



# 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](http://www.must.ac.ke) Email: [info@must.ac.ke](mailto:info@must.ac.ke)

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## University Examinations 2022/2023

SPECIAL/SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF BACHELOR OF  
SCIENCE IN CHEMISTRY

SPECIAL/SUPPLEMENTARY EXAMINATION FOR THE DEGREE OF BACHELOR OF  
SCIENCE

### SCH 3352: SYNTHETIC ORGANIC CHEMISTRY II

DATE: AUGUST 2023

TIME: 2 HOURS

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

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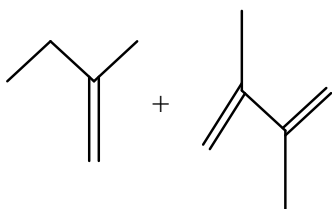
#### QUESTION ONE (30 MARKS)

a) Define a fused ring (2 marks)

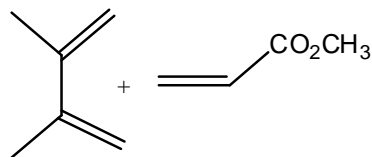
b) Draw the product formed when each diene and dienophile react in a Diels-Alder reaction

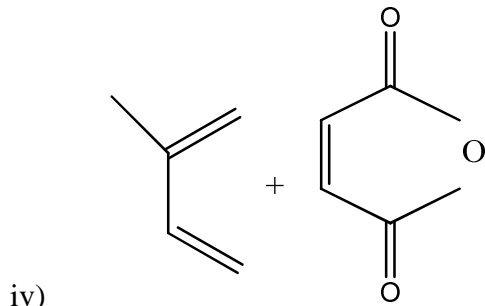
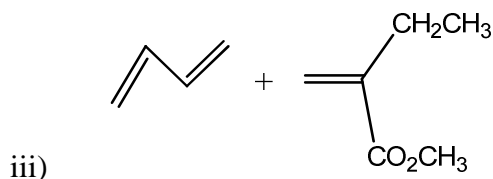
(8 marks)

i)



ii)

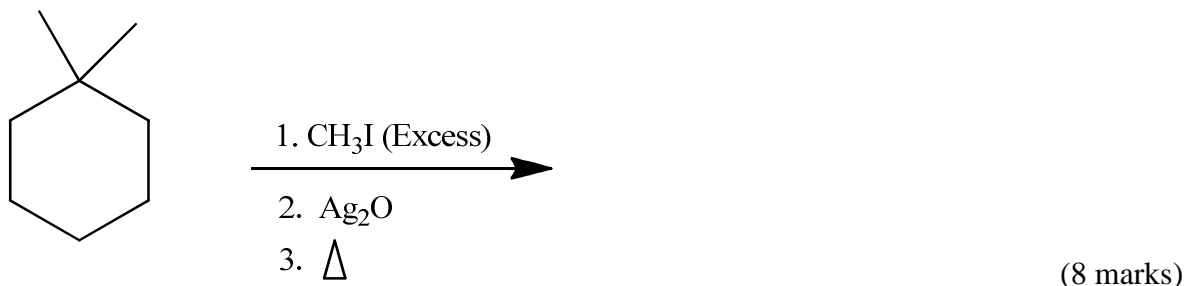




- c) By using a general structure of a tertiary amine, show the mechanism involved in the cope elimination reaction (6 marks)
- d) (i) Define hydroboration (1 mark)  
(ii) Show the stepwise conversion of  $\text{BH}_3$  to a trialkylborane with three equivalents of  $\text{CH}_2 = \text{CH}_2$  (8 marks)
- e) Explain why methylvinylether ( $\text{CH}_2 = \text{CHOC}_2\text{H}_5$ ) is not a reactive dienophile in Diels-Alder reaction (3 marks)
- f) Give the conditions for intramolecular Diels-Alder reactions (2 marks)

