



MERU UNIVERSITY OF SCIENCE AND TECHNOLOGY

P.O. Box 972-60200 – Meru-Kenya

Tel: +254(0) 799 529 958, +254(0) 799 529 959, + 254 (0) 712 524 293,

Website: info@must.ac.ke Email: info@must.ac.ke

University Examinations 2023/2024

FOURTH YEAR SECOND SEMESTER EXAMINATION FOR THE DEGREE OF SCIENCE
CHEMISTRY

SCH 3456: NATURAL PRODUCTS CHEMISTRY

DATE: APRIL 2024

TIME: 2 HOURS

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

QUESTION ONE (30 MARKS)

- a) Define the following terms
- i) Chemosystematics
 - ii) Pharmacognosy
 - iii) Docking program (3 marks)
- b) State four reasons for increased interest in demand for phytochemicals world over (4 marks)
- c) i) Define the term metabolites (1 mark)
- ii) With suitable examples, distinguish between primary and secondary metabolites (3 marks)
- d) Discuss **alkaloids** under the following subheadings
- i. Define alkaloids. (1 mark)
 - ii. State their occurrence (2 marks)
 - iii. State two characteristics of alkaloids (2 marks)
- e) Describe two spectroscopic techniques used in structural elucidation (4 marks)

- f) Briefly explain the applications of computer-aided phytochemicals studies (5 marks)
- g) I) Define the term metabolic pathway (1 mark)
- II) With suitable examples, state the various metabolic pathways for different phytochemicals (4 marks)

QUESTION TWO (20 MARKS)

- a) Define the following terms as used in bioassay *in vivo*, *ex vivo* and *in vitro* (3 marks)
- b) Discuss three disciplines or activities used to conduct search of phytochemicals for novel bioactive molecules (3 marks)
- c) I. State two properties of flavonoids (2 marks)
- II. Draw the structure of the following flavonoids
- i) Chalcone
- ii) Isoflavone
- iii) flavanone (3 marks)
- d) Illustrate the classification of terpenoids and state two uses of terpenoids (4 marks)
- e) State two advantages the natural bioactive compounds may have over synthetic derivatives in drug design field. (3 marks)
- f) Explain why should secondary metabolites have biological activity in animals? (2 marks)

QUESTION THREE (20 MARKS)

- a) Discuss how the following methods are used in evaluation of plant material
- i. Macroscopic investigations (2 marks)
- ii. Microscopic investigation (2 marks)
- b) State two ideal properties of solvent for extraction (2 marks)
- c) Briefly, explain the post-chromatographic mode for localization of the separated phytochemical components (3 marks)
- d) With examples, illustrate the classification of chromatography (5 marks)
- e) Discuss **Cocaine** under the following subheadings
- i. Its structure (1 marks)
- ii. biological activity and its effects (2 marks)

iii. isolation (3 marks)

QUESTION FOUR (20 MARKS)

- a) Describe the considerations made when collecting plants material for phytochemical analysis (5 marks)
- b) Discuss **natural products** under the following subheading
- (i) define natural products (1 mark)
 - (ii) outline two aspects included in natural products research of a plant (2 marks)
 - (iii) state three functions of phytochemicals in living organisms (2 marks)
- c) Briefly, explain the following extraction techniques
- i) Microwave assisted extraction (MAE) (2 marks)
 - ii) Super critical fluid extraction (SFE) (2 marks)
 - iii) Ultrasound-assisted extraction (UAE) (2 marks)
- d) State three advantages of the modern extraction techniques over the conventional solvent extraction methods (3 marks)
- e) State two parameters of stability of herbal formulation (1 marks)