THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

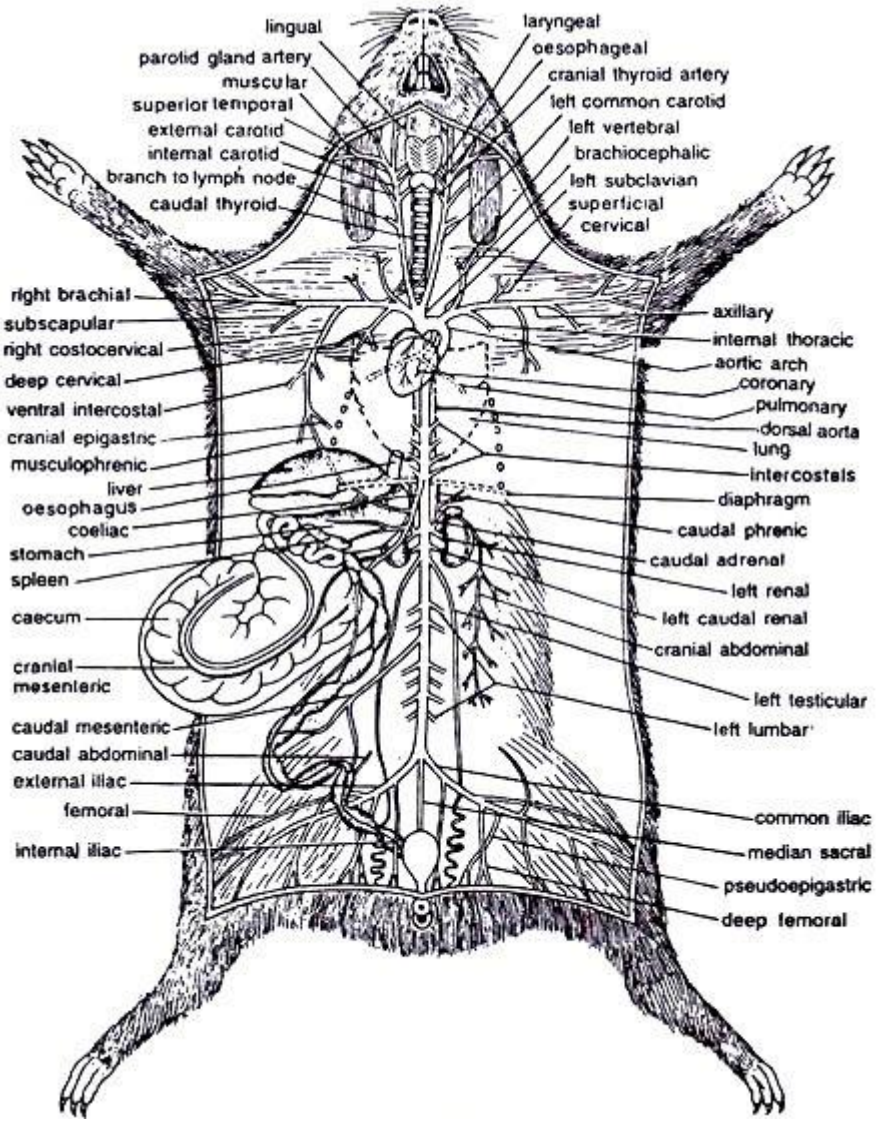
Time: 3 Hour. **ANSWERS** **Year: 2001**

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 M (a male or female guinea pig) to expose the digestive system.

(a) Draw the dissected specimen M and label six parts that form the digestive system.



(b) Use a hand lens to identify the organs responsible for the following functions:

(i) Food movement from mouth to stomach

The oesophagus is the organ responsible for moving food from the mouth to the stomach. It is a muscular tube that performs peristaltic contractions to push the food down.

(ii) Enzyme production in the mouth

The salivary glands are responsible for producing the enzyme ptyalin (salivary amylase). These are located in the mouth cavity and release saliva that begins the breakdown of starch.

(iii) Bile secretion

The liver is the organ that secretes bile. It is a large, reddish-brown organ located beneath the diaphragm. Bile produced by the liver is stored in the gall bladder and aids in fat digestion.

(c) Does the specimen have a gall bladder? Give a reason for your answer.

Yes, the guinea pig has a gall bladder. It is a small, greenish sac located under the liver. Its presence allows storage and concentration of bile, which is released into the duodenum during digestion.

2. You are provided with specimen N. Follow these procedures:

(i) Cut the specimen into two halves
(ii) Crush one half using mortar and pestle, label the paste as test tube A
(iii) Place the uncrushed half into test tube B
(iv) Add 2 ml of 2% hydrogen peroxide to each test tube
(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 was to test for the presence and activity of the enzyme catalase in the specimen and demonstrate the effect of surface area on the rate of reaction.

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

Test tube B served as the control because the specimen was uncrushed. This limited enzyme exposure and allowed comparison with the crushed specimen in test tube A.

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

In test tube A, rapid bubbling was observed due to the breakdown of hydrogen peroxide into water and oxygen by catalase. Crushing increased surface area and enzyme release.

In test tube B, there was either no bubbling or very little. This is because the intact tissue prevented sufficient contact between hydrogen peroxide and the catalase enzyme.

(d) Name the substance in specimen N responsible for the reaction.

The substance responsible is catalase, an enzyme found in many animal tissues that decomposes hydrogen peroxide.

(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 using a glowing splint, which reignited in the presence of oxygen.

(g) Give two deductions from this experiment.

Catalase is present in living tissues and is capable of breaking down hydrogen peroxide. Crushing tissues exposes more catalase, increasing the reaction rate and gas production.

3. Observe the following specimens: D (Fern), E (Fly), F (Grasshopper), G (Antelope skin), and H (Tomato plant). Then respond to the following:

(a) List five observable similarities between specimens E and F.

Both have segmented bodies divided into head, thorax, and abdomen. This body division is a defining feature of insects.

They each possess three pairs of jointed legs attached to the thorax. This is a common feature of Class Insecta.

They both have a pair of antennae for sensing the environment, located on the head.

They exhibit compound eyes which enable wide vision and detection of movement.

They have exoskeletons made of chitin, providing protection and support to their bodies.

(b) Give four economic uses of specimen G.

The skin of the antelope is used in leather production for making shoes, belts, and bags.

It can also be used in the manufacturing of drum skins and traditional musical instruments.

Antelope skin is valued in the fashion industry for decorative items and garments.

Additionally, it serves as raw material in tanning industries which contribute to local employment and income.

(c) Observe the lower surface of specimen D: (i) Identify the structures present (ii) State their functions.

The structures present are sori, which are clusters of sporangia on the lower surface of fern leaves.

Sori are involved in reproduction as they produce spores, allowing the plant to propagate through an asexual life cycle stage.

(d) Provide three features used to place specimens E, F, and G in the same phylum.

They have bilateral body symmetry, meaning the left and right halves of their bodies are mirror images.

They possess jointed appendages such as legs and antennae, a key characteristic of phylum Arthropoda.

They have a segmented body with a tough exoskeleton made of chitin that they periodically molt as they grow.