

University of Ruhuna- Faculty of Technology**Bachelor of Biosystems Technology Honours Degree****Level 1 (Semester II) Examination, December 2025****Academic year 2023/2024****Course Unit: BST 1232 (New) Organic Chemistry (Written) Duration: 1 & 1/2 hours**
.....**Index Number:****Instructions to candidates:**

Please read and follow the instructions carefully before answering the questions.

- Answer **All** the questions.
- Answers should be given in the spaces allocate in the question paper.

Total number of questions

05

Total number of pages

12

Question Number	Marks out of 100
01	
02	
03	
04	
05	
Total out of 500	

Q 01.

a) Chromatography is defined as a separation technique based on differential migration between a stationary and a mobile phase.

i. Compare the nature of the mobile phase used in Gas Chromatography (GC) and High-Performance Liquid Chromatography (HPLC).

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(15 marks)

ii. What is represented by the retention time (t_R) of a peak?

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(10 marks)

iii. What information does the size (area) of a peak provide?

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(5 marks)

iv. State two key advantages of High-Performance Liquid Chromatography (HPLC)

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(10 marks)

b) A chemist needs to analyze a sample that may contain a mixture of the following: pesticides, fatty acids, sugars, and proteins.

i. For which of these analyte/s would GC be an **inappropriate** technique? Explain your reasoning.

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(10 marks)

ii. Explain why a constant temperature in the column oven is important for results in HPLC.

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(10 marks)

c) In High-Performance Liquid Chromatography (HPLC), method development depends on several parameters.

i. List FOUR critical HPLC analysis parameters that can be optimized.

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(10 marks)

ii. Explain how the polarity of the stationary and mobile phases in Reverse-Phase HPLC leads to the separation of organic compounds.

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(15 marks)

iii. A student synthesizes aspirin (acetylsalicylic acid) from salicylic acid and acetic anhydride. They need to determine the purity of their product and identify any remaining starting material.

a. Do you recommend either HPLC or GC for this analysis?

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(5 marks)

b. Justify your answer above.

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(10 marks)

(Total-100 marks)

Q 02.

a) Organic synthesis has transformed from imitating nature to create novel molecules with a growing emphasis on sustainability

i. Describe the significance of Friedrich Wöhler's synthesis of urea in 1828.

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(15 marks)

- ii. Discuss the importance of chiral synthesis and resolution in the pharmaceutical industry.

