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

733/2A **BIOLOGY 2 A**

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

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).

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1. You are given specimen C. Dissect specimen C (a male or female cockroach) in the usual way to display the reproductive and excretory systems. Respond to the following questions:

(a) Draw a well-labelled diagram of dissected specimen C to show two parts that form each of the reproductive and excretory systems.

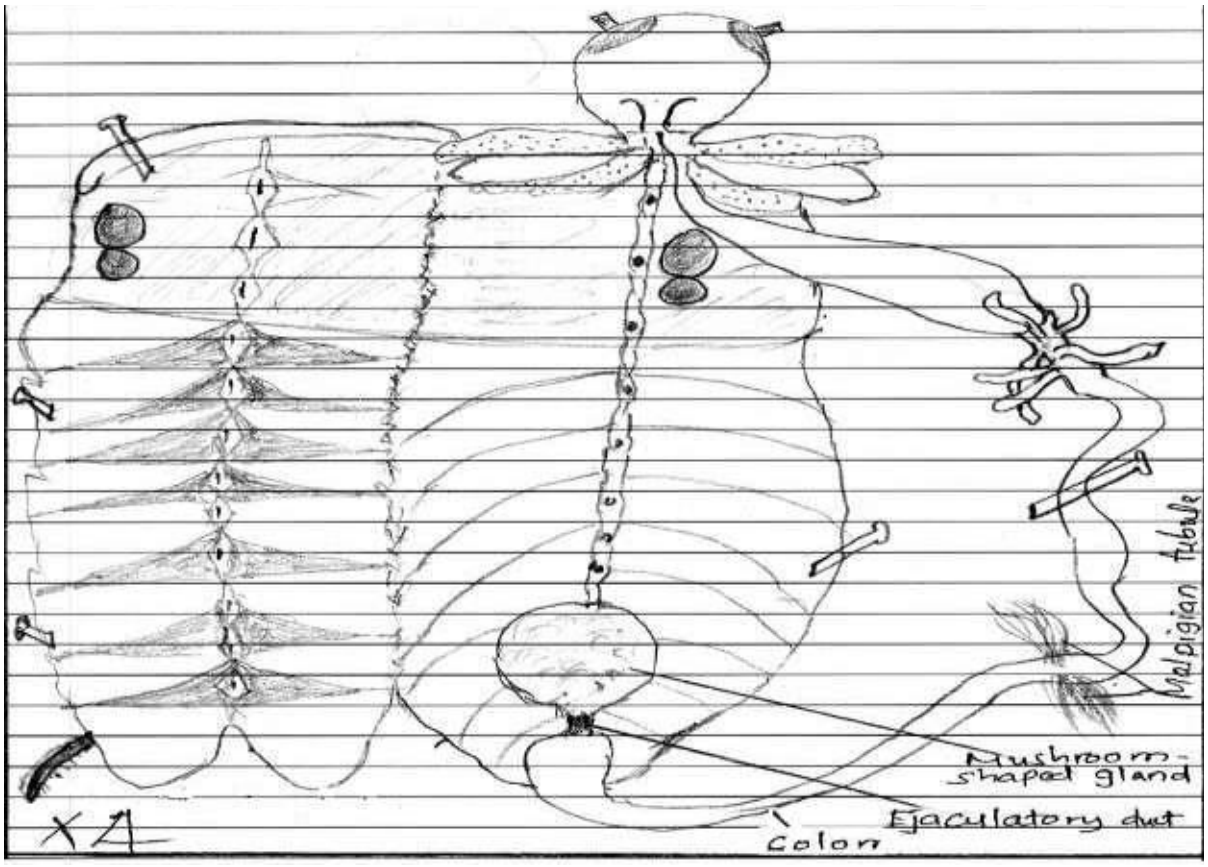
For the reproductive system:

- In male: Testes (two whitish oval structures located anteriorly)
- In female: Ovaries (a pair of branched structures containing developing ova)

For the excretory system:

- Malpighian tubules (fine, thread-like structures attached at the junction between the midgut and hindgut)
- Rectum (enlarged posterior part of the gut where waste is collected before excretion)

The diagram would clearly show these labeled structures along with surrounding organs like the crop, gizzard, and gut.



