



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

PURE AND APPLIED SCIENCES DEPARTMENT

UNIVERSITY EXAMINATION FOR

BTAC 13S AND BTAC 14S₂

ACH 4403 : ORGANIC SYNTHESIS

END OF SEMESTER EXAMINATION

SERIES: DECEMBER 2016

TIME: 2 HOURS

DATE:

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

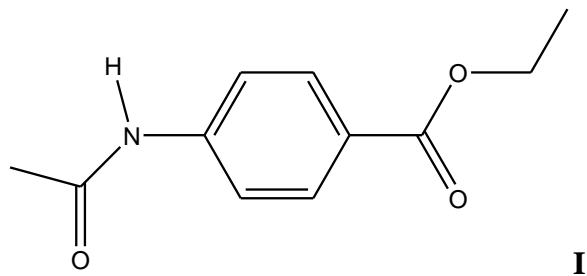
This paper consists of five questions. Answer question one and any other two.

Do not write on the question paper.

Question ONE

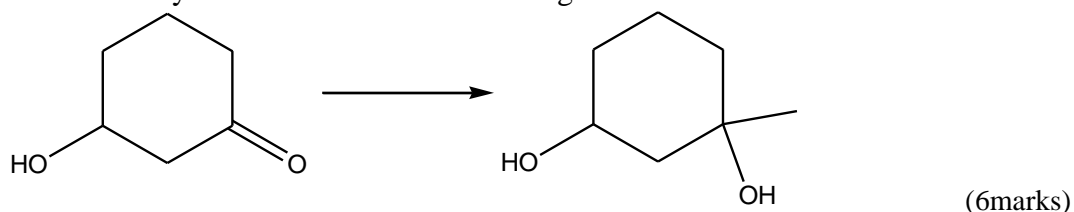
- a. Explain four the major considerations when planning an organic synthesis (6marks)
- b. Provide the use of the following reagents commonly used in organic synthesis
i) LiAlH_4 ii) BMPA iii) TsOH (6marks)
- c. i) Using simple illustrations differentiate between linear and convergent synthesis (4marks)
ii) Convergent synthesis is preferred in most organic synthesis. Explain (2marks)
- d. Write the sequence of reactions for the synthesis of 2-bromobutane from a named
i) alkene
ii) alkyne (6marks)

- e. i) Explain the term FGI as used in retrosynthesis (2marks)
- ii) Carry out a retrosynthetic analysis of ethyl 4-acetamidobenzoate **I** a derivative of benzocaine a known anaesthetic by FGI (4marks)

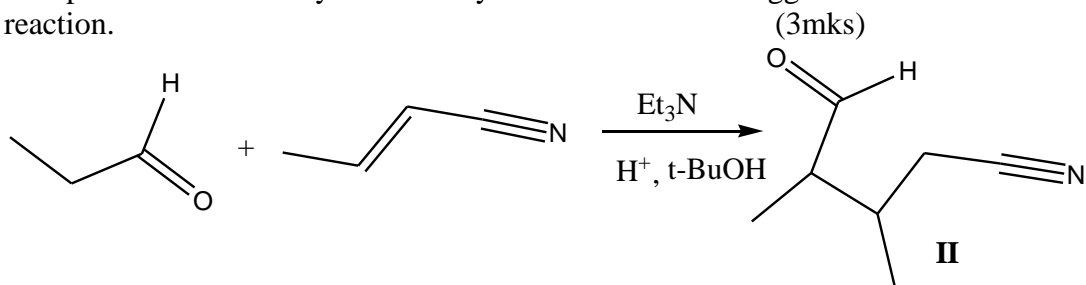


Question TWO

- a. i) Explain the term protecting group (2marks)
- ii) Provide the synthetic route for the following transformation (6marks)



- b. Explain the following terms (4marks)
- i) Synthons
- ii) Synthetic equivalents
- c. Compound **II** below is synthesized by Michael addition. Suggest the mechanism for the reaction. (3mks)



