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M. Sc. Chemistry, III Semester
Supplementary Examination 2023

Paper Name: Chemistry of Natural Products - I

Paper Code: MCHCCO-301

Time: 3 hours

Maximum Marks: 75

Note: This paper has 3 sections A, B, and C, Attempt all three sections; **Section A:** Answer *all* the questions; **Section B:** Answer *any 2* out of 4; **Section C:** Answer *all* the questions, each question has an *internal choice*

Abbreviations Used

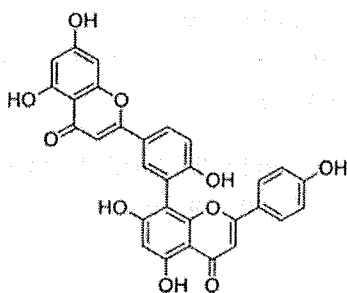
CLO- Course Learning Outcome, PLO- Program learning Outcome, BTL- Bloom Taxonomy Level: BT level 1-Remember; BT level 2-Understand; BT level 3-Apply; BT level 4-Analyse; BT level 5-Evaluate, BT level 6-Create

Q.No

BTL CLO PLO

SECTION AAttempt all questions**(10 x 2 = 20 Marks)**

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|------|--|-----|-----|-----|
| A 1. | Give one example with structure from each class of the following:
(a) Acyclic terpenoid
(b) Monocyclic terpenoid | 1/2 | 1-3 | 1-3 |
| A 2. | What information is obtained from thalleoquin test? How is it performed? | 3/4 | 4,5 | 3,4 |
| A 3. | How many asymmetric carbon atoms are present in the nucleus of steroids? Draw the structure of the steroid nucleus and identify the asymmetric carbon atoms. | 1/2 | 1-3 | 1-3 |
| A 4. | Draw the structure of santonin and show how the carbons are numbered. | 1/2 | 1-3 | 1-3 |
| A 5. | Draw the structure of flavonoids to identify the carbon framework of the basic skeleton. | 1/2 | 1-3 | 1-3 |
| A 6. | Identify the linkage in the following biflavonoid. | 1/2 | 1-3 | 1-3 |



- | | | | | |
|-------|--|-----|-----|-----|
| A 7. | Name two most important and abundant bile acids in human bile. | 1/2 | 1-3 | 1-3 |
| A 8. | Steroids exists in two conformations namely chair form and boat form. Which conformation is more stable and why? | 1/2 | 4,5 | 3,4 |
| A 9. | Give an example of an alkaloid containing pyridine and pyrrolidine heterocyclic ring? | 1/2 | 4,5 | 3,4 |
| A 10. | Name the biosynthetic precursor of cholesterol. | 1/2 | 4,5 | 3,4 |

SECTION BAttempt any two out of following four questions**(2 x 10 = 20 Marks)**

- | | | | | |
|------|---|-----|-----|-----|
| B 1. | a. Explain isoprene rule with suitable examples. How can you prove the p-methane skeleton in menthol?
b. What strategy would you adopt to evaluate and prove the structure elucidation of α -Terpineol? | 3/4 | 3/4 | 4,5 |
|------|---|-----|-----|-----|

B 2.	a.	The structure of quininic acid and meroquinene should be established in order to establish the structure of quinine. Justify the statement by explaining the structure elucidation of quininic acid and meroquinene.	3/4	2/3	3-5
			5/6		
B 3.	b.	Can you give a schematic representation of Hofmann degradation to show how it combines exhaustive methylation and the Hofmann elimination. How Hofmann degradation is applied to discover the nitrogen ring environment in alkaloids.			
B 3.	a.	Discuss the stereochemistry of steroids?	5/6	3/4	4,5
B 4.	b.	Explain the ring contraction and ring expansion of steroids with suitable examples.			
B 4.	a.	Distinguish between the structural features of flavonoids, isoflavonoids and neoflavonoids with suitable examples.	3/4	5	5,6
B 4.	b.	Discuss the position of hydroxyl groups in cholesterol?			

SECTION C

Attempt *all* questions, each question has an *internal choice*

(7 x5 = 35 Marks)

C 1.	What are eicosanoids? Give a brief description of its types and classification.	3/4	5,6	4,5
	OR			
	Describe the method you think is most suitable for the isolation of terpenoids? Give reasons for your analysis.	5	5,6	4,5
C 2.	The mevalonate pathway produces one molecule of isopentenyl pyrophosphate (IPP) in six enzymatic steps with the consumption of 3 acetyl-CoAs, 3ATPs, and 2 NADPH reducing equivalents. Discuss all the six steps while specifying the enzymes used.	3/4	5,6	4,5
	OR			
	Differentiate between COX-1 and COX-2? Propose the mechanism of inhibition of prostaglandin synthesis by aspirin. Justify your answer with proper reasoning.	5	5,6	4,5
C 3.	Apply your knowledge of the chemistry to propose an extraction/isolation of flavonoids. Give two chemical tests for the detection of flavonoids.	5/2	5,6	4,5
	OR			
	Sketch the biosynthesis of flavonoids by shikimic acid pathway.	2/3	5,6	4,5
C 4.	Sketch the flow chart diagram of the isolation of morphine from the unripe seed capsule of the opium poppy (<i>Papaver somniferum</i>).	1/2	5,6	4,5
	OR			
	Sketch the synthesis of tropine by the method proposed by Richard Willstätter.	5/6	5,6	4,5
C 5.	Analyze the nature of nitrogen present in tropine with appropriate reasoning to justify its assigned structure.	3/4	5,6	4,5
	OR			
	Segregate different classes of terpenoids on the basis of their structural forms.	3	4,5	3,4
C 6.	Propose a method of synthesis of testosterone from cholesterol.	3/4	5,6	4,5
	OR			
	Analyse and explain the linkage between quininic acid and meroquinine to form quinine.	5/6	5,6	4,5
C 7.	Explain the colour changes of anthocyanins at various pH ?	5/6	5,6	4,5
	OR			
	Prove that morphine has a structure containing an ether linkage in position 4, 5 of the phenanthrene nucleus ?	3/4	5,6	4,5

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