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(b) What function does each of the two reproductive parts labelled in 1(a) have?

In a male cockroach, the testes produce and store sperm. These are paired organs located anteriorly, responsible for generating male gametes essential for reproduction. In a female cockroach, the ovaries produce ova (eggs). They consist of multiple ovarioles where ova develop, eventually passing through the oviduct during mating and laying.

(c) What is the sex of specimen C? Give three evidences.

The sex of specimen C can be identified through specific morphological features. If it is a male cockroach, it will have a pair of slender anal styles at the posterior end, which are absent in females. Secondly, the male's abdomen is relatively narrower and more pointed at the posterior compared to the broader and rounded abdomen of a female. Thirdly, internally, the male possesses testes and seminal vesicles, whereas the female has paired ovaries with developing ova. Observing these features would allow you to confirm the sex.

(d) Observe the thread-like structures present in specimen C and state why they are so numerous.

The thread-like structures are the Malpighian tubules, which are numerous because they play a crucial role in excretion and osmoregulation in the cockroach. Their high number increases the surface area for the removal of nitrogenous wastes from the hemolymph (blood) into the gut for elimination. This abundance ensures efficient waste removal and maintains the insect's internal fluid balance.

2. Provided with solutions P and Q (Egg albumen solution) and required to answer the following questions:

(a) Use the reagent provided to carry out the biochemical test to identify classes of food contained in solution P and Q. Tabulate your results as shown in the following table:

Food Test	Procedure	Observation	Inference
Test for Protein (Biuret test)	Add equal amounts of Biuret reagent to solution P and Q and shake	Solution turns purple in both P and Q	Proteins present in both solutions
Test for Protein (Confirmatory)	Heat gently with Millon's reagent	Whitish or red precipitate forms	Confirms presence of protein

(b) State three functions of the food substance(s) identified in solution P and Q in human body.

Proteins serve as essential building blocks for body tissues, aiding in the growth and repair of worn-out cells. They are also important for the production of enzymes, hormones, and antibodies, which regulate

physiological functions and enhance immunity. Additionally, proteins provide energy when carbohydrates and fats are insufficient, though they are not primarily used for this purpose.

(c) (i) What digestive enzyme is responsible for digestion of food substance identified in solution Q in the duodenum?

The enzyme responsible is trypsin. It is secreted by the pancreas in an inactive form (trypsinogen) and activated in the duodenum to digest proteins into smaller peptides.

(ii) Give the end product of digestion carried by the enzyme identified in (c)(i).

The end products of protein digestion by trypsin are amino acids, which are then absorbed into the bloodstream through the small intestine walls.

(d) What nutritional disease is caused by the deficiency of food substance contained in solution Q to human?

The deficiency of proteins leads to a nutritional disorder known as kwashiorkor. This disease is common in children and is characterized by swollen abdomen, stunted growth, skin lesions, and a weakened immune system due to insufficient protein intake.

3. Provided the candidates with a bee, spider, tilapia fish, grasshopper, and a monocot plant labelled as specimen L, M, N, O, and R, respectively. It required them to observe the specimens carefully and answer the questions that follow:

(a) With what observable features would you place the specimens M, N, and R in their respective classes? Give two points for each.

Specimen M, the spider, belongs to Class Arachnida because it has two main body parts: the cephalothorax and abdomen, and it possesses four pairs of walking legs, totaling eight legs.

Specimen N, the tilapia fish, is placed in Class Pisces because it has fins for locomotion and gills for respiration, which are typical characteristics of aquatic vertebrates.

Specimen R, the monocot plant, belongs to Class Monocotyledonae because it exhibits parallel leaf venation and its floral parts occur in multiples of three.

(b) Which observable features help the specimen O to be an agent of pollination? Give two points.

