order of acidity. (4 marks)



d) Two alcohols **S** and **T** have a molecular formula  $\text{C}_4\text{H}_{10}\text{O}$ . Treating **S** with  $\text{KMnO}_4$  leads to the formation of 2-methylpropanoic acid. While **T** did not react with either  $\text{CrO}_3$  or  $\text{KMnO}_4$ . Give the possible structures of **S** and **T**. (2 marks)