TECHNICAL UNIVERSITY OF MOMBASA

FACULTY OF APPLIED AND HEALTH SCIENCES

PURE AND APPLIED SCIENCES DEPARTMENT

SUPPLEMENTARY/SPECIAL UNIVERSITY EXAMINATION FOR

BTAC 13S AND BTAC 14S$_2$

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

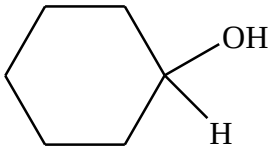
-Answer Booklet, examination pass and student ID

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

Do not write on the question paper.

Question ONE

a. Use the target molecule below to illustrate the difference between synthons and synthetic equivalents



(6marks)

b. Provide the use of the following reagents commonly used in organic synthesis

i) $NaBH_4$ ii) Magnesium monoperoxy phthalate (MMPP)

iii) Lindlar's catalyst($Pd/BaSO_4$/Pb acetate)

(6marks)

c. i) Write the main considerations in disconnecting any target molecule

(4marks)

ii) Linear synthesis builds up molecules step by step. State two instances when it is preferred to other types of synthesis.

(2marks)

d. Write the mechanism for the base catalysed aldol condensation of acetone

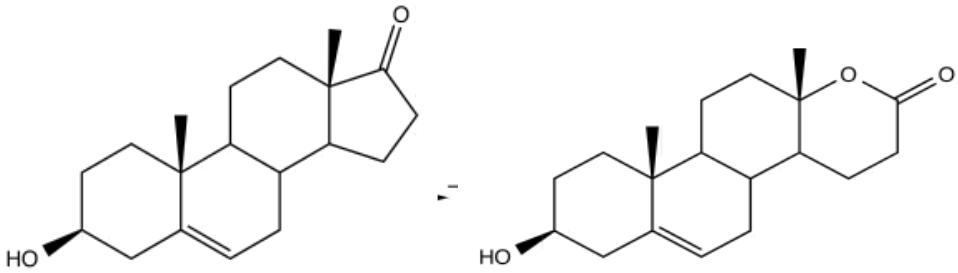
(6marks)

e. i) Explain the term Baeyer – Villigers oxidation

(2marks)

ii) Provide the general mechanism responsible for the transformation of compound I to II which has been identified as anticancer agent below

(4marks)



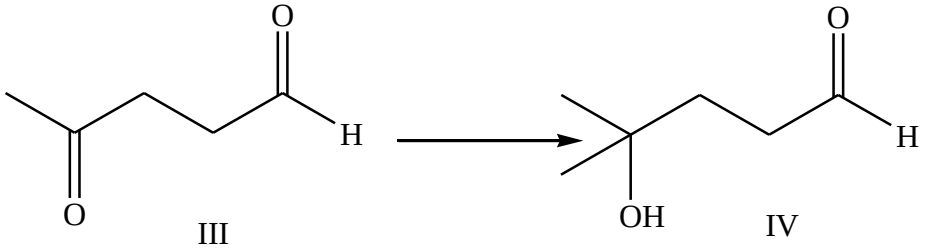
I **II**

Question TWO

a. i) Explain the function of protecting group

(2marks)

ii) With the help of a protecting group provide the synthetic route for the following transformation.



(6marks)

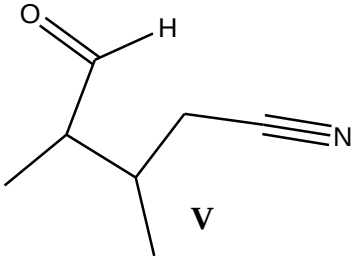
b. Explain the following terms

i) Precursors

ii) Synthetic tree (4marks)

c. Name two starting materials and conditions that can be used to synthesise Compound **V** below.

(3mks)



V

d. Provide a general mechanism for the reaction of ketone and phosphonium ylide.

