

051106T4APB

APPLIED BIOLOGY LEVEL 6

APB/OS/AB/CR/12/6

Perform Pharmacological and Toxicological Techniques

November/December, 2025



**TVET CURRICULUM DEVELOPMENT, ASSESSMENT AND CERTIFICATION
COUNCIL
(TVET CDACC)**

WRITING

Time: 3 hours

INSTRUCTIONS TO CANDIDATES

1. This paper consists of **TWO** sections: **A** and **B**.
2. Answer **ALL** questions in section A and **ANY THREE** (3) questions in section B.
3. Marks for each question are indicated in the brackets.
4. Candidates are provided with a separate answer booklet
5. Do not write on the question paper.

This paper consists of FOUR (4) printed pages

Candidates should check the question paper to ascertain that all pages are printed as indicated and that no questions are missing.

SECTION A (40 MARKS)

Attempt ALL Questions in This Section.

1. Drugs can be administered in various ways to achieve a therapeutic effect. While some routes deliver a drug systemically throughout the body, others are designed to produce a localized effect on a specific area
 - a. Name TWO drug administration routes suitable to produce local effects. (2 Marks)
 - b. Describe the sublingual route of drug administration (2 Marks)
2. Therapeutic drug monitoring (TDM) is a practice used to measure drug concentrations in a patient's blood to optimize therapy and minimize toxicity. State FOUR reasons why the value of TDM using drug concentration data is considered limited. (4 Marks)
3. During a toxicology lesson on chemical hazards, learners were discussing the origins of cyanide exposure. State FOUR sources of acute hydrogen cyanide poisoning in human being. (4 Marks)
4. Preparing drugs for administration by combining the active drug ingredient with various inactive substances, called
 - a. Define the term pharmaceutical formulation. (2 Marks)
 - b. List TWO types of topical drug formulation. (2 Marks)
5. Bacterial toxins and poisonous gases are both harmful substances, but they differ in their origin, chemical nature, and mode of action.
 - a. Distinguish between endotoxin and exotoxin. (1 Mark)
 - b. Describe the mechanism of action of carbon monoxide poisoning. (3 Marks)
6. While studying drug kinetics, learners examined how long it takes for drug concentration in the body to reduce and how this can be represented visually.
 - a. Define half-life ($t_{1/2}$) of a drug (1 Mark)
 - b. Using a graph, illustrate the half-life of a drug in a zero-order kinetic elimination. (3 Marks)
7. In a pharmacology exercise on drug safety, students were tasked with assessing how close a drug's effective dose is to its lethal dose. Calculate the standard safety margin of a drug whose effective dose in 99% of subjects (ED_{99}) is 150, and the dose lethal to 1% of subjects (LD_1) is 200. (4 Marks)

8. During a pharmacokinetics lesson on drug absorption, the trainer highlighted key concepts influencing how drugs enter the bloodstream.
- a. Define the term bioavailability. (1 Mark)
 - b. Distinguish between first-order kinetic and second-order kinetic in drug absorption. (3 Marks)
9. Observing drug effects in animals is important for safety. State how the following factors determine drug dosage in animals:
- a. Age (2 Marks)
 - b. Weight (2 Marks)
10. Drug metabolism tells us how the body handles medicine. State FOUR organs involved in drug metabolism and excretion in laboratory animals. (4 Marks)

SECTION B (60MARKS)*Answer any THREE Questions in This Section.*

11. Describe drug metabolism under the following subheadings

- a. The liver as the main organ of drug metabolism (8 Marks)
- b. Events of Phase I of drug metabolism (6 Marks)
- c. Events of Phase II of drug metabolism (6 Marks)

12. Toxicity tests help in determining if substances are harmful. Describe the following basic toxicity tests used in laboratory animals.

- a. Acute toxicity tests (4 Marks)
- b. Sub-chronic toxicity tests (3 Marks)
- c. Chronic toxicity tests (3 Marks)
- d. Carcinogenicity tests (3 Marks)
- e. Mutagenicity tests (3 Marks)
- f. ELISA Test (4 Marks)

13. Pharmacodynamics explains that molecules produce their effects by interacting with specific receptors.

- a. Classify receptors on the basis of their structure and nature of the transduction mechanism. (12 Marks)
- b. Explain the drug–receptor interaction phenomenon of drug action. (8 Marks)

14. Drug response refers to the physiological, psychological, and therapeutic effects that a medication has on a person's body.

- a. Using graphs on the same grid, illustrate therapeutic effects and toxic side effects. (8 Marks)
- b. With the aid of a diagram, illustrate a transdermal device in relation to drug administration. (12 Marks)