THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

Time: 3 Hour. **ANSWERS** **Year: 2003**

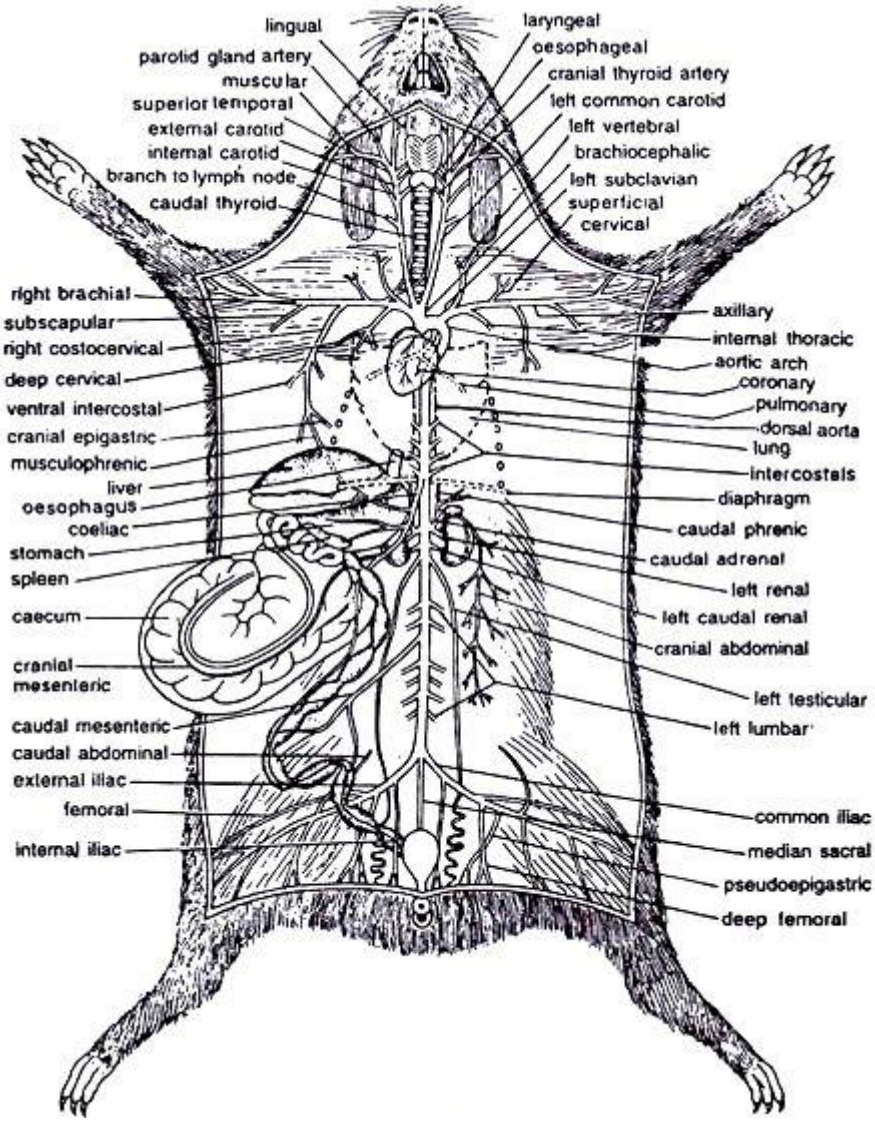
Instructions

1. This paper has three papers.
2. Answer **all** questions.
3. Question **1** contains 30 marks while question 2 and 3 have 10 marks each.
4. Mobile phones are not allowed inside the examination room.
5. Write your Examination Number on every page of your answer booklet.

1. Dissect the provided specimen W (a male or female guinea pig) to display the reproductive system. Then answer:

(a) Draw the dissected specimen W and label five parts of the reproductive system.

(Drawing should be done on practical sheet. The labelled parts of the reproductive system in males may include: testes, vas deferens, seminal vesicle, penis, and prostate gland. For females: ovary, oviduct, uterus, vagina, and vulva.)



(b) Identify the sex of the specimen W. Give four evidences for your answer.

Presence of testes in the abdominal cavity, appearing as two oval organs near the kidneys, confirms the specimen is male. These structures are connected to vas deferens, which are visible as coiled tubes leading toward the posterior end.

Males also show the presence of a penis, which may be visible or can be extruded by applying pressure near the genital opening. This organ is absent in females.

