

CHUKA



UNIVERSITY

UNIVERSITY EXAMINATIONS

EXAMINATION FOR THE AWARD OF DEGREE OF BACHELOR OF SCIENCE IN CHEMISTRY

CHEM 439: INTRODUCTION TO ORGANIC SYNTHESIS

STREAMS: BSC

TIME: 2 HOURS

DAY/DATE: THURSDAY 23/09/2021

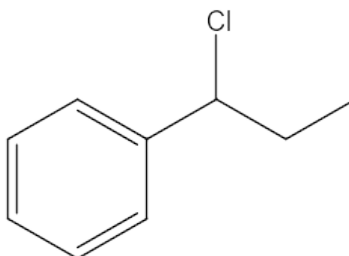
8.30 A.M – 10.30 A.M.

INSTRUCTIONS:

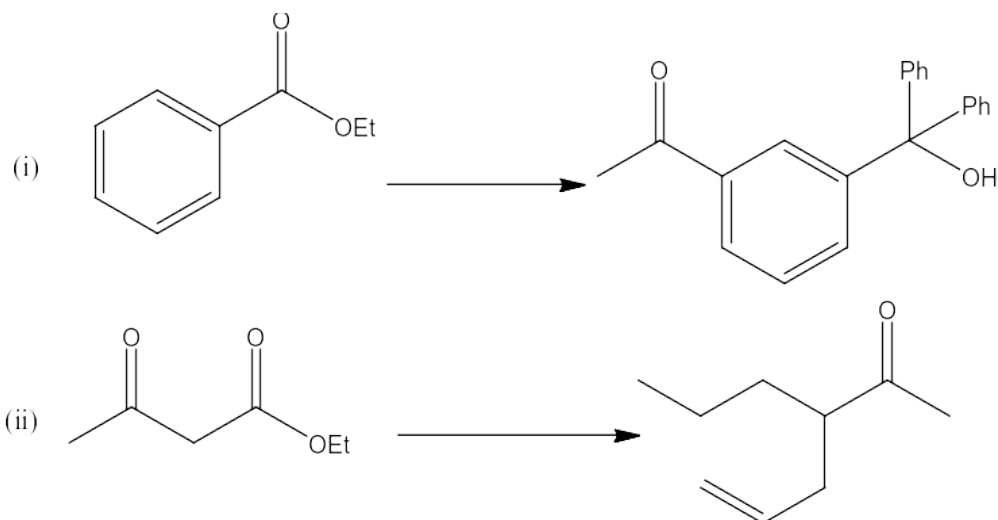
- Answer question **One** (Compulsory) and any other **Two** questions

QUESTION ONE [30 MARKS]

- (a) State three qualities of a good protecting group. (3 marks)
- (b) Explain why convergent syntheses are preferred over linear syntheses. (3 marks)
- (c) Perform a retrosynthetic analysis and a stepwise synthesis of the following target molecule starting with benzene. (8 marks)



- (d) Provide the reagents necessary to transform the given starting materials into the desired products. (10 marks)

