



EMBU UNIVERSITY COLLEGE

(A Constituent College of the University of Nairobi)

2015/2016 ACADEMIC YEAR

SECOND SEMESTER EXAMINATION

SECOND YEAR EXAMINATION FOR THE DEGREE OF BACHELOR OF
SCIENCE AND BACHELOR OF EDUCATION (SCIENCE)

SCH 206: ORGANIC ACIDS, AMINES, ESTERS AND PHENOLS

DATE: APRIL 11, 2016

TIME: 2:00-4:00

INSTRUCTIONS:

Answer Question ONE and ANY other two Questions

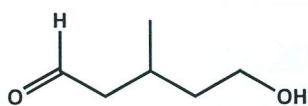
QUESTION ONE

- a) Draw structures of each of the following compounds (5 Marks)
- 4-hydroxyhexanenitrile
 - 3-chloropent-2-enoic propanoic acid anhydride
 - Cis-3-methyl-3-penten-2-one
 - Ethyl acetate
 - Triisopropylamine
- b) Match each of the following pKa values (3.2, 4.9, and 0.2) to the appropriate carboxylic acid, give your reasons. (4 Marks)
- $\text{CH}_3\text{CH}_2\text{COOH}$
 - CF_3COOH
 - ICH_2COOH

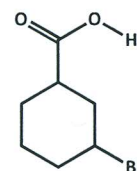
c) Provide IUPAC name for the following compounds.

(5 Marks)

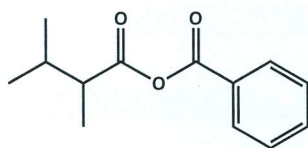
i



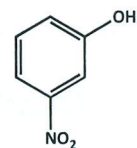
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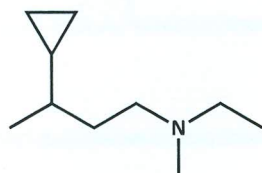
iii



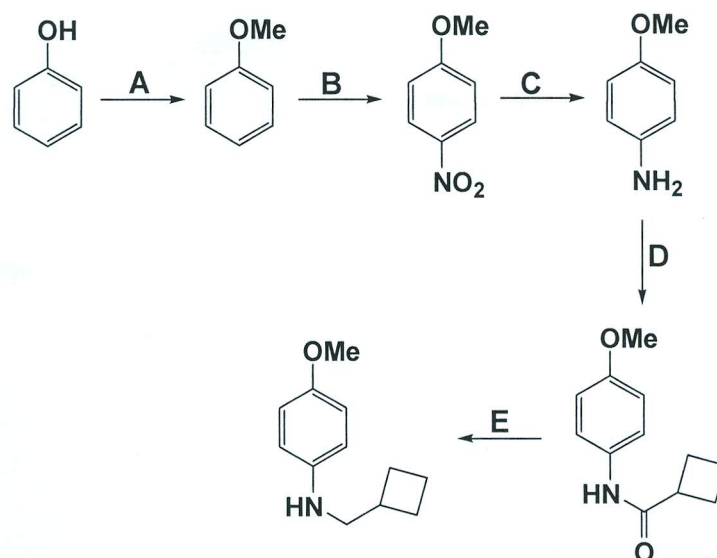
iv



v

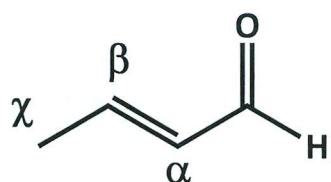


d) Provide reagents A-E to achieve the following transformations. (5 Marks)



- e) The hydrogen atoms of the χ carbon of crotonaldehyde are appreciably acidic ($pK_a \approx 20$). Write resonance structures that will explain this fact.

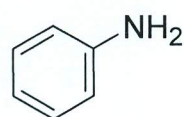
(5 Marks)



Crotonaldehyde

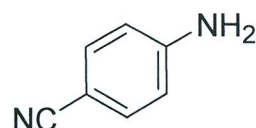
- f) Which is more basic aniline or 4-aminobenzonitrile? Give a brief explanation.

