THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

133/3B **BIOLOGY 3B**

ACTUAL PRACTICAL B

(For Both School and Private Candidates)

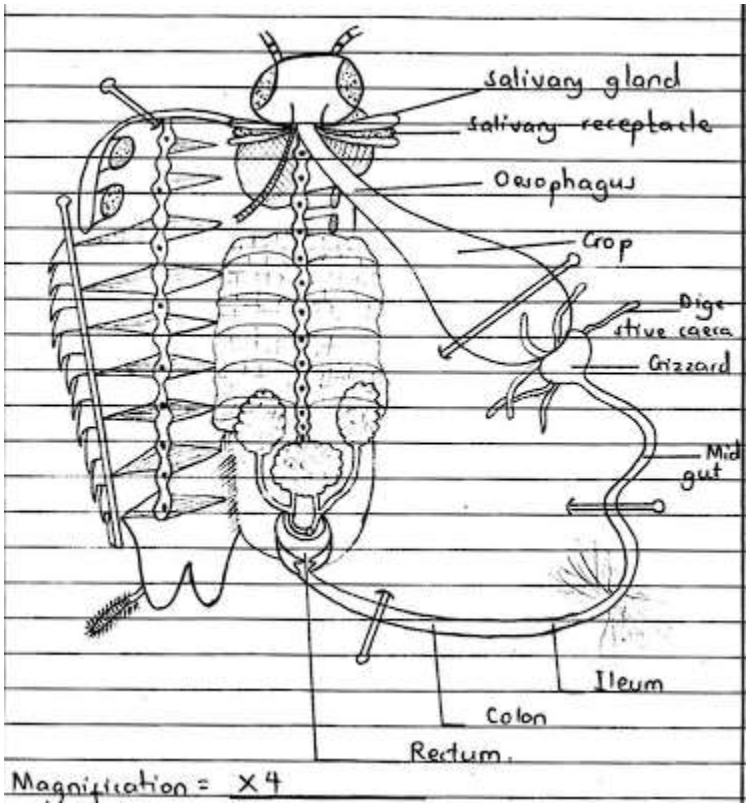
Time: 3:30 Hours **ANSWERS** **Year: 2025**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **all** questions.
3. Question **one (1)** carries **twenty (20)** marks and other **two (2)**, carries **fifteen (15)** marks each.
4. All writings should be in **blue** or **black** ink, **except** for drawings which must be drawn in pencil.
5. Communication devices and any unauthorised materials are **not** allowed in the examination room.
6. Write your **Examination Number** on every page of your answer booklet(s).

1. You have been provided with specimen **Q**. Dissect it in a usual way to fully display the *digestive system* to your right-hand.
   Leave your dissection properly displayed for Assessment.

   a) Draw a neat diagram of the dissected specimen and label ten parts.



   b) Provide two functions performed by

      i. the fore gut

      The fore gut stores food temporarily in the crop before digestion begins, helping the cockroach regulate feeding intervals. It also carries out mechanical digestion in the gizzard where muscular grinding breaks food into smaller particles for easier chemical digestion

ii. the mid gut of the digestive system.

The mid gut performs chemical digestion by releasing enzymes that break down food into absorbable nutrients.
It also absorbs digested nutrients into the haemolymph, providing the cockroach with energy and materials needed for growth and movement.

c) Explain briefly why the hind gut must remain intact in the lifespan of the cockroach.

The hind gut is essential because it reabsorbs water and important salts from undigested food, helping the cockroach maintain internal water balance. It also compacts waste into faecal pellets for elimination, and any damage to the hind gut disrupts excretion and causes dehydration, leading to death.

d) Explain one advantage and disadvantage of cockroaches to human beings.

One advantage of cockroaches is that they contribute to decomposition by feeding on organic waste, which helps in recycling nutrients in the environment.

other disadvantage is that cockroaches spread diseases by contaminating food and surfaces with pathogens, making them health hazards in homes and food storage areas.

2. You have been provided with solution S1 (glucose solution) and solution S2 (egg albumen solution).

(a) Identify the food substances present in solution S1 and S2 and write an experimental report in a tabular form using the format provided.

Food Tested	Procedure	Observation	Inference
S1 (Glucose solution)	Add Benedict's solution to S1 and heat in a boiling water bath	Solution changes from blue to brick-red	Reducing sugar (glucose) present
S2 (Egg albumen solution)	Add Biuret reagent (or NaOH then $CuSO_4$) to S2	Solution changes from blue to violet	Protein present

(b) Explain the basis of the test for each positive result obtained in 2(a).

The positive result for glucose in the Benedict's test occurs because glucose is a reducing sugar that donates electrons to copper(II) ions in Benedict's solution when heated. This converts blue copper(II) ions into insoluble red copper(I) oxide, which forms the brick-red precipitate observed. This chemical reduction confirms the presence of glucose or other reducing sugars.

The positive result for protein in the Biuret test occurs because peptide bonds in the protein react with copper(II) ions in an alkaline medium. These peptide bonds form a violet-coloured complex with the copper ions, which confirms the presence of protein. The intensity of the violet colour depends on the number of peptide bonds present.

(c) Give reasons why boiling was important in some procedures of the experiment.

Boiling is necessary in the Benedict's test because reducing sugars only react with Benedict's reagent when sufficient heat energy is provided to drive the redox reaction.

Boiling increases molecular movement, allowing glucose molecules to collide effectively with copper(II) ions and produce the brick-red copper(I) oxide precipitate.

Boiling also accelerates the reaction rate, ensuring the colour change occurs within a reasonable experimental time.

3. You have been provided with specimens J (Moss plant), K (Maize plant/seedling) and L (Bean plant). Study them carefully and then answer the following questions:

(a) Identify the specimens J, K and L by their common names

Specimen J is identified as a moss plant, commonly called moss.

Specimen K is identified as a maize plant or corn seedling.

Specimen L is identified as a bean plant.

(b) Explain how does each of the specimen J and K adapted to its habitat by giving two points

Specimen J is adapted to its habitat by absorbing water directly through its surface because mosses lack true roots, enabling them to survive in moist environments.

Specimen J is also adapted by having rhizoids that anchor the plant onto rocks or soil, allowing it to grow in shaded, damp habitats with little competition.

Specimen K is adapted to its habitat by having fibrous roots that spread widely in the soil, allowing efficient absorption of water and minerals in open fields.

Specimen K is also adapted by having long, narrow leaves that reduce water loss through transpiration, helping it survive in sunny and warm environments.

(c) (i) Classify each of the specimen J and K to class level

Specimen	**kingdom**	**division**	**class**
J	Plantae	Bryophyta	Musci
K	Plantae	Angiospermophyta	Monocotyledoneae

(ii) Give two reasons as to why specimen J and K are placed in the classes they belong.

Specimen J is placed in class because it has no vascular tissues, meaning it lacks true xylem and phloem, which is characteristic of mosses.
Specimen J also reproduces through spores and requires water for fertilization.

Specimen K is placed in class Monocotyledonae because it has one cotyledon in its seed structure, which is a key feature of monocots.
Specimen K also has parallel leaf venation and fibrous root systems, both of which are typical characteristics of monocot plants.

(d) Give two points in what ways specimens K and L differ

Specimen K has parallel leaf venation, while specimen L has reticulate or net-like venation.
Specimen K is a monocot with one cotyledon, while specimen L is a dicot with two cotyledons.