



SOUTH EASTERN KENYA UNIVERSITY
UNIVERSITY EXAMINATIONS 2016/2017

**FIRST SEMESTER EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE (CHEMISTRY) AND BACHELOR OF EDUCATION (SCIENCE)**

SCH 206: ORGANIC ACIDS, AMINES, ESTERS AND PHENOLS

DATE: 15TH DECEMBER, 2016

TIME: 1.30-3.30 P.M

INSTRUCTIONS TO CANDIDATES

- (a) Answer **question One** and any other **Two questions***
- (b) Question 1 carries 30 marks while the other questions carry 20 marks each*
- (c) Illustrate your answers with well labeled diagrams where appropriate*
- (d) No written materials allowed.*
- (e) Write all answers in the booklet provided.*
- (f) Do not forget to write your Registration Number.*
- (g) Do not write any answers on this question paper*

QUESTION 1 (30 MARKS)

- a) Write the structural formula for each of the following compounds:
 - i. 2,2-dibromopentanecarbaldehyde
 - ii. 3-methyl-2-butanone
 - iii. 4-oxopentanal
 - iv. Pentanedial
 - v. 1,2-cyclopentanedione

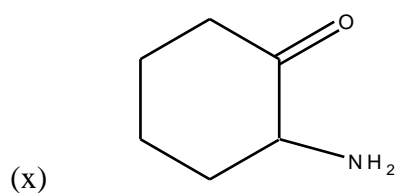
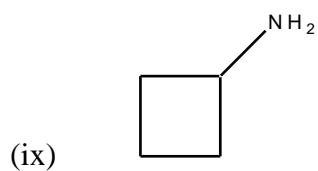
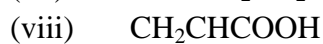
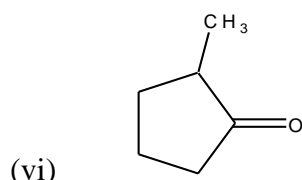
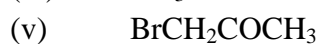
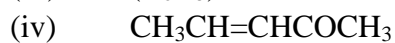
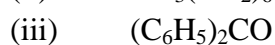
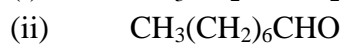
- vi. 2-aminopropanoic acid
- vii. 3-oxobutanoic acid
- viii. ethylhexylamine
- ix. isopropyl benzoate
- x. 2-isopropyl-5-methylphenol

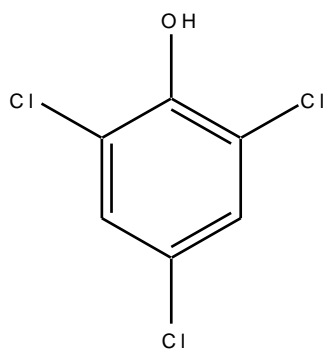
(10 marks)

b) Draw the structures of nine isomeric esters of formula $C_5H_{10}O_2$.

(9 marks)

c) Give the names of each of the following compounds





(11 marks)

QUESTION 2 (20 MARKS)

a) Write balanced equations, naming all organic products, for the reaction (if any) of acetophenone with:

- i. $\text{CH}_3\text{MgBr}/\text{H}_3\text{O}^+$
- ii. CrO_3/H^+
- iii. Tollens reagent, heat
- iv. Ethyl alcohol, dry HCl
- v. Phenylhydrazine
- vi. $\text{NaBH}_4/\text{H}_3\text{O}^+$

(6 marks)

b) Write equations to show how each of the following compounds could be converted to *n*-butyric acid:

- i. *n*-butyl alcohol
- ii. *n*-propyl alcohol
- iii. Methyl *n*-propyl ketone

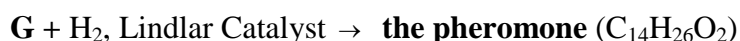
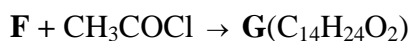
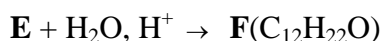
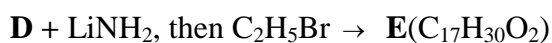
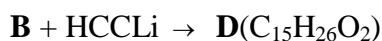
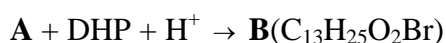
(6 marks)

