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

SPECIAL/ SUPPLEMENTARY EXAMINATION

SERIES: July 2025 SERIES

TIME: 2 HOURS

DATE: July 2025

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) Outline two major phases of drug metabolism reactions as aided by liver enzymes. [**5 Marks**]

(b) Describe the importance of the structure-activity relationship in drug development. [**3 Marks**]

(c) Other than metabolism, state and explain three other key factors that determine a drug's ability to reach its active site and how they influence drug bioavailability. [**6 marks**]

(d) Explain how the following physical properties of drugs influence their pharmacological activity/ bioavailability: [**6 marks**](2.1.a)

i. Solubility

ii. Ionization

iii. Partition coefficient

Question Two (20 Marks)

(a) Explain the concept of agonist, antagonist, and inverse agonist in the context of drug-receptor interactions. [**6 marks**]

(b) Differentiate between competitive and non-competitive antagonist in drug-receptor interactions clearly indicating how their mechanisms of action affect the drug's dose-response relationship. [**8 marks]**

(c) Explain the significance of the 'lock-and-key' model and the 'induced fit' model in drug-receptor interactions. [**6 marks**]

Question Three (20 Marks)

(a) Outline how pH influences the ionization, solubility and absorption of sulphonamides in the body. [**4 marks**]

(b) Discuss the mechanisms of bacterial resistance to sulphonamides. [**4 marks**]

(c) Evaluate the potential side effects associated with sulphonamide therapy. [**4 marks**]

(d) Outline the role of sulphonamides in combination therapy. [**4 marks**]

(e) Explain the pharmacokinetics of sulphonamides, focusing on their absorption, distribution, metabolism, and excretion. How do these factors influence clinical decision-making? [**4 marks**]

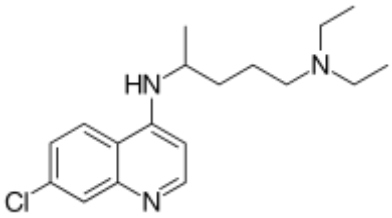
Question Four (20 Marks)

(a) Provide side effects associated with four named antimalarial drugs. Outline the implications of these side effects on patient adherence to treatment. [**6 marks**]

(b) Explain the development of resistance in malaria parasites against antimalarial drugs. [**4 marks**]

(c) Why is combination therapy preferred over monotherapy in the treatment of malaria? Provide two examples of effective combinations. [**5 marks**]

(d) Outline the synthesis of chloroquine (structure below) by making use of two organic molecules, one that provideds the quinolone moiety and the other that provides the diamine side chain. [**7 marks**]



Question Five (20 Marks)

(a) Define antiviral drugs and describe their general mechanism of action. **[4 marks]**

(b) Name four classes of antiviral drugs providing an examples of drug from each class and the viral infections they target. **[8 marks]**

(c) Outline the significance of combination therapy in antiviral treatment by making use of HIV treatment as an example. **[4 marks]**

(d) What are the common adverse effects associated with antiviral drugs? Outline how these side effects can impact patient management and treatment adherence. **[4 marks]**