UNIVERSITY OF ESWATINI

Final Examination(Main) – 2020/2021

TITLE OF PAPER:	Natural Products and Medicinal Chemistry
COURSE NUMBER:	CHE432
TIME ALLOWED:	Three Hours

INSTRUCTIONS:

Answer any four (4) questions of the six (6) questions and every question holds 25 marks.

NB: all questions are to be answered in a separate answer sheet.

This Examination Paper Contains **FOUR** Printed Pages Including This Page

You are not supposed to open the paper until permission to do so has been granted by the Chief Invigilator.

QUESTION 1

(a) Define a natural product. [1]

(b) Write informative notes on the following people that contributed towards the development of natural products and medicinal chemistry.

(i) Ebers Papyrus [3]

(ii) Pedanius Discorides [3]

(iii) Avicenna [3]

(iv) Sir Alexander Fleming [3]

(c) Define or describe the following concepts:

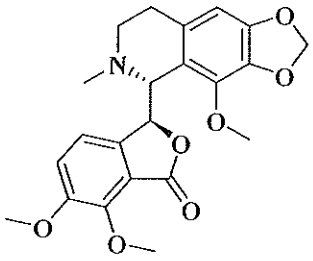
(i) Primary metabolites [4]

(ii) Secondary metabolites [4]

(d) The extraction of natural products progresses through four stages. Name and briefly describe the four stages of natural products extraction. [4]

QUESTION 2

(a) Name the following compounds below and give the medicinal use for each. [12]



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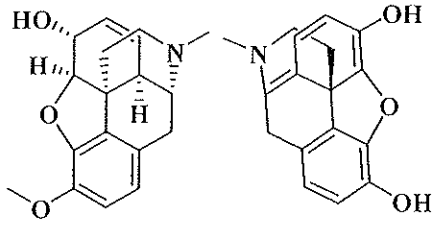

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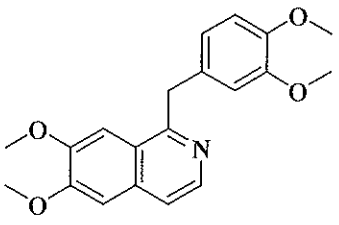

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(b) Heroin is a semi-synthetic organic compound, using a synthetic scheme, giving all reagents and solvents used, explain how heroin is synthesized. [8]

(c) Describe the role of Shikimic acid pathway in natural products. [5]

QUESTION 3

(a) What is the association of each of the following individuals with aspirin?

(i) Hippocrates [2]

(ii) Joseph Buchner [2]

(iii) Raffaele Piria [2]

(iv) Cesare Bertagnini [2]

(v) Felix Hoffmann [2]

(b) Starting from phenol, and using suitable reaction mechanisms, show how salicylic acid is synthesized in Kolbe reaction. [15]

QUESTION 4

(a) Describe the factors affecting the extraction process of natural products. [10]

(b) Draw the structure of the following natural occurring molecules:

1. Salicin [2]
2. Salicylic acid [2]
3. Quinine [2]
4. Caffeine [2]
5. Nicotine [2]

(c) Using a flow chat, describe the bioassay-guided natural product drug discovery process. [5]

QUESTION 5

(a) Using a synthetic scheme outline all steps in the Shikimate Pathway. [10]

(b) Name and draw structures of the three naturally occurring aromatic amino acids biosynthesized by plants via the Shikimate Pathway. [9]

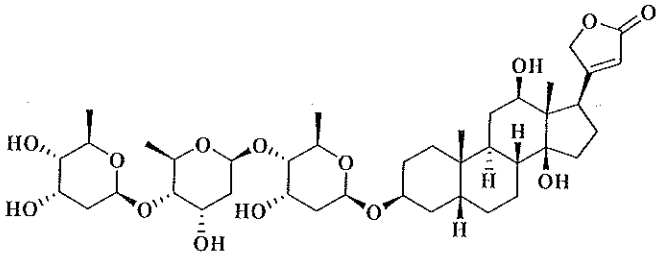
(c) Describe the role of mevalonate pathway in natural product chemistry. [6]

QUESTION 6

(a) Describe the role of natural products in drug discovery development. [4]

(b) Discuss the principle of Agar-Disk Diffussion antimicrobial bioassay. [4]

(c) Below is a chemical structure of a natural occurring molecule.

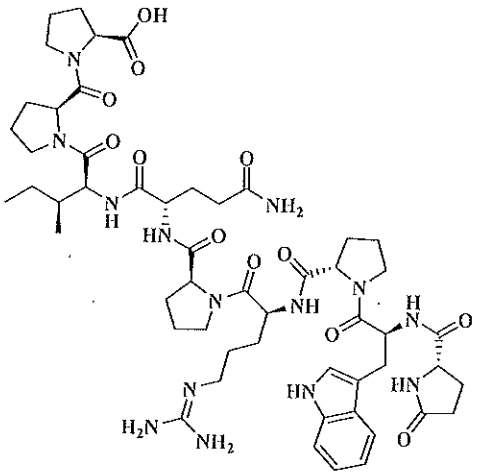


(i) Give the common name of the molecule. [2]

(ii) Give the name of the source of this molecule. [2]

(iii) Give the medicinal use of this molecule. [2]

(d) The name of the structure below is teprotide, a molecule isolated from a venom of an animal source. It has contributed a lot in drug discovery and development of novel drug alternatives.



(i) Name the animal source of teprotide. [2]

(ii) Draw structures and give names of two molecules that were designed based on the structure of teprotide. [6]

(iii) Name the enzyme which is inhibited by these molecules. [2]

(iv) Give one disease that can be treated with these molecules. [1]