- c) Write balanced equations, naming all organic products, for the reaction (if any) of methyl n-butyrate with:
- Hot $\text{H}_2\text{SO}_4(\text{aq})$
 - Hot KOH
 - Isopropyl alcohol + $\text{H}_2\text{SO}_4(\text{aq})$
 - Isobutylmagnesium bromide

(8 marks)

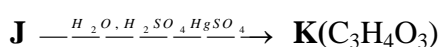
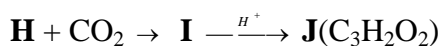
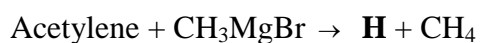
QUESTION 3 (20 MARKS)

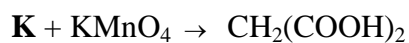
- (a) An insect pheromone is prepared in the following way. (**Useful information:** An alcohol ROH is often converted into its acetate CH_3COOR , by treatment with acetyl chloride CH_3COCl). Give the structure of the pheromone and all intermediate compounds.



(14 marks)

- (b) Give the chemical structures of the compounds **H-K**:

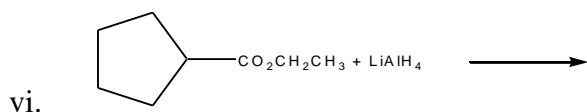
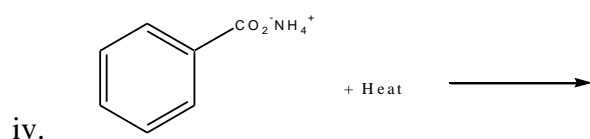
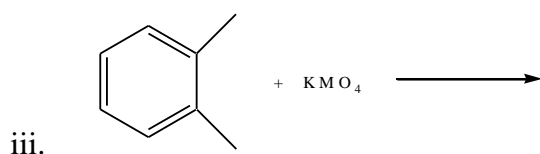
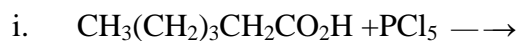




(6 marks)

QUESTION 4 (20 MARKS)

(a) Complete the equation for each of the following reactions

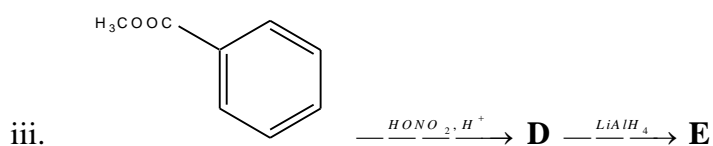
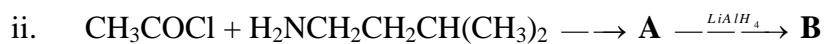
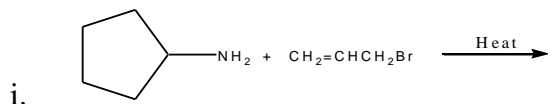


(12 marks)

(b) Draw the structures for, name, and classify as primary, secondary, or tertiary the eight isomeric amines with molecular formula $\text{C}_4\text{H}_{11}\text{N}$. (8 marks)

QUESTION 5 (20 MARKS)

(a) Complete the following equations



(12 marks)

(b) Arrange the compounds of each set in order of increasing acidity. Give an explanation for each.

- i. Benzenesulfonic acid, benzoic acid, benzyl alcohol, phenol
- ii. Carbonic acid, phenol, sulfuric acid, water
- iii. *m*-bromophenol, *m*-nitrophenol, phenol
- iv. *p*-chlorophenol, 2,4-dichlorophenol, 2,4,6-trichlorophenol

(8 marks)