Part II only

UNIVERSITY OF RUHUNA

FACULTY OF FISHERIES AND MARINE SCIENCES & TECHNOLOGY

Academic Year 2023/2024

Bachelor of Science Honors in Fisheries and Marine Sciences Degree/ Bachelor of Science Honors in Marine and Freshwater Sciences Degree

Level IV Semester I Examination – April/May 2025

CHM 4132: Natural Product Chemistry **Time:01 hour and 30 minutes**

Instructions:

- Answer all questions in part I in the paper itself.

  In each of the questions 1-15 in part I, pick one of the alternatives from (A), (B), (C), (D) and (E) which is correct or most appropriate and underline your selection.

- **Answer any two (02) questions from part II.**
- Use the answer writing book to answer the questions in part II.

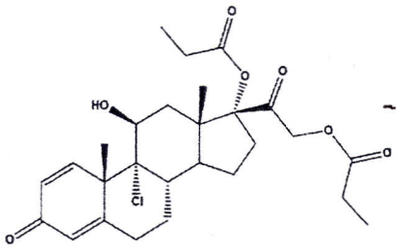
Part II

Answer **02 questions** only.

01. Answer **all** parts.

a. Giving reasons identify the relevant phytochemical class to which the following secondary metabolites are belonging.

i.



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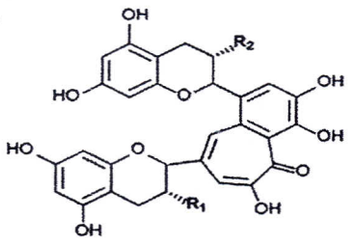

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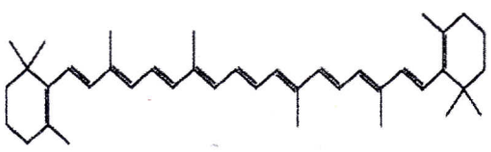

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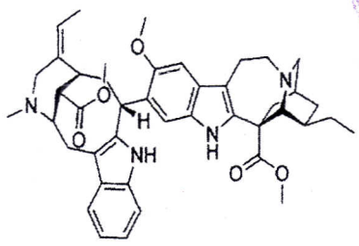


(20 marks)

b. Give short answers to the following questions.

i. Define the difference between terms "Isocratic elution" and "Gradient elution ".

ii. Briefly explain the quantitative and qualitative use of chromatography in natural products-based studies.

iii. What are the advantages and disadvantages of gas chromatography?

(40 marks)

c. Flavonoids are major secondary metabolites in fruits and vegetables.

i. Draw the basic structure of flavonoids and number the structure accordingly.

ii. What is the basis for classifying different flavonoids?

iii. Suggest a suitable method to extract flavonoids from plants.

iv. List out 5 pharmacological actions of flavonoids.

(40 marks)

02. Answer **all** parts.

a. Give brief answers to the following questions regarding alkaloids.

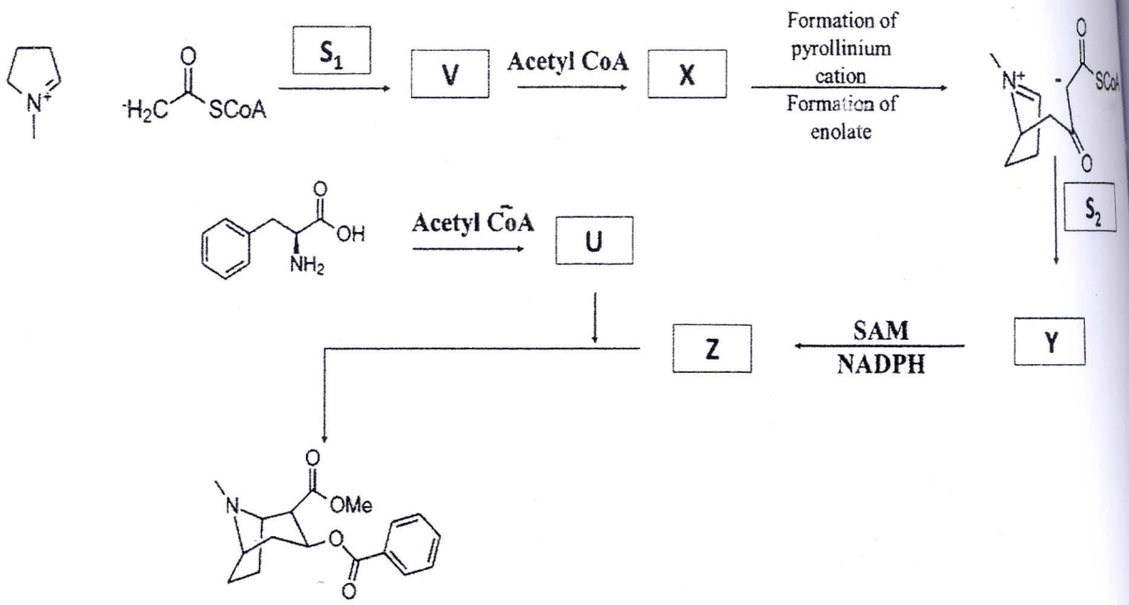
i. List major categories of alkaloids, and mention the basis for this classification.

