THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

Time: 3 Hour. **ANSWERS** **Year: 2008**

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 specimen P (a male or female frog) to expose the digestive system.
(a) (i) Draw and label a diagram showing at least seven parts of the digestive system.
This task requires a labelled drawing including parts such as the mouth, esophagus, stomach, small intestine, large intestine, liver, and cloaca.

(a) (ii) Show the direction of food flow using arrows.
Arrows in the diagram should indicate movement from the mouth → esophagus → stomach → small intestine → large intestine → cloaca.

(b) (i) Name the organ responsible for enzyme production.
The pancreas is responsible for producing digestive enzymes such as trypsin, amylase, and lipase, which act on proteins, carbohydrates, and lipids respectively.
(ii) Identify the part where nutrient absorption takes place.
The small intestine is the primary site for nutrient absorption. Its inner lining has villi that increase surface area for effective absorption into the bloodstream.
(iii) State the organ that stores bile.
The gall bladder stores bile produced by the liver. Bile helps in emulsifying fats during digestion in the small intestine.

(c) (i) Mention three precautions taken during dissection.
A sharp scalpel or blade should be used to avoid tearing internal organs.
The specimen must be properly pinned on the dissection board to hold it in place.
A shallow and careful incision should be made to prevent damage to underlying structures.

(ii) What is the significance of using pins while displaying internal parts?
Pins help to spread and secure flaps of skin or muscles, giving a clear view of the internal organs for study. They also prevent the specimen from moving during dissection, ensuring accuracy.

2. You are given specimen U for a catalase experiment.
(a) (i) Grind half of U and leave the other half whole.
This step increases surface area for catalase activity in the ground half.
(ii) Add 2 ml of 2% hydrogen peroxide into both and observe.
Upon addition, observe bubbling or frothing due to the breakdown of hydrogen peroxide into water and oxygen.
(iii) Test the evolved gas using a glowing splint.
Insert a glowing splint into the test tube mouth. If oxygen is present, the splint will reignite.
(b) (i) State the purpose of this experiment.
The purpose is to test for the presence of catalase enzyme in the specimen by observing the breakdown of hydrogen peroxide into oxygen and water.
(ii) Which test tube serves as control? Explain.
The test tube with the unground specimen serves as the control. It shows the natural enzymatic activity without increased surface area, allowing comparison with the experimental setup.
(iii) What did you observe in each test tube and why?
In the test tube with ground specimen, there is vigorous bubbling due to more catalase being available from broken cells.
In the unground specimen, less or slower bubbling is seen because fewer enzyme sites are exposed.

(c) (i) Name the enzyme responsible for the reaction.
Catalase is the enzyme that catalyzes the breakdown of hydrogen peroxide.
(ii) Write the chemical equation for the reaction.
$2H_2O_2 \rightarrow 2H_2O + O_2$
(iii) Identify the gas evolved and explain its significance in biology.
The gas evolved is oxygen. It is vital for cellular respiration, a process that provides energy for biological functions.

3. Observe specimens A (Grasshopper), B (Beetle), and C (Spider).
(a) (i) State five features common in A and B.
They have a segmented body divided into head, thorax, and abdomen.
Both possess compound eyes for detecting movement and images.
They have three pairs of jointed legs attached to the thorax.
Both exhibit bilateral symmetry.
They undergo metamorphosis during their life cycle.
(ii) List two distinguishing features of specimen C.
Specimen C has two main body parts: cephalothorax and abdomen, unlike A and B which have three.
C has four pairs of legs instead of three, placing it in class Arachnida.
(b) (i) Mention two economic roles of specimen A.
Grasshoppers serve as food for birds and other animals in the ecosystem.
In some cultures, they are used as protein-rich food for humans.
(ii) In what class is specimen A placed? Give three reasons.
Specimen A belongs to Class Insecta.
It has three pairs of legs.
Its body is divided into three distinct parts.
It bears one pair of antennae and compound eyes.
(c) (i) Draw specimen B and label five external parts.
(This should include the head, thorax, abdomen, legs, antennae, and wings.)
(ii) What adaptation allows B to survive in its environment?
Beetles have hardened forewings called elytra that protect their flying wings and body from damage and dehydration. This helps them survive in harsh environments.