**THE UNITED REPUBLIC OF TANZANIA**
**NATIONAL EXAMINATIONS COUNCIL OF TANZANIA**
**DIPLOMA IN SECONDARY EDUCATTION EXAMINATION**

**733/2C** **BIOLOGY 2C**

**Time: 3 Hours** **ANSWERS** **Year: 2022**

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**Instructions.**

1. This paper consists **three (3)** questions
2. Answer **all** questions.
3. Cellular phones are **note** allowed in the examination room.
4. Write your **examination Number** on every page of your answer booklet(s).

**1. Dissect specimen A (a male or female frog/toad) in the usual way to display the viscera-in-situ and respond to the following questions:**

**(a) Which procedures did you follow from pinning back the outer skin to pinning back the inner skin?**

(i) make two small incisions in the abdominal wall one on either side of the mid-ventral line while taking care not to piece the rectum.

(ii) insert the forceps through the slit in order to grip in the loop of thread.

(iii) pull the thread through the slits and cut the loop.

(iv) tie the thread, a quarter of an inch apart in order to ligature the interior abdominal vein.

(v) ligature the anterior abdominal vein/cutting through the vein and the body wall between the threads.

(vi) cut forwards on either sides of the mid-line to the level of the centre of the xiphisternum and through the pectoral girdle or pelvic on the either sides of the mid-line while taking care not to the internal organs.

(vii) move the pins holding the arms outwards slightly to widen the gap while taking care not to stretch it forcely and tear the blood vessel of the region.

(viii) hold the loose piece of the abdominal wall up and cut across posterior to the pelvic veins and transversely at the level of the pelvic veins

**(b) Draw a diagram of the dissected specimen and label three observable parts which are concerned with the transportation of blood.**

In the diagram, the following three parts involved in blood transportation would be labelled:

- Heart (with three chambers: two atria and one ventricle)
- Major blood vessels like the truncus arteriosus or aorta
- Sinus venosus (a chamber receiving deoxygenated blood)

This diagram would clearly show the heart centrally placed and connected to vessels transporting blood throughout the body.

**2. Provided the candidates with specimen Q (Liver) and required them to carry out procedures (a) to (i) and then answer the questions:**

**(a)(i) What was the aim of this experiment?**

The aim of this experiment was to investigate the catalytic action of the liver enzyme catalase on hydrogen peroxide, resulting in the breakdown of hydrogen peroxide into water and oxygen gas. This was done to demonstrate enzyme activity in living tissues.

**(ii) Which test tube was used as a control experiment?**

Test tube C, which contained liver paste boiled in water before the addition of hydrogen peroxide, served as the control. Boiling denatures the enzyme catalase, ensuring no reaction occurs in the absence of active enzyme.

**(b) Give a reason for doing each of the following:**

**(i) Mixing specimen Q with sand.**
Sand was added to help physically break down the liver tissue during grinding, increasing the surface area for more effective enzyme extraction into the paste.

**(ii) Grinding the specimen Q.**
Grinding the liver tissue was necessary to release intracellular enzymes such as catalase from the cells into the mixture, allowing them to interact with the hydrogen peroxide solution.

**(c)(i) What did you observe after adding 2% hydrogen peroxide solution into each of the test tubes B and C? Give reason for each observation.**

In test tube B, there was rapid effervescence or bubbling upon adding hydrogen peroxide due to the breakdown of hydrogen peroxide by catalase in the fresh liver paste, releasing oxygen gas. In test tube C, no bubbling occurred because boiling had denatured the catalase enzyme, rendering it inactive.

**(ii) Suggest the name of the substance contained in the specimen Q which was responsible for the changes noted in (f).**

The substance responsible is catalase, an enzyme found abundantly in liver tissue.

**(iii) Write a chemical equation for the reaction which occurred after adding 2% hydrogen peroxide solution to test tube B.**

$2H_2O_2\ (aq) \rightarrow 2H_2O\ (l) + O_2\ (g)$

**(d) Name the gas evolved in this experiment. Give reason for your answer.**

The gas evolved was oxygen. This was confirmed by inserting a glowing wooden splint into the test tube, which re-ignited in the presence of oxygen, a characteristic property of the gas.

**(e) What can you deduce from this experiment?**

From this experiment, it can be deduced that the liver contains the enzyme catalase, which rapidly catalyzes the breakdown of hydrogen peroxide into water and oxygen. It also shows that enzymes are protein in nature and are denatured by heat, as observed in the control where no reaction occurred after boiling.

**3. Provided the candidates with specimens D (Hind limb of a grasshopper), E (small bird) and F (Black ant) and required them to answer the following questions:**

**(a)(i) What are the observable features used to place specimen E to its respective Kingdom? State two features.**

Specimen E, the small bird, is placed in the Kingdom Animalia because it exhibits mobility and heterotrophic nutrition, depending on other organisms for food. Additionally, it possesses complex organ systems like a circulatory and respiratory system, characteristics of animals.

**(ii) How are the members of the Class to which the specimen E belong important for industrial development? Give three points.**

Birds contribute to industrial development in several ways.

First, poultry farming provides meat and eggs, supporting food industries and employment.

Secondly, feathers from certain bird species are used in garment and decorative industries.

Lastly, birds contribute to the pest control industry by naturally reducing harmful insect populations in agricultural areas.

**(iii) State four observable features which enable specimen E to adapt to its habitat.**

The bird possesses feathers, which provide insulation and aid in flight.

Its streamlined body shape minimizes air resistance during flight.

It has lightweight, hollow bones that reduce overall body weight while maintaining structural strength.

Additionally, the bird's sharp, clawed feet are adapted for perching, grasping prey, or locomotion depending on its environment.

**(b)(i) Identify the organism from which specimen D was taken.**

Specimen D is the hind limb of a grasshopper, an insect.

**(ii) How is specimen D important to the organism from which it was taken? Give two points.**

The hind limb of a grasshopper is highly adapted for locomotion.

Its long, muscular femur provides the power needed for jumping, enabling the grasshopper to escape predators and move quickly between food sources.

Additionally, it helps in stabilizing the insect when stationary and while feeding.

**(c) What observable features are used to place specimen F to its respective Phylum? State three features.**

Specimen F, the black ant, is placed in Phylum Arthropoda because

- it has a segmented body divided into head, thorax, and abdomen.
- It possesses a hard exoskeleton made of chitin and has jointed appendages, including six legs attached to the thorax.
- The presence of compound eyes and antennae also supports its classification in this phylum.