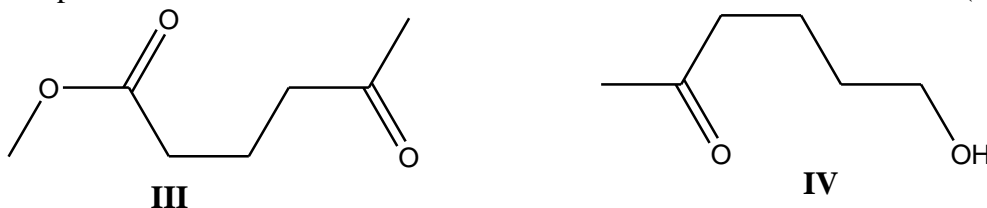
- d. Suggest a synthesis route for 2-hexanone from 1-pentyne and an alkyl bromide in presence of sodium amide. (5mks)

Question THREE

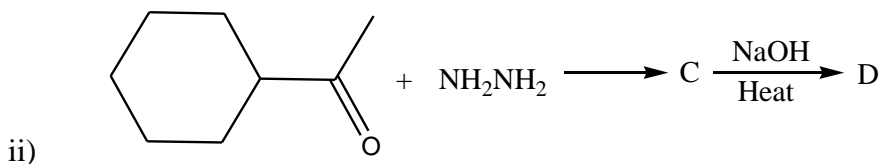
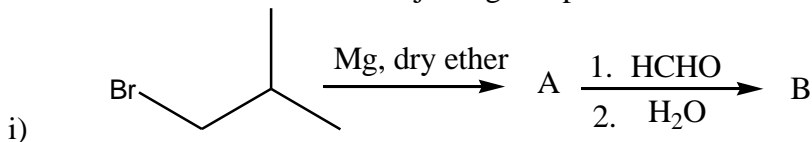
- a. Outline four main reasons for carrying out laboratory synthesis of an organic compound (4mks)
- b. Using two general examples explain why β -ketoesters are important starting materials in organic synthesis of alkylated ketoesters and ketones. (7mks)
- c. With the help of five and six membered locked diene and ethene explain using a simple mechanism the formation of a bicyclic organic product from each of the cyclic dienes. (5mks)
- d. How can the yield of a Diels-Alders reaction be increased (4mks)

Question FOUR

- a. State and explain any two general considerations essential in choosing protecting groups in organic synthesis (4marks)
- b. Using the necessary reagents show how a protecting group can be used in the synthesis of compound **IV** from **III** below (4marks)



- c. Provide the structures of the major organic products A-D in the following reactions.

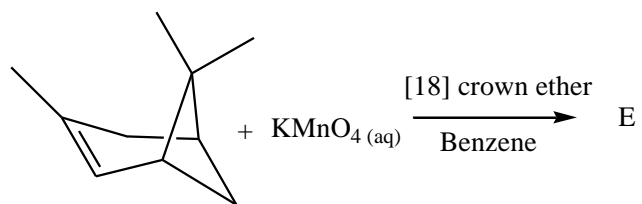


- d. Using curly arrows suggest plausible mechanisms for the reactions in (c) above. (4marks)
- (8mks)

Question FIVE

- a. Explain the following terms (4marks)
- i) Clemensen's reduction
- ii) Wolff-Kishner reduction
- b. i) Using an equation show how [18] crown ether can facilitate dissolution of KMnO_4 in benzene.

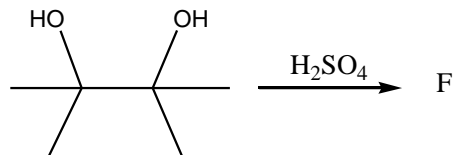
ii) Draw the structure of compound E and name the type of reaction. (3marks)



(3marks)

c. i) Explain the term Pinacol rearrangement (2mks)

ii) Draw the structure and name the organic product F below (3mks)



iii) Provide the mechanism for the reaction in (ii) above (5marks)