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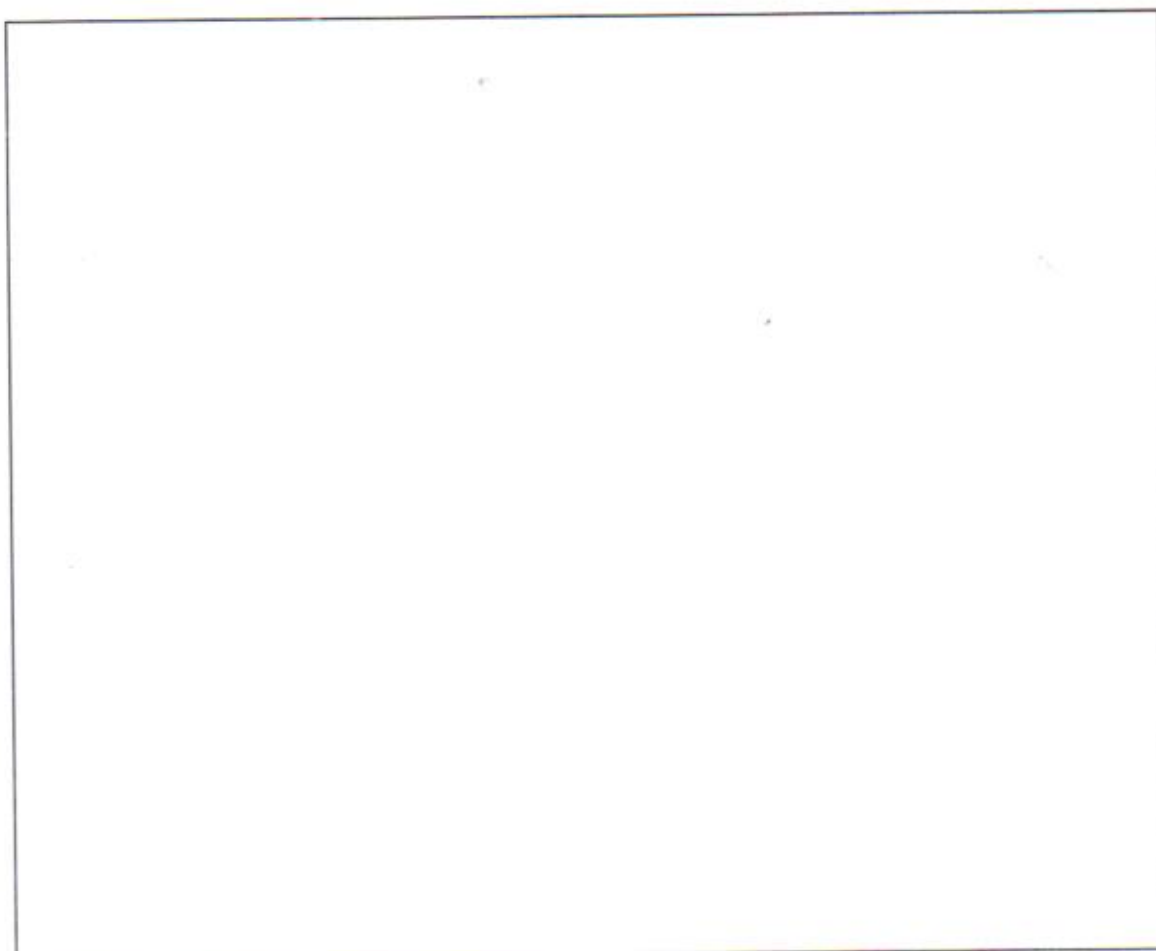
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(20 marks)

- b) Describe the mechanism of electrophilic addition using the reaction of propene with HBr as an example.



(40 marks)

c) A chemist wants to synthesize butanal from butan-1-ol without oxidizing it further to butanoic acid.

i. Suggest a suitable oxidizing agent for this transformation

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(10 marks)

ii. Explain why this reagent (answer in part i).stops at the aldehyde stage.

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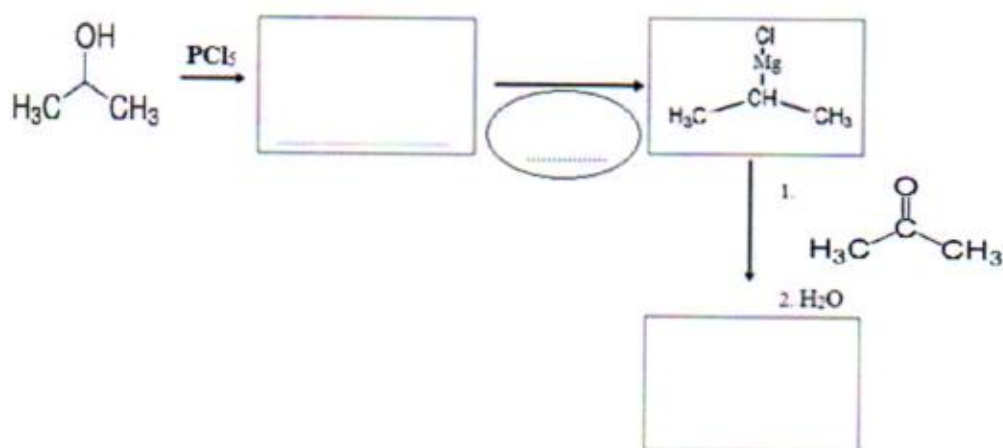
(15 marks)

(Total-100 marks)