(5 Marks)



Aniline

or

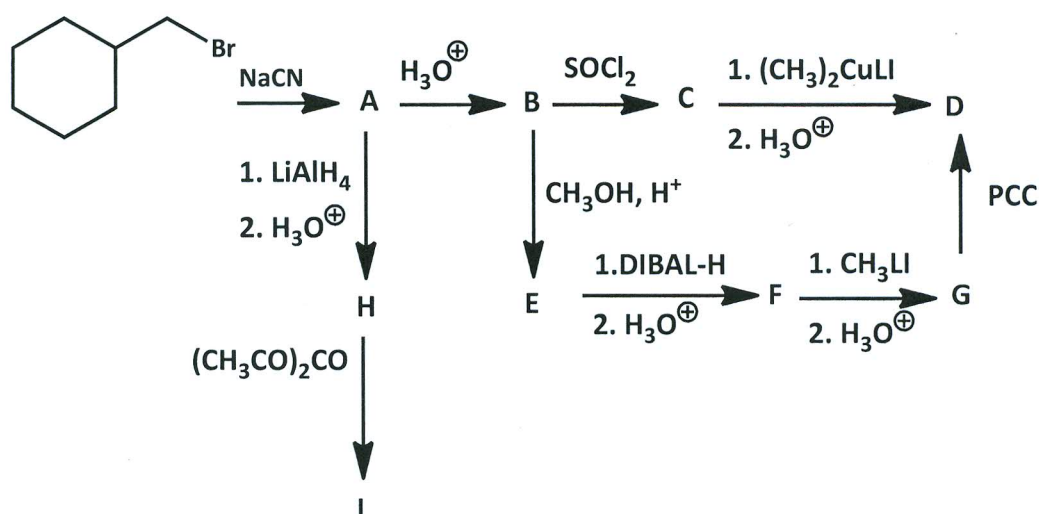


4-Aminobenzonitrile

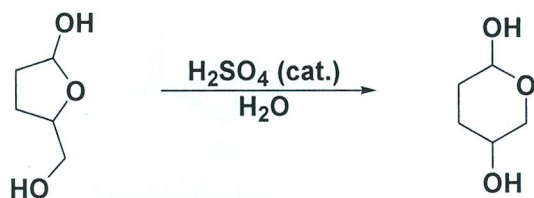
QUESTION TWO

- a) Identify compounds A-I in the following reaction sequence.

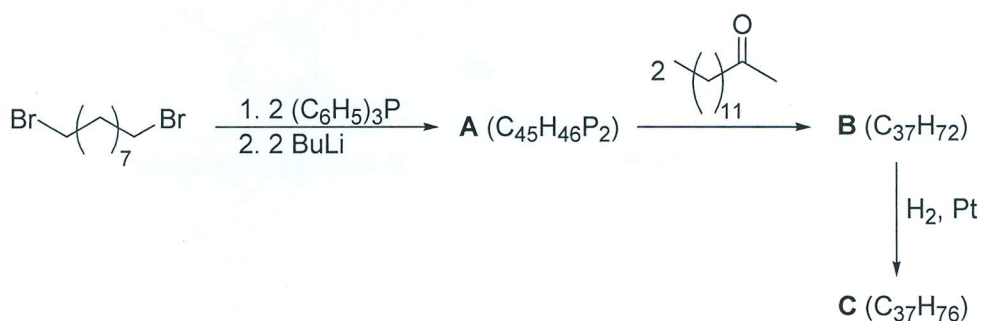
(9 Marks)



b) Write a detailed mechanism for the following reaction. (5 Marks)

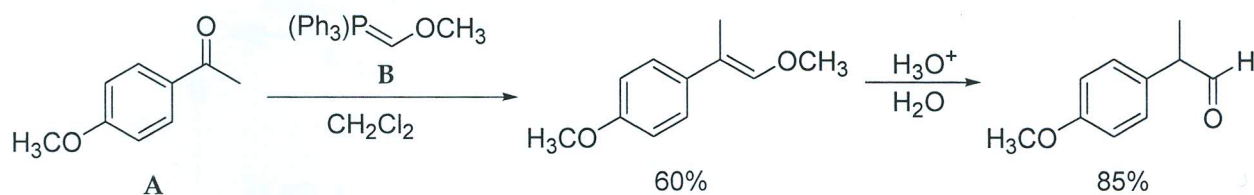


c) The structure of a sex pheromone (attractant) of the female tsetsefly has been confirmed by the following synthesis. Compound **C** appear to be identical to the natural pheromone in all aspects (including the response of the male tsetse fly). Provide the structures of **A**, **B** and **C**. (6 Marks)



QUESTION THREE

a) The reaction below can be used in the synthesis of aldehydes.



