MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya.
Tel: +254 (0)799529958, +254 (0)799529959, +254 (0)712524293
Website: www.must.ac.ke Email: info@must.ac.ke

University Examinations 2023/2024

FIRST YEAR, FIRST SEMESTER EXAMINATION FOR THE DEGREE OF MASTER OF SCIENCE CHEMISTRY

SCH 7115: MODERN SYNTHETIC METHOD IN ORGANIC CHEMISTRY

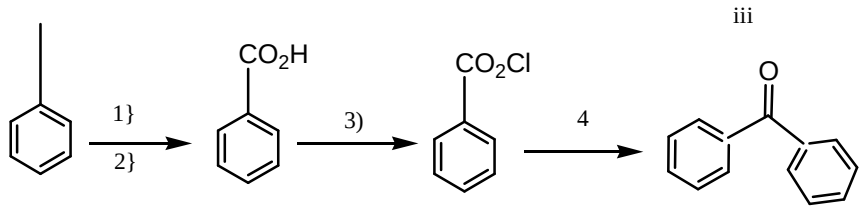
DATE: DECEMBER 2023 **TIME:3 HOURS**

INSTRUCTIONS: *answer question one and any other two questions*

QUESTION ONE (20 MARKS)

a) Identify three stages of the drug discovery, design, and development process where combinatorial chemistry or parallel synthesis is of importance. (3 Marks)

b) Provide the major or necessary reagents required for each transformation represented by steps 1,2,3 and 4 in the scheme below. (4 Marks)



c) What considerations do you think have to be taken into account when choosing a solvent for scale up? Would you consider diethyl ether or benzene as a suitable solvent? (4 Marks)

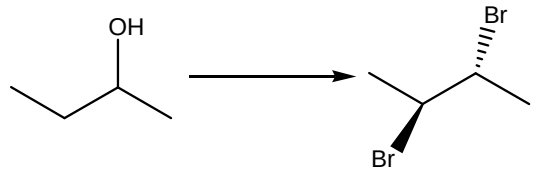
d) State the considerations made when assessing good synthetic route suggested by different retrosynthetic analysis if target molecule (3 Marks)

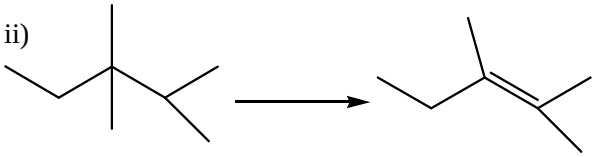
e) Explain how

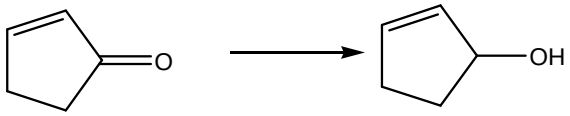
i) acetylene is protected and deprotected during synthesis (1 Mark)

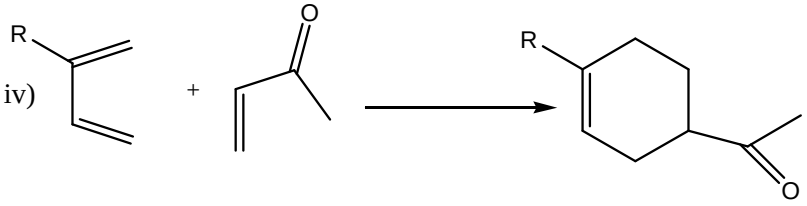
ii) Base is chosen so as to favor enolate formation. (1 Marks)

f) Provide reagents for the following transformations. (4 marks)

i) 

ii) 

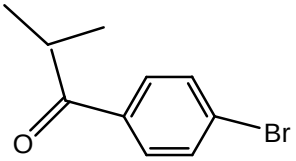
iii) 

iv) 

QUESTION TWO (20 MARKS)

a) Distinguish between anti- and syn-elimination reaction (2 Marks)

b) Study the structure of the molecule below and answer questions that follows



i) Identify the synthon and synthetic equivalent (2 Marks)

ii) Write synthetic write up (4 Marks)

c) Briefly, explain the following terms Chemoselectivity, Regioselectivity and Stereoselectivity (3 Marks)

d) With increased environmental awareness and challenging limiting resources scientists are focusing on green chemistry approaches in the synthesis of organic compounds.

i) Define green chemistry (1 Marks)

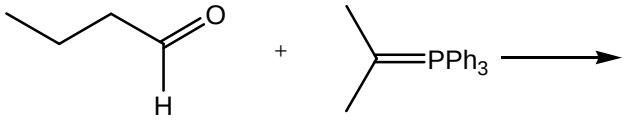
ii) Explain four principles of green chemistry approaches (4 Marks)

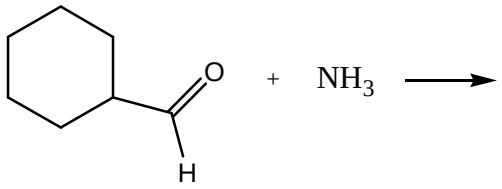
iii) Describe two examples of synthesis of organic compounds and how these could be made safer and environment friendly (4 Marks)

QUESTION THREE (20 MARKS)

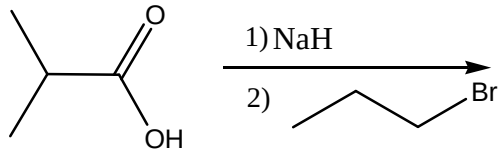
a) What are protecting groups and state two criteria of a good protecting group (3 Marks)

b) Draw the structure of the major organic product for each of the following reaction (6 Marks)





c)

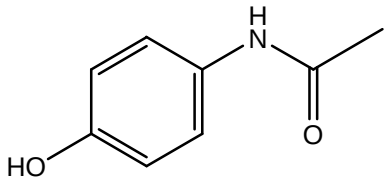


d) Discuss giving examples the two main operations of a retrosynthetic analysis

i. functional group interconversion (3 Marks)

ii. bond disconnection (3 Marks)

e)



i) identify the synthon and synthetic equivalent (2 Marks)

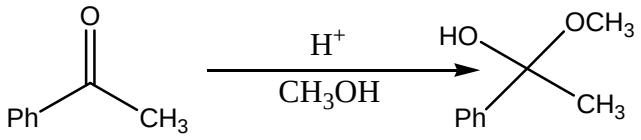
ii) Write synthetic write up (3 Marks)

QUESTION FOUR (20 MARKS)

a) Phosphorus tribromide was added to an alcohol to give an alkyl bromide, but the product was contaminated with an ether impurity. Explain how this impurity might arise and how the reaction conditions could be altered to avoid the problem. (2 Marks)

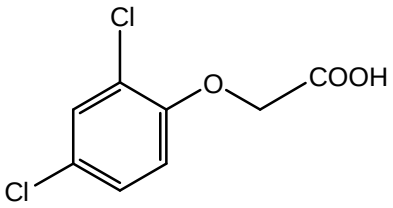
b) State two advantages and disadvantages of using enzymes in synthesis (4 Marks)

c) Provide the complete electron pushing mechanism for the following reaction



(4 Marks)

d) Carry out the retrosynthesis of 2,4-dichlorophenoxyacetic acid (2,4-D), a common herbicide for the control of broadleafed weeds



j) identify the synthon and synthetic equivalent (3 Marks)

ii) Write synthetic write up (2 Marks)

e) i) what are pericyclic reactions (1 Marks)

ii) with illustrations how are pericyclic reactions classified (4 Marks)