Q-03

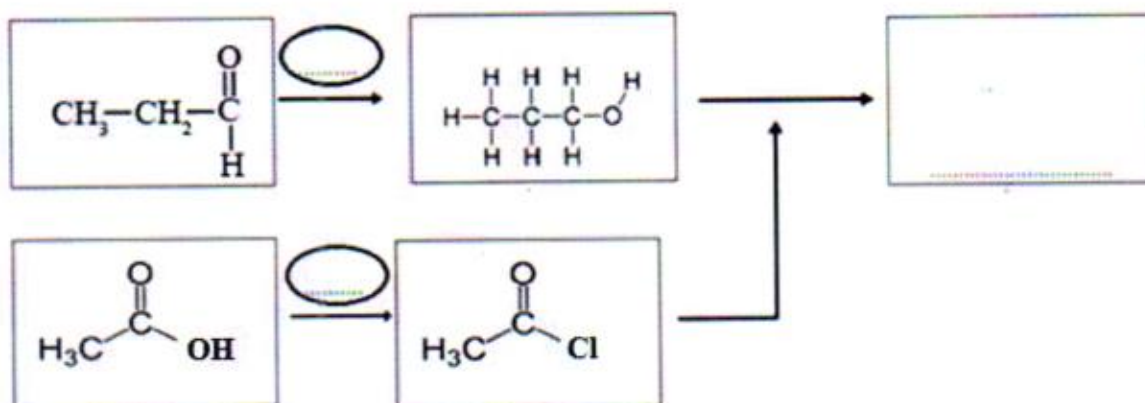
Complete following conversions by filling reagents/catalyst in ellipse and intermediates in rectangles.

a)



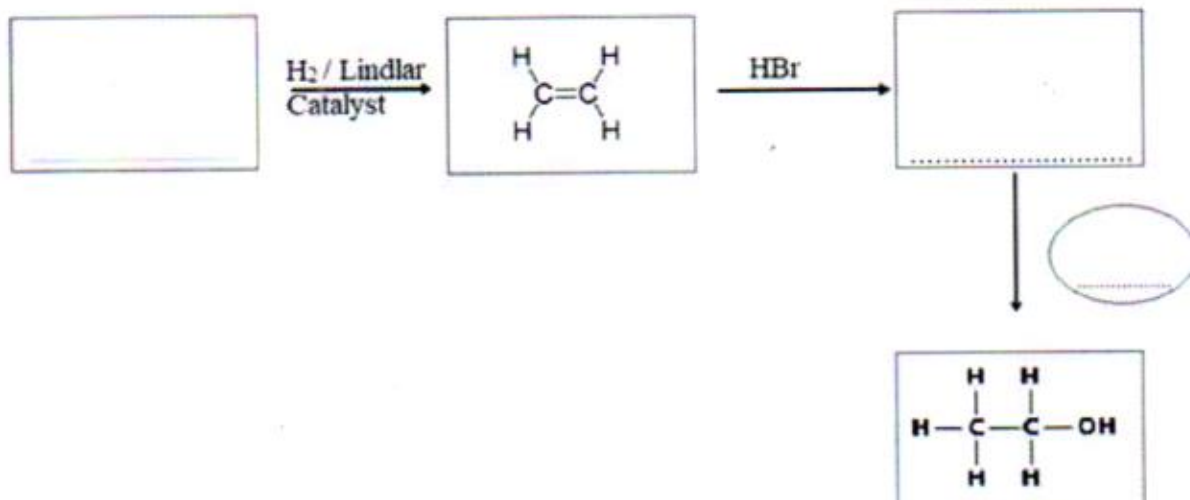
(25 marks)

b)