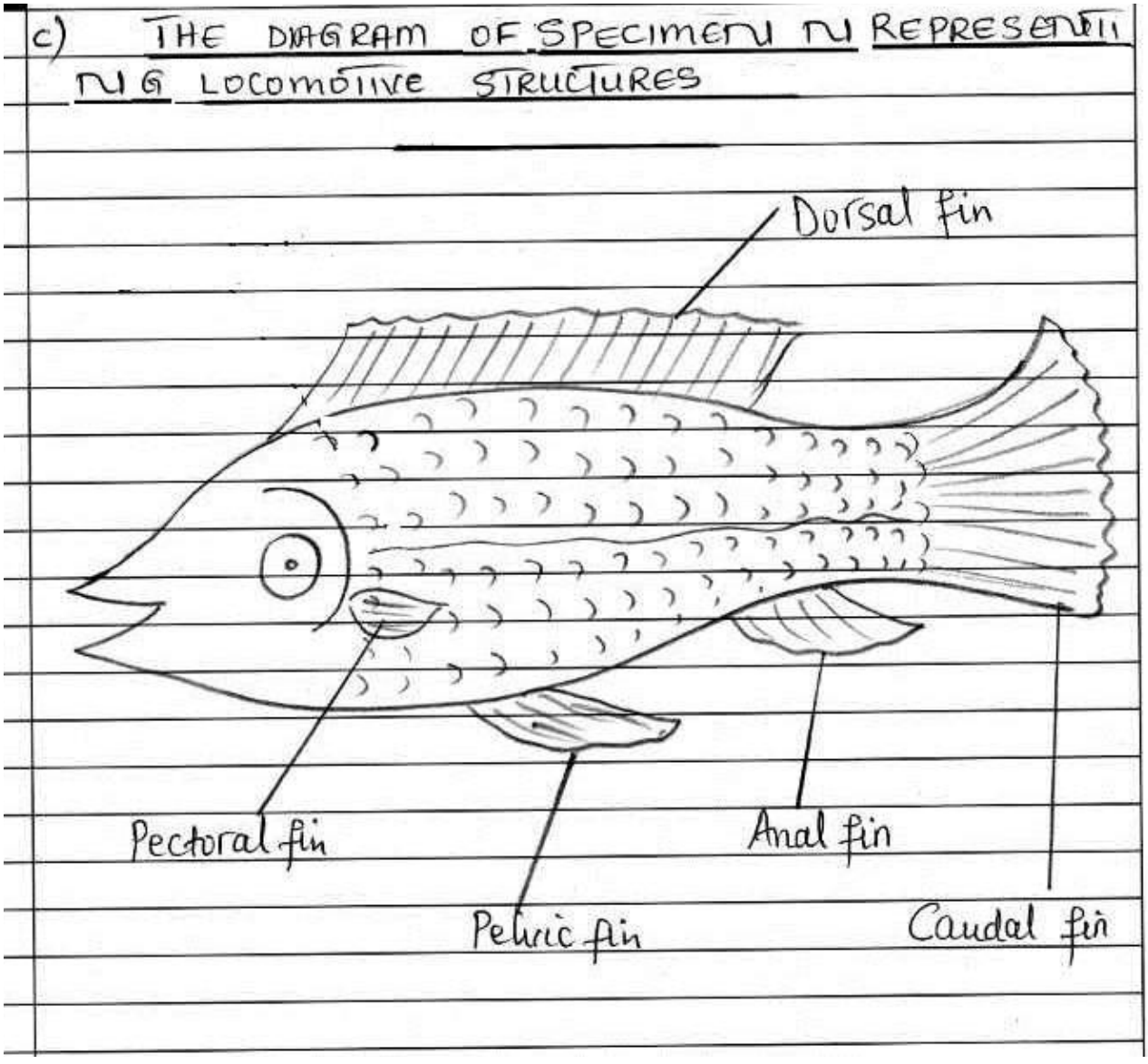
Specimen O, the grasshopper, can assist in pollination due to its hairy body, which traps pollen grains when it visits flowers, and its mobility, allowing it to move between flowers and transfer pollen.

(c) Draw a diagram of specimen N and label the locomotive structures.

As I cannot physically draw here, the diagram would display a tilapia fish's lateral view, labelling structures such as:

- Dorsal fin
- Caudal (tail) fin
- Pectoral fins
- Pelvic fins
- Analfin

These fins enable the fish to steer, balance, and propel itself in water.



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