ii. Give three reasons for plants to synthesize alkaloids

iii. Briefly explain a method that can be used to extract and isolate an alkaloid from the plant.

(30 marks)

b. An incomplete reaction pathway for biosynthesize of Cocaine is given below.



i. Write the suitable chemical structures for X, Y, U, and Z

ii. What are the names of reaction steps S_1 and S_2.

iii. Steps S_1 and S_2 show the same mechanism to form products X and Y. Outline the mechanism to explain step S_1.

(40 marks)

c. Give short answers to the following questions about steroids.

i. Draw the basic structural unit of steroids and number the rings accordingly.

ii. List main categories of steroid with one example for each class.

iii. Suggest a suitable method to extract steroids from a plant.

(30 marks)

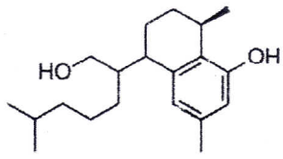
03. Answer **all** parts.

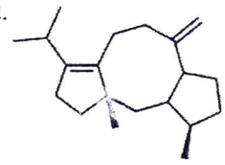
a. Terpenoids are one of the main secondary metabolites present in the plant kingdom. Give short answers to the following questions with respect to terpenoids.

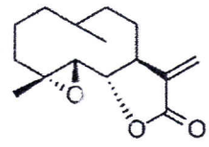
i. Give the structure and the IUPAC name of the basic structural unit of terpenoids.

ii. List out five uses of terpenoids in different industries.

iii. Using suitable classification and reasoning, name the main classes of terpenoids to which the following structures are belonging

1. 

2. 

3. 

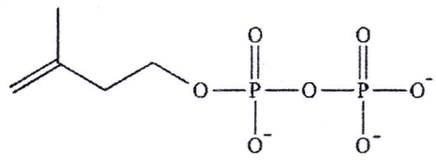
(40 marks)

b. Usually biosynthesis of terpenoids occurs through a common mechanism.

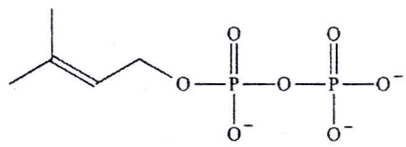
i. Name the starting compound of Terpenoid biosynthesis.

ii. Terpene units joint each other in specific manner in the process of terpenoids synthesis. Name the rule relevant to that process.

iii. Isopentenyl pyrophosphate (IPP) and dimethylallyl pyrophosphate (DMAPP) are the primary products of the biosynthesis of terpenoids.



IPP



DMAPP

Using the above structures (IPP and DMAPP) propose a suitable mechanism which is relevant to the rule as you mentioned in above par **ii** **(30 marks)**

c. Eugenol is an essential oil with distinctive pharmacological effects that can be extracted from Cloves.

i. You are supposed to extract this compound using steam distillation. Explain the theory behind the steam distillation.

ii. What are the other methods that can be used to extract essential oils from the plants?

(30 marks)

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