**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATION COUNCIL**

**DIPLOMA IN SECONDARY EDUCATION EXAMINATION**

**733/2A** **BIOLOGY 2A**

**Time: 3 Hour.** **ANSWERS** **Year: 2004**

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**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 F (Cockroach) to display the reproductive and excretory systems.**

**(a) (i) Draw a well-labelled diagram showing two reproductive parts and two excretory parts.**

The diagram should include reproductive organs such as testes or ovaries, and vas deferens or oviduct, as well as excretory organs such as Malpighian tubules and rectum.

**(ii) Indicate the position of the heart and fat bodies.**

The heart runs dorsally as a tubular structure, segmented, and the fat bodies are seen as whitish tissues throughout the hemocoel, especially around the digestive organs.

**(b) (i) State the function of each reproductive and excretory part drawn.**

Testes produce sperms while vas deferens transport sperms to the external genitalia. Ovaries produce eggs while oviducts transport eggs. Malpighian tubules filter nitrogenous waste from haemolymph, and the rectum reabsorbs water and helps in feces formation.

**(ii) Describe how excretion occurs in specimen F.**

Nitrogenous waste is excreted mainly as uric acid. Malpighian tubules collect wastes from the haemolymph and empty them into the gut where it is passed out with feces. Water is conserved by reabsorption in the rectum.

**(c) (i) Identify the sex of specimen F.**

The sex is identified based on the reproductive organs observed — presence of testes and vas deferens indicates male, while ovaries and oviducts indicate female.

**(ii) Give three justifications based on observable features.**

In males, the terminal abdominal segments are more pointed, presence of claspers or styles, and smaller body size. In females, the abdomen is broader, the ovipositor is present, and the body is generally larger.

**2. You are given solutions P and R.**

**(a) (i) Carry out food tests and complete the table below:**

| Food Test | Procedure | Observation | Inference |
|---|---|---|---|
| Starch | Add iodine | Blue-black color | Starch present |
| Reducing sugar | Add Benedict's and heat in water bath | Orange/red precipitate | Reducing sugar present |
| Protein | Add Biuret solution | Purple coloration | Protein present |

| | | | |
|---|---|---|---|
| Lipid | Add ethanol, shake, add water | Cloudy emulsion appears | Lipid present |

**(b) (i) State the enzyme that digests starch and its end product.**

The enzyme is amylase which breaks starch into maltose and eventually into glucose.

**(ii) What organ secretes enzyme for protein digestion?**

Protein digestion begins in the stomach, where pepsin is secreted by gastric glands, and continues in the small intestine with trypsin from the pancreas.

**(iii) Why are proteins essential in the human body?**

Proteins are necessary for body building, repair of worn-out tissues, production of enzymes and hormones, and functioning of the immune system.

**(c) (i) Why should the solution be kept warm during Benedict's test?**

Heat is required to activate the chemical reaction that causes the color change indicating presence of reducing sugars.

**(ii) What is the role of water in a Biuret test?**

Water helps to dissolve the sample and reagents uniformly, facilitating the color change if proteins are present.

**3. Observe specimens G (Beetle), H (Grasshopper), and J (Dragonfly).**

**(a) (i) Mention five observable features common in all three.**

All are arthropods and share features such as segmented bodies, jointed appendages, exoskeleton made of chitin, compound eyes, and one pair of antennae.

**(ii) What are two distinct features of specimen J?**

Dragonfly has a long slender abdomen and two pairs of large, transparent wings with unequal sizes and venation, and it is an agile flier.

**(b) (i) Explain how specimen H adapts to jumping.**

It has large, powerful hind legs with muscular femur and long tarsal segments that provide the mechanical force for leaping.

**(ii) State two economic values of specimen G.**

Beetles aid in decomposing organic matter and recycling nutrients, and some species pollinate plants. However, some can also be pests to stored grains.

**(c) Draw specimen J and label five external parts.**

The drawing should include: compound eyes, antennae, thorax, abdomen, and wings.