Absence of ovaries and uterus indicates the specimen is not female. In females, the uterus is a Y-shaped structure, while the ovaries are small oval bodies at the end of the Y-branches.

The external genitalia in males typically include a single opening for both urinary and reproductive systems, while females have separate openings for urethra and vagina. The presence of one opening confirms a male specimen.

(c) Explain why it is necessary to place the specimen on a dissecting board before cutting.

Placing the specimen on a dissecting board helps stabilize it during dissection, preventing unnecessary movement which could lead to inaccurate cuts or damage to internal organs.

It also allows the specimen to be pinned in an extended and symmetrical position, which provides better access and visibility of internal structures for accurate identification and labeling.

Additionally, the board protects the working surface and allows for easy rotation or repositioning of the specimen for thorough examination of both the dorsal and ventral sides.

2. You are provided with specimen K. Use the following procedures to perform an experiment:

(i) Cut the specimen into two halves
(ii) Crush one half using mortar and pestle, label the paste as test tube X
(iii) Place the uncrushed half into test tube Y
(iv) Add 2 ml of 2% hydrogen peroxide to both test tubes
(v) Use a glowing splint to test for the gas produced
(vi) Record your observations

(a) What was the purpose of this experiment?

The aim of this experiment was to demonstrate the presence and activity of catalase enzyme in specimen K. Catalase breaks down hydrogen peroxide into water and oxygen, which can be tested through the release of bubbles or relighting of a glowing splint.

(b) Which test tube acted as a control and why?

Test tube Y acted as the control because it contained the uncrushed half of specimen K, meaning fewer cells were exposed and thus less enzyme was available. This helped compare the effect of crushing the tissue on enzyme release and activity.

(c) What were the observations in test tubes X and Y? Give reasons for each.

In test tube X, brisk bubbling was observed upon addition of hydrogen peroxide. This is because crushing the tissue released more catalase, which reacted quickly with H2O2 to release oxygen gas.

In test tube Y, there was little or no bubbling, since the uncrushed tissue had limited surface area, preventing much interaction between the enzyme and the hydrogen peroxide.

(d) Name the substance in specimen K responsible for the observed change.

The substance is catalase, an enzyme naturally present in cells that catalyzes the decomposition of hydrogen peroxide into oxygen and water.

(e) Write the chemical equation of the reaction.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

(f) Name the gas produced and explain how it was confirmed.

The gas evolved was oxygen. It was confirmed by inserting a glowing splint into the test tube and observing that it relit, which is a positive test for oxygen.

(g) Give two deductions that can be made from this experiment.

Catalase is present in the tissues of specimen K, as shown by the reaction with hydrogen peroxide. Crushing tissues increases the surface area, releasing more enzyme and enhancing the reaction rate.

3. Observe the provided specimens J (Bee), L (Ant), M (Fly), N (Fungus), and O (Maize). Then respond to the following:

(a) List five observable features shared by specimens J and L.

Both the bee and the ant have three main body regions: head, thorax, and abdomen, which is a standard feature of insects.

They each possess a pair of antennae used for detecting smell and touch, positioned on the head.

They both exhibit three pairs of jointed legs attached to the thorax, a defining characteristic of insects.

Their bodies are covered with a chitinous exoskeleton which provides protection and support.

Both possess compound eyes for wide-angle vision and are active foragers in their ecosystems.

(b) State four ways specimen N is important to humans.

Fungi contribute to decomposition, breaking down dead organic material and recycling nutrients into the soil.

Some fungi are edible and serve as a source of food, such as mushrooms.

Certain fungi are used in biotechnology and medicine, especially in the production of antibiotics like penicillin.

Fungi are also used in fermentation industries, for example in baking (yeast) and alcohol production.

(c) Observe the lower surface of specimen O: (i) Identify any visible structures. (ii) State their functions.

Stomata are visible as small pores mostly found under the leaf surface. These are surrounded by guard cells.

Stomata allow gaseous exchange, permitting the intake of carbon dioxide and release of oxygen during photosynthesis and also facilitate transpiration.

(d) Provide three features placing specimens J, L, and M in the same phylum.

They all possess segmented bodies, with distinct regions (head, thorax, abdomen), a feature of arthropods.

They have jointed appendages including legs and antennae, which is a key characteristic of the phylum Arthropoda.

They all possess an external skeleton made of chitin, offering both support and protection.