



TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES
PURE AND APPLIED SCIENCES DEPARTMENT
SUPPLEMENTARY/ SPECIAL UNIVERSITY EXAMINATION FOR
BTAC 14S AND BTAC 15S₂
ACH 4403 : ORGANIC SYNTHESIS
SERIES: SEPTEMBER 2018
TIME: 2 HOURS
DATE: Sep 2018

Instructions to Candidates

You should have the following for this examination

-Answer Booklet, examination pass and student ID

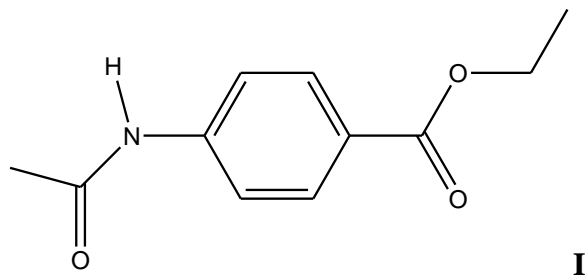
This paper consists of five questions. Answer question one and any other two.

Do not write on the question paper.

Question ONE

- a. Explain any four major considerations before designing an organic synthesis (6marks)
- b. Provide the use of the following reagents commonly used in organic synthesis
i) PCC ii) BMPA iii) Zn(Hg) and HCl (6marks)
- c. i) Using simple illustration explain 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 each of the following
i) But-2-ene (2marks)
ii) But-1-yne (4marks)
- e. i) Explain the term FGI as used in retrosynthesis (2marks)

- ii) Carry out a retrosynthetic analysis of ethyl 4-acetamidobenzoate **I** which is a derivative of benzocaine (a known anaesthetic) by FGI (4marks)

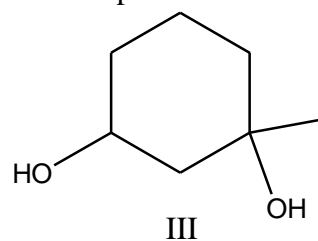
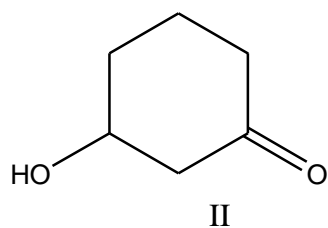


Question TWO

- a. i) State any two protecting groups and indicate where each is used.

(2marks)

- ii) Provide the synthetic route for the transformation of compound **II** to **III** below.



(6marks)

- b. Discuss the reactions below using suitable examples, and show the importance of each reaction in synthesis of organic molecules.

(i) Epoxidation reaction

(3 marks)

(ii) Robinson Annulation reaction

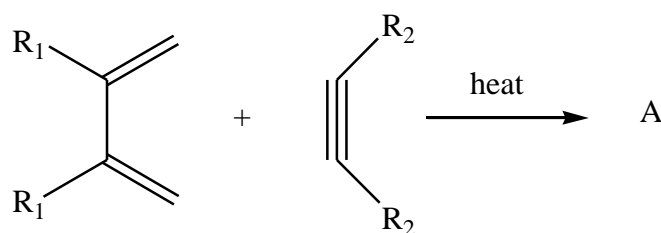
(4 marks)

- c. Suggest a synthetic route for 2-hexanone starting from 1-pentyne and an alkyl bromide in presence of sodium amide.

(5marks)

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. i) Provide the structure of the product labelled A in the reaction below and give the name when $R_1 = R_2 = H$.



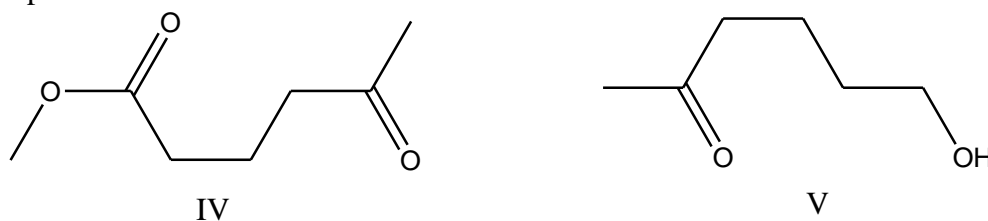
(2mks)

- ii) What type of groups should R_1 and R_2 be in order to increase the yield of the product in (i) above.

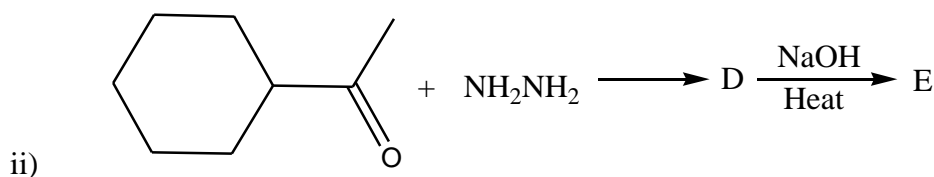
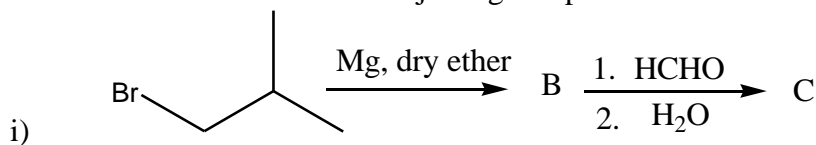
(2mks)

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 V from IV below (4marks)



- c. Provide the structures of the major organic products B-E in the following reactions.



(6marks)

- d. Using curly arrows suggest plausible mechanisms for the reactions in (c)i above.

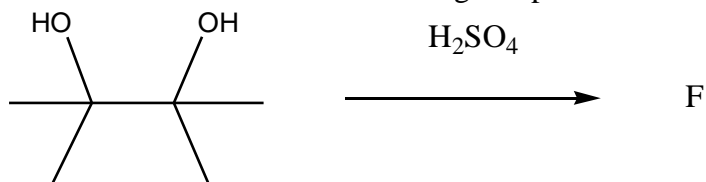
(6mks)

Question FIVE

- a. Explain the following terms
i) Clemensen's reduction
ii) Wittig reaction

(4marks)

- b. 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 b(ii) above (5marks)

- c. Explain the acyloin condensation using a reaction mechanism involving carbonyl carbon of ethyl ethanoate in presence of sodium in liquid ammonia. (6marks)

(6marks)