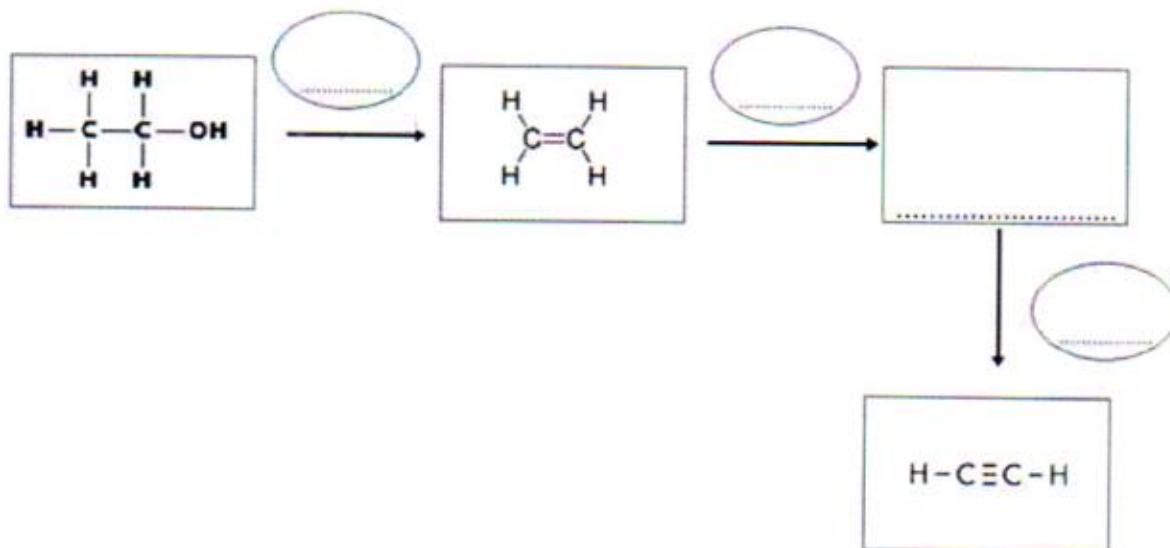
(25 marks)

c)



(25 marks)

d)



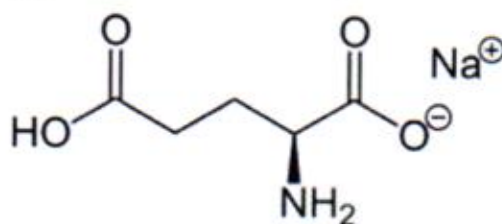
(25 marks)

(Total-100 marks)

Q 04.

a) Monosodium glutamate (MSG) is found naturally in some foods including tomatoes and cheese in this glutamic acid form.

i. The structure of Monosodium glutamate is shown below and mark the chiral center/s using asterisk (*).



(5 marks)

ii. Explain why a racemic mixture is optically inactive.

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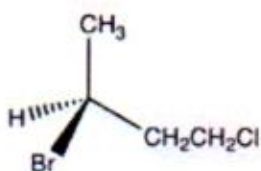
(10 marks)

ii) Name the functional group in each of your structures in part i.

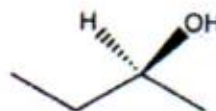
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(5 marks)

iii. Determine the R/S configuration of the chirality center in following compounds



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(10 marks)

c) State whether following compounds can exist as cis-trans isomers? If your answer is yes draw the cis and trans conformations for each compound.



(15 marks)



(15 marks)

(Total-100 marks)

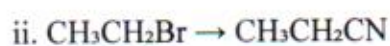
Q 05

a) Complete the following one-step transformations by providing the missing reagents:



Reagent: _____

(10 marks)



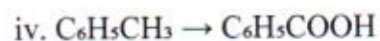
Reagent: _____

(10 marks)



Reagent: _____

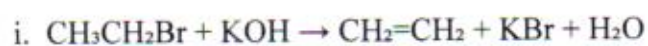
(10 marks)



Reagent: _____

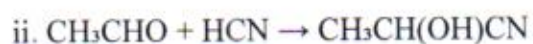
(10 marks)

b) For each transformation, state the type of reaction occurring.



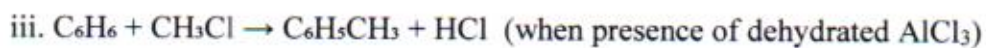
Reaction type: _____

(5 marks)



Reaction type: _____

(5 marks)



Reaction type: _____

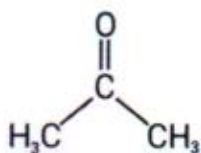
(5 marks)



Reaction type: _____

(5 marks)

c) A mixture of acetaldehyde and acetone is reacted with dilute sodium hydroxide (NaOH) solution. Draw displayed formula of the major organic product(s) formed in this reaction.



Acetone

(40 marks)

(Total -100 marks)

.....End of the Paper.....