TECHNICAL UNIVERSITY OF MOMBASA

School of Applied and Health Sciences

DEPARTMENT OF PURE AND APPLIED SCIENCES

UNIVERSITY EXAMINATION FOR:

BACHELOR OF TECHNOLOGY IN APPLIED CHEMISTRY

ACH 4401: MEDICINAL CHEMISTRY I

END OF SEMESTER EXAMINATION

SERIES: December 2024 SERIES

TIME: 2 HOURS

DATE: December 2024

Instructions to Candidates

You should have the following for this examination

Answer Booklet, examination pass and student ID

This paper consists of **FIVE** questions. Attemptquestion ONE (Compulsory) and any other TWO questions.

Do not write on the question paper.

Question One (30 Marks)

(a) Define the term "biotransformation" and explain its significance in drug elimination. [**5 Marks**]

(b) By making use of relevant examples, explain how the functional groups on a drug molecule can influence its pharmacological activity. [**6 Marks**]

(c) Explain the concept of lead compounds in drug design. [**4 marks**]

(d) Define isosterism and bio-isosterism and explain how these concepts are applied in drug design. [**4 Marks**]

(e) Describe full agonists, partial agonists, and antagonists in terms of their effects on receptor activation, and indicate their individual impact on the resulting dose-response curves. [**6 Marks**]

(f) Explain how hydrophobicity affects absorption and distribution of drugs. [**5 Marks**]

Question Two (20 Marks)

(a) Explain the concept of drug-receptor interactions and its significance in drug design. [**4 marks**]

(b) Describe the role of stereochemistry in drug-receptor interactions and activity. [**4 marks]**

(c) Outline any **six** types of interactions/ forces involved in drug-receptor complex. [**12 marks**]

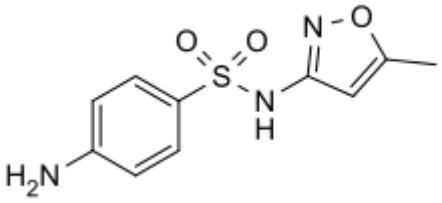
Question Three (20 Marks)

(a) Define sulphonamides and explain their mechanism of action [**4 marks**]

(b) Classify sulphonamides based on their therapeutic applications. [**4 marks**]

(c) Discuss the structural features that contribute to the antibacterial activity of sulphonamides. [**4 marks**]

(d) Outline the synthesis of Sulfamethoxazole (**structure below**) from appropriate carbamic acid and aminobenzenesulfonamide clearly indicating the key steps and reagents involved in the process. [**8 marks**]



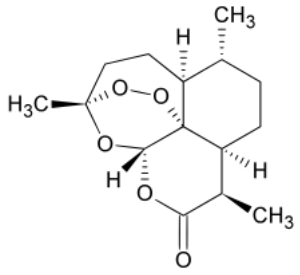
Question Four (20 Marks)

(a) Name primary causal organisms responsible for malaria and state the major transmission routes of the disease. [**6 marks**]

(b) Outline the key control strategies used to combat malaria transmission. [**4 marks]**

(c) Other than artemisinins, name six other classes of antimalarial drugs based on their chemical structure [**3 marks**]

(d) Describe the pharmacological mechanisms of action for artemisinins based on their parent chemical structure (**Structure below**). **[7 marks]**



Question Five (20 Marks)

(a) Describe the general molecular structure of beta-lactams with the aid of chemical structures. **[6 marks]**

(b) Explain the mechanism of action of cephalosporins. How does their structure influence their effectiveness against different types of bacteria? **[7 marks]**

(c) Account for bacterial resistance to beta-lactam antibiotics based on their chemical structure **[7 marks]**