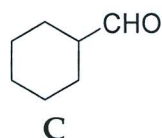
i) How you would prepare $CH_3O-CH=P(Ph)_3$ (**B**)? (2 Marks)

(2 Marks)

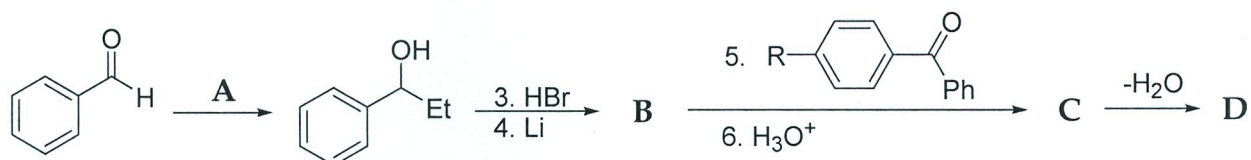
ii) Show the mechanism of how the second reaction produces aldehyde? (3 Marks)

(3 Marks)

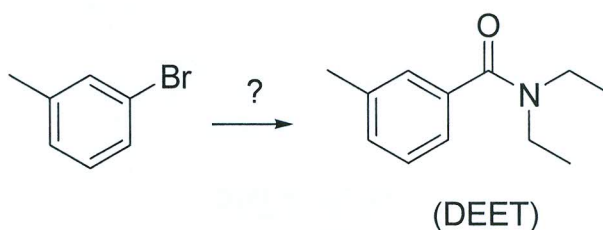
iii) How would you use this synthetic strategy to prepare compound **C** below from cyclohexanone? (Show all intermediates) (2 Marks)



b) Supply the missing reagents/compounds **A-D** of the reaction below. (8 Marks)

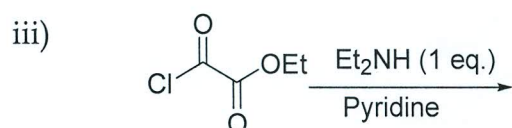
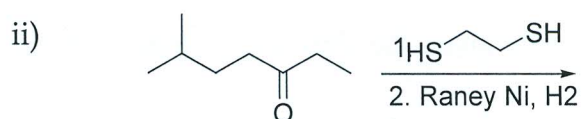
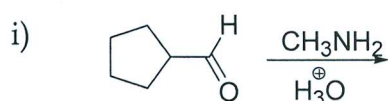


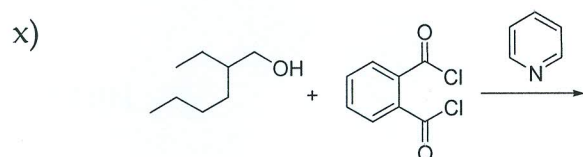
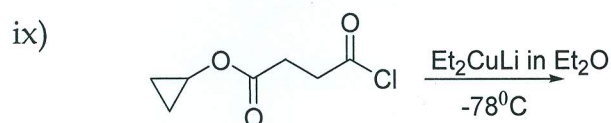
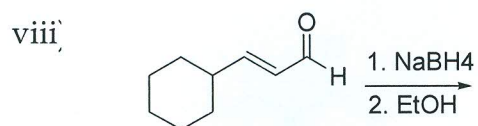
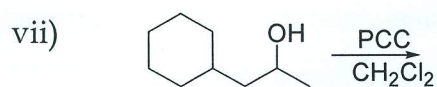
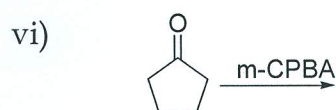
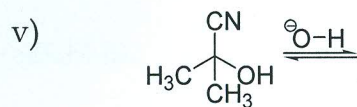
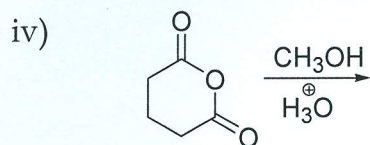
c) DEET is the active ingredient in many insect repellants. Starting with *meta*-bromotoluene and using any other reagents of your choice, devise an efficient synthesis for DEET. (5 Marks)



