KISII UNIVERSITY

UNIVERSITY EXAMINATIONS

THIRD YEAR EXAMINATION FOR THE AWARD OF THE DEGREE OF BACHELOR OF EDUCATION SCIENCE AND ANALYTICAL CHEMISTRY AND INDUSTRIAL AGRICULTURE

SECOND SEMESTER 2021/2022

(FEBRUARY-JUNE, 2022)

CHEM 328- CARBOXYLIC ACID DERIVATIVES, AMINES, PHENOLS

STREAM: Y3 S2 **TIME: 2 HOURS**

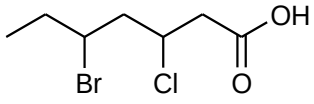
DAY: MONDAY, 9.00 AM – 11.00 AM **DATE: 23/05/2022**

INSTRUCTIONS:

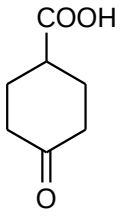
1. ***Do not write anything on this question paper.***
2. ***Answer ALL Questions in Section A ONE and any other TWO Questions in Section B.***

SECTION A

a. Give systematic names of the following compounds (7 marks)



i



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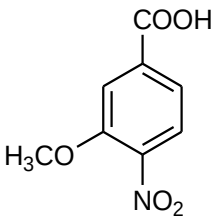

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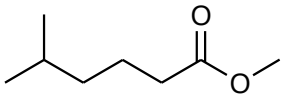

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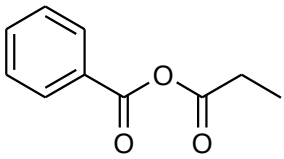

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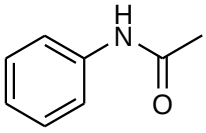

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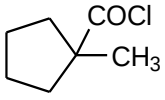

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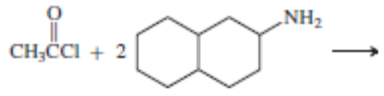
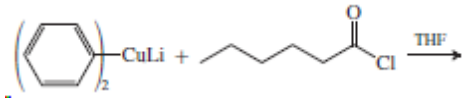
b. give the structural formulae of the following compounds (8 marks)

i. Butyl propanoate
ii. 2-Chloroethyl benzoate
iii. N,N-Dimethylbenzamide
iv. Cyclopentanecarbonitrile

c. Use inductive effects and resonance forms to explain in detail the relative order of acidity of carboxylic acid derivatives. (6 marks)

d. Give the product(s) of each of the following reactions (8 marks)

i 

ii 

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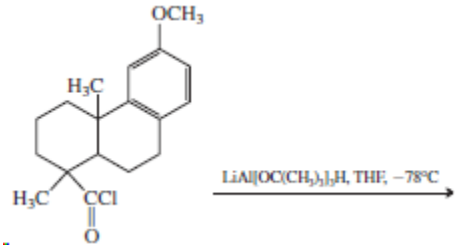
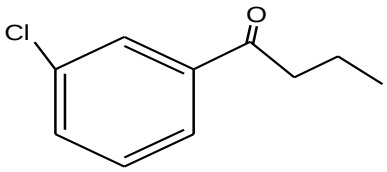
iv 

e. Write the structure formed when chlorobenzene is boiled in water for 2 hours (4 marks)

f. Devise a synthesis of the following compound from benzene and an organic alcohol containing four or less carbons. You may also use any required organic or inorganic reagent. (7marks)



SECTION B

1. Give the products of reaction of methyl pentanoate with each of the following reagents under the conditions shown. (15 Marks)

   i. $NaOH$, H_2O, heat; then H_1, H_2O
   ii. $(CH_3)_2CHCH_2CH_2OH$ (excess), H_1
   iii. $(CH_3CH_2)_2NH$, heat
   iv. CH_3MgI (excess), $(CH_3CH_2)_2O$; then H_1, H_2O
   v. $LiAlH_4$, $(CH_3CH_2)_2O$; then H_1, H_2O
   vi. $[(CH_3)_2CHCH_2]_2AlH$, toluene, low temperature; then H_1, H_2O

2. Formulate a mechanism for the acid-catalyzed transesterification of ethyl 2-methylpropanoate (ethyl isobutyrate) into the corresponding methyl ester. Your mechanism should clearly illustrate the catalytic role of the proton. (15 Marks)

3. Fill in suitable reagents to carry out the following transformations (15 Marks)