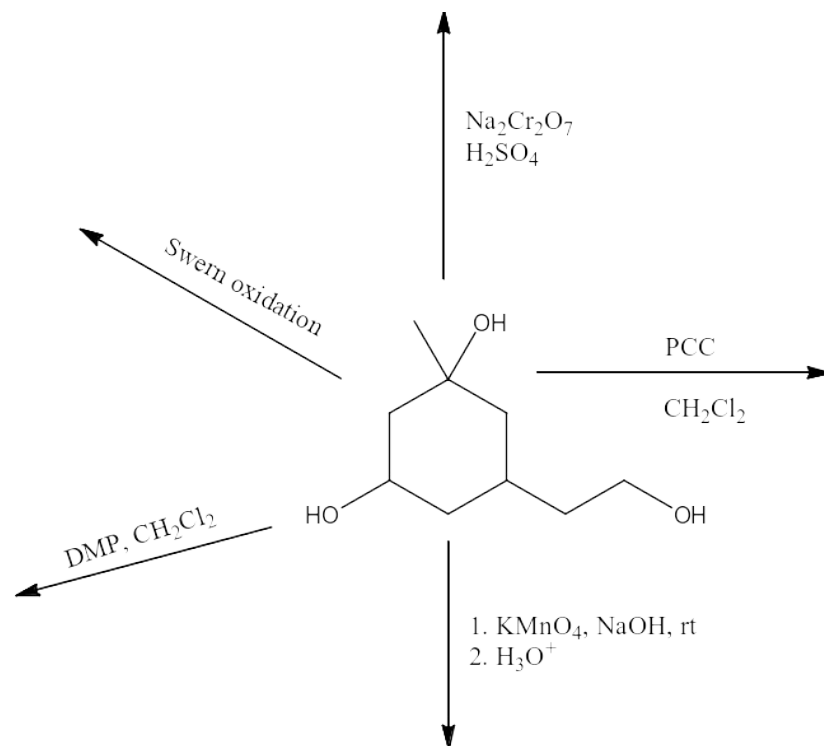


(e) Explain (give examples) how LiAlH_4 can be made less reactive and selective. (4 marks)

(f) Describe one common method of protecting/deprotecting hydroxyl groups during multistep organic synthesis. (2 marks)

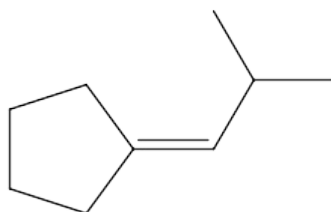
QUESTION TWO [20 MARKS]

(a) Write the major organic products of the following reactions (5 marks)



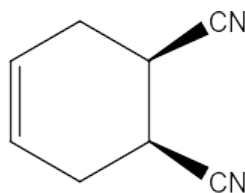
(b) Design a stepwise synthesis of the following target molecule using a Wittig reaction.

(6 marks)



(c) Design a stepwise synthesis of the following target molecule using a Diels-Alder reaction.

(3 marks)



(d) Describe, with an aid of a suitable example, how the following functional groups can be protected and protected during multistep organic synthesis (one method per functional group)

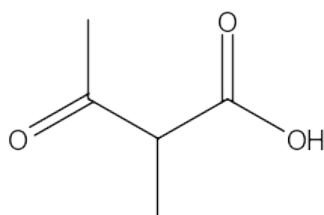
(6 marks)

(i) Amino groups (ii) carboxyl groups

QUESTION THREE [20 MARKS]

(a) Explain the effects of different solvents affects the rates of C-C bond formation using enolates. (6 marks)

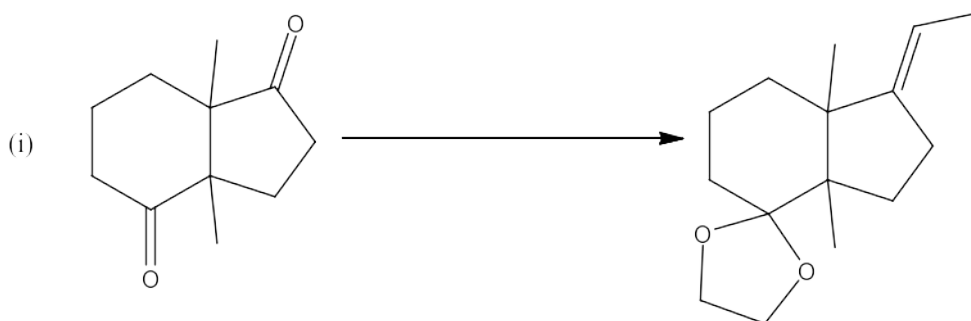
(b) Design a stepwise synthesis of the following target molecule using a malonate ester as one of the starting materials. (6 marks)



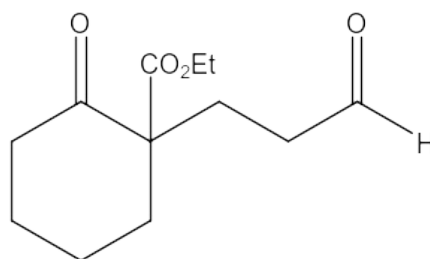
(c) Design a stepwise synthesis of Tyr-Ala-Val tripeptide using the solid-phase peptide synthesis method (8 marks)

QUESTION FOUR [20 MARKS]

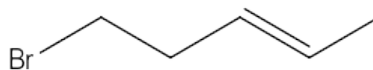
(a) Provide the reagents necessary to transform the given starting materials into the desired products **(5 marks)**



(b) Perform a retrosynthetic analysis and design a stepwise synthesis of the following target molecule starting with materials containing no more than six carbons **(6 marks)**



(c) Design a stepwise synthesis of the following target molecule starting with ethyne, ethylene oxide and any other materials of your choice **(6 marks)**



(d) Design a synthesis of the following target molecule starting using a Stork enamine reaction

(3 marks)