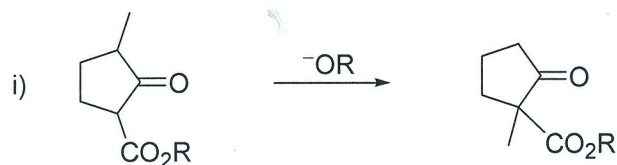
QUESTION FOUR

a) Give product(s) of the following reactions. (10 Marks)

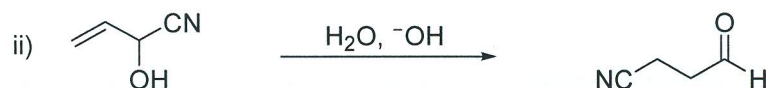




b) Outline a detailed MECHANISM for each of the following. No other reagents than those given are necessary. Use arrows ONLY to explain the flow of electrons and show all intermediates.



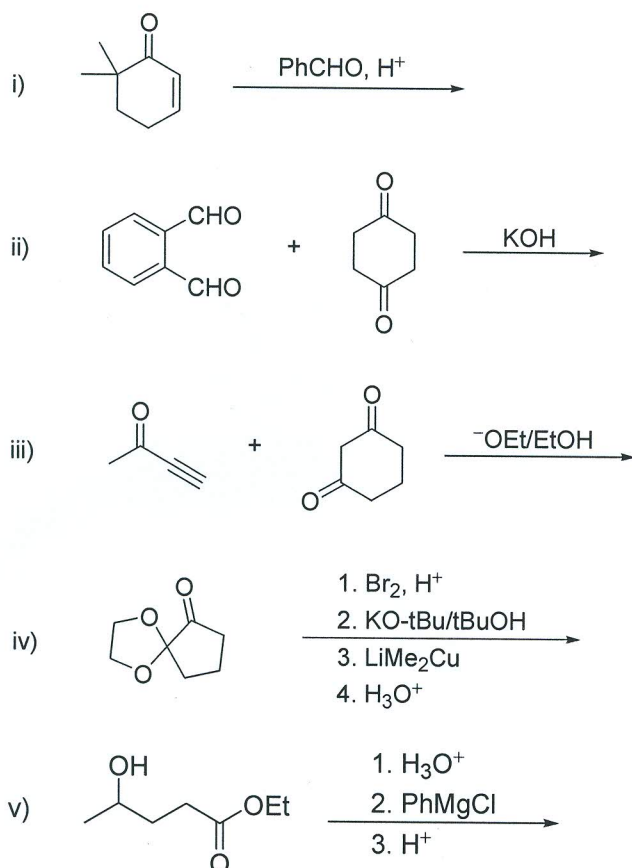
(6 Marks)



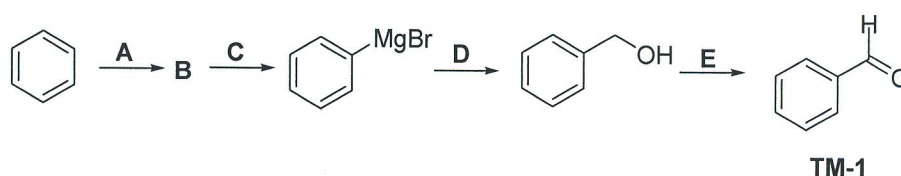
(4 Marks)

QUESTION FIVE

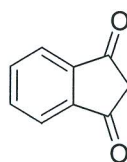
- a) Write the structural formula product(s) in each case. For (iv) and (v) include the structures of the intermediates. (10 Marks)



- b) Provide the indicated reagents and intermediates (A-E) in the synthesis of compound **TM-1** shown below. (5 Marks)



- c) Show how the diketone below can be prepared by condensation. (5 Marks)



--END--