### QUESTION TWO (20 MARKS)

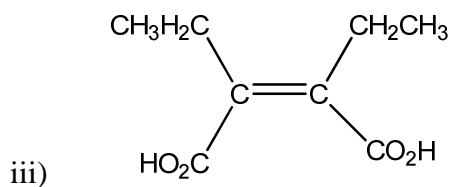
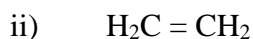
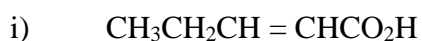
- a) (i) Define hydroboration (2 marks)  
(ii) Using the general formula of an alkene, show the mechanism involved in the hydroboration oxidation of alkenes (6 marks)
- b) Briefly describe why (z,z)-2,4-hexadiene is considerably less reactive than (E,E)-2,4-hexadiene in a Diels-Alder reaction. Your explanation should include the structures of the compounds (4 marks)
- c) By showing the reaction mechanism draw the major product formed from Hoffmann elimination for the following amine



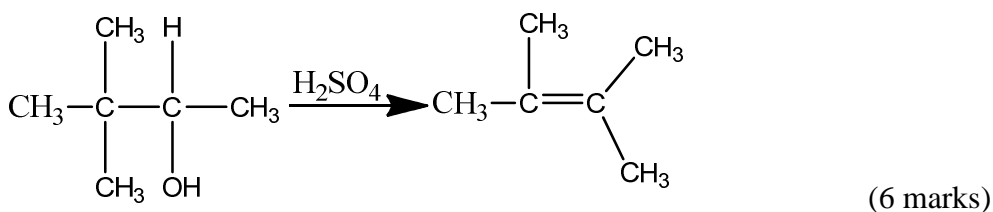
**QUESTION THREE (20 MARKS)**

a) Briefly describe four features of the Diels-Alder reactions (8 marks)

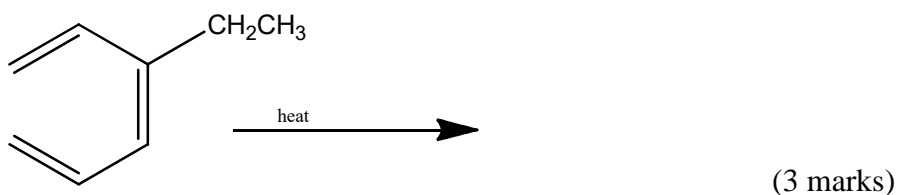
b) Rank the following dienophiles in order of increasing reactivity (3 marks)



c) Show the mechanism for the dehydration reaction below using carbocation rearrangement



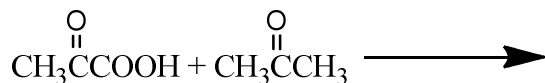
d) Give the structure and name of the product formed in the following reaction



**QUESTION FOUR (20 MARKS)**

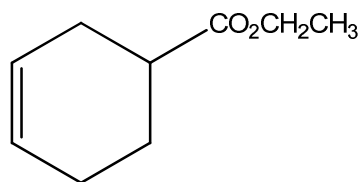
a) Using the Hoffmann elimination show the reaction mechanism for the preparation of hexane from hexylamine (6 marks)

b) Using relevant structures show the reaction mechanism and product formed in the following Baeyer-Villiger reaction below

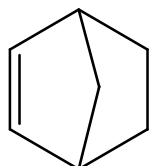


c) What diene and dieno Phice are needed to prepare each of the following compounds below

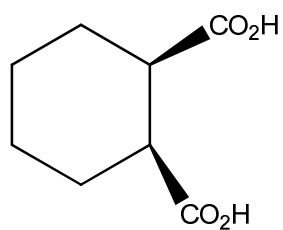
(i)



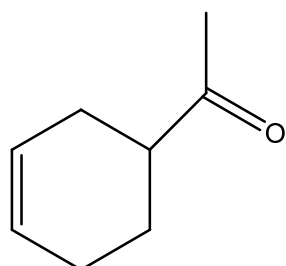
(ii)



(iii)



(iv)



(v)

