**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATIONS COUNCIL OF TANZANIA**

**ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION**

**133/3C** **BIOLOGY 3C**

**(ACTUAL PRACTICAL C)**

(For Both School and Private Candidates)

**Time : 3:20 Hours** **ANSWERS** **Year : 2023**

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**Instructions**

1. This paper consists of three questions, answer all questions
2. All writing should be in **blue** or **black** ink.
3. Communication devices and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

1. You are provided with specimen T, dissect it in a usual way to fully display the urinogenital system and pin the alimentary canal to the left hand side of the specimen.
   Questions
   (a) Draw a large neat diagram of a dissected specimen T and label eight parts.

The diagram of specimen T (rat or small mammal) should show labelled parts such as kidney, ureter, urinary bladder, urethra, testes/ovaries, oviduct/sperm duct, alimentary canal, and anus.

(b) Identify the sex of the specimen T and give one external feature used for identification.

If the specimen is male, it has external testes and a penis.
If the specimen is female, it has teats and a vaginal opening.

(c) (i) Name the type of nitrogenous waste excreted by specimen T.

Specimen T excretes urea.

(ii) State the structure of the kidney responsible for excretion of nitrogenous waste in Specimen T.

The nephron is the structure responsible for excretion of nitrogenous waste.

(iii) State specific part of the structure named in (c)(ii) where glucose and salt ions are reabsorbed.

Glucose and salts are reabsorbed in the proximal convoluted tubule of the nephron.

(d) Explain the adaptations of specimen T to its environment.

Specimen T has fur which helps regulate body temperature in different conditions.
It has sharp incisors adapted for gnawing food and defending itself.
It has long hind limbs adapted for fast running to escape predators.
It has a keen sense of smell and hearing to detect danger and locate food.

2. You are provided with 2% hydrogen peroxide solution and fresh liver tissue. Carry out a guided experiment to investigate the reaction of hydrogen peroxide with substance X present in the liver tissue. Perform the following procedures:

(i) Label three test tubes 1, 2 and 3.
(ii) Cut the liver tissue to obtain three cubes of about 1 $cm^3$.
(iii) Place one of the cubes in test tube 1. Add 2 ml of hydrogen peroxide solution. Observe the changes.
(iv) Take the second cube of the liver tissue and grind it. Place the ground liver in test tube 2. Add 2 ml of hydrogen peroxide in the test tube. Observe the changes.
(v) Take the third cube of the liver tissue and grind it. Place the ground liver in test tube 3. Boil it and allow it to cool. Add 2 ml of hydrogen peroxide solution, and then observe the changes.

Questions
(a) Present their observations of test tubes 1, 2 and 3 in tabular form and give reasons for the observed changes.

| Test tube | Observation | Reason |
|---|---|---|
| 1 | Bubbles of oxygen produced | Catalase in liver tissue breaks down hydrogen peroxide into water and oxygen |
| 2 | More vigorous bubbling observed | Grinding increases surface area of liver cells, exposing more catalase enzyme |
| 3 | No bubbles observed | Boiling denatured catalase enzyme, preventing breakdown of hydrogen peroxide |

(b) (i) Identify a cellular organelle where substance X can be found.

Catalase is found in the peroxisome.

(ii) Name the biochemical reaction catalyzed by substance X in the liver.

Catalase catalyzes the decomposition of hydrogen peroxide into water and oxygen.

(c) State the purpose of grinding and boiling the liver.

Grinding increases surface area for the enzyme to act more effectively.
Boiling destroys the enzyme by denaturation to confirm that enzymes are protein in nature.

(d) (i) Write the balanced chemical equation for the reaction between substance X and hydrogen peroxide.

$2H_2O_2 \rightarrow 2H_2O + O_2$

(ii) State the biological significance of the reaction in living organisms.

This reaction removes hydrogen peroxide, which is toxic to cells, thus protecting body tissues from damage.

3. You are provided with specimen Z4, Z5 and Z6. Observe them carefully and:
   (a) (i) Explain why it is not advised to identify specimens Z4, Z5 and Z6 by their common names.

Common names vary across different regions and languages, leading to confusion. Scientific names are universal and precise.

(ii) Identify the habitat of each of the specimen Z5 and Z6.

Specimen Z5 (fish) lives in aquatic habitats.
Specimen Z6 (frog) lives in both aquatic and terrestrial habitats (amphibious).

(b) Classify each of the specimen Z4, Z5 and Z6 to Class level.

Specimen Z4 belongs to Class Aves (birds).
Specimen Z5 belongs to Class Pisces (fish).
Specimen Z6 belongs to Class Amphibia (frog).

(c) (i) Identify two observable differences between specimen Z5 and Z6 at Class level.

Z5 (fish) has gills for respiration while Z6 (frog) has lungs and skin for respiration.
Z5 has fins for locomotion while Z6 has limbs for locomotion.

(ii) State three observable features shared by specimen Z5 and Z6.

Both are cold-blooded vertebrates.
Both lay eggs for reproduction.
Both have moist skin or scales adapted for aquatic environments.

(d) Give three observable features of specimen Z6 at Class level.

Specimen Z6 (frog) has moist, smooth skin with no scales.
It has four limbs adapted for jumping and swimming.
It undergoes metamorphosis from a tadpole to an adult frog.