(5mks)

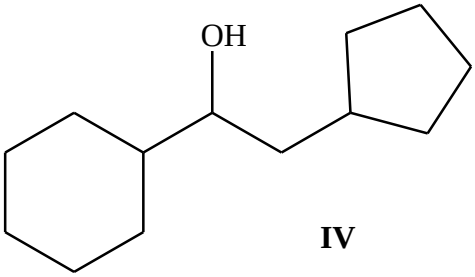
Question THREE

a. Grignard reagents are useful in organic synthesis. Using equations, explain the general reactions with the following compounds

i) Esters
ii) Carbon dioxide
iii) Acid halides
iv) nitriles

(8mks)

b. The compound VI below was synthesized using Grignard reagents and other available organic reagents



IV

i) Carry out a retrosynthetic analysis by disconnections. (5mks)
ii) Provide the synthesis write up for compound VI. (3mks)

c. Explain why reaction of Grignard reagents with esters is only suitable for synthesis of tertiary alcohols

(4mks)

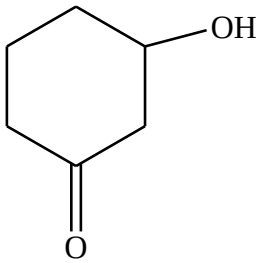
Question FOUR

a. Explain the optical inactivity of the synthesis product of 2-bromobutane from the addition of hydrogen bromide to but-2-ene.

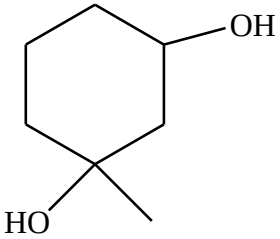
(4marks)

b. Using all necessary reagents show how a protecting group can be used to in synthesis of compound **VIII** from **VII** .

(5marks)



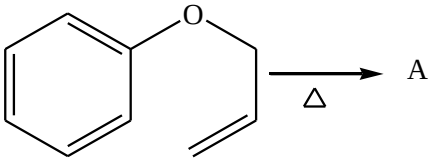
VII



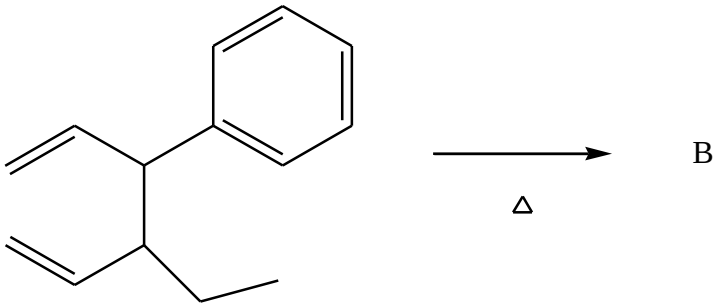
VIII

c. Provide the structures of the major organic products A-B and name the type of reaction

i)



ii)



(4marks)

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

(7mks)

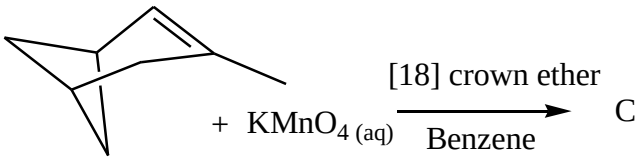
Question FIVE

a. i) Using an illustration show how [12] crown ether can complex with Li^+ ions and not [18] crown ether.

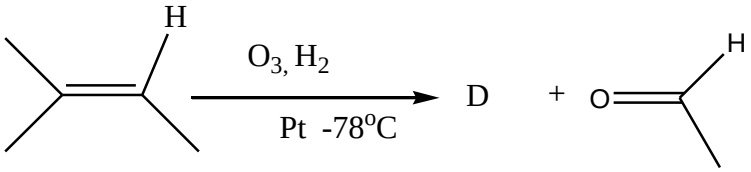
(3marks)

ii) Draw the structure of compound C and name the type of reaction.

(3marks)



b. i) Draw the structure and name the organic product D below (2marks)



ii) Provide the mechanism for the reaction in (i) above (6marks)

c. Explain the following types of rearrangement

i) Fries rearrangement

ii) Demyanov rearrangement

iii) Beckmann rearrangement (6mks)