THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2A **BIOLOGY 2A**

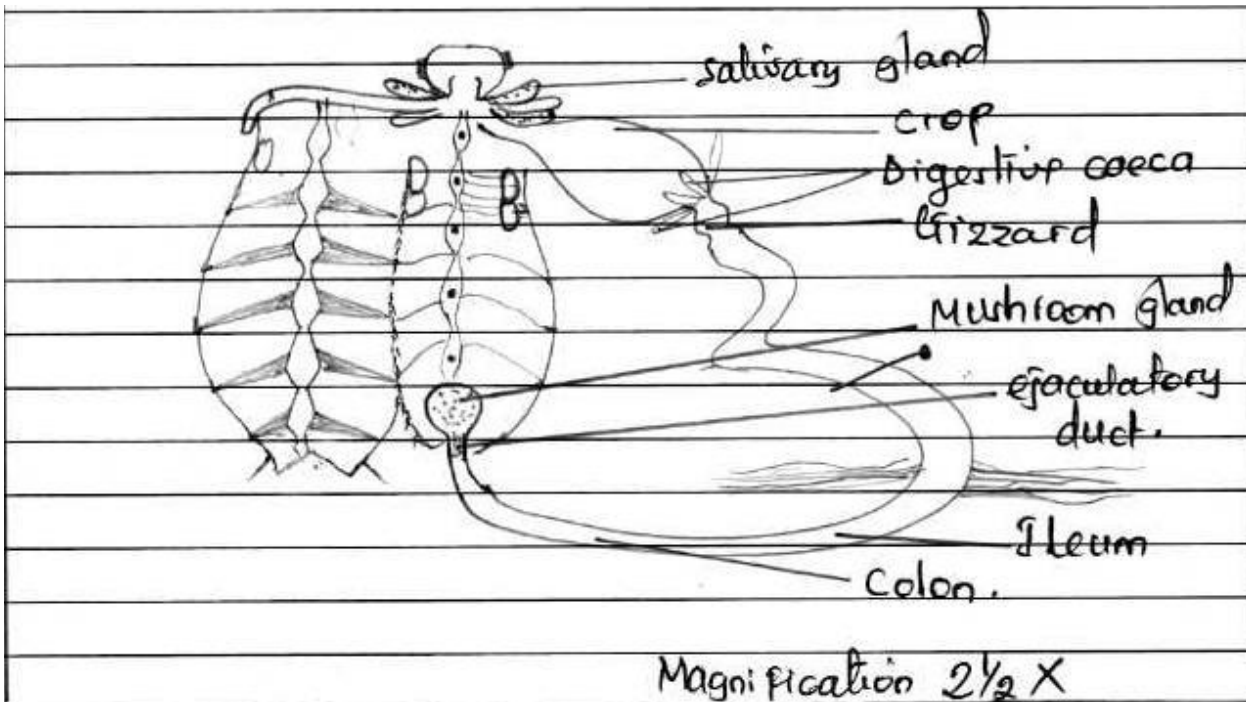
Time: 3 Hour. **ANSWERS** **Year: 2005**

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 S (a cockroach) to expose reproductive and excretory parts.

(a) (i) Draw and label two reproductive and two excretory parts.



(ii) Indicate the direction of movement of materials.

In the diagram, show reproductive parts such as testes or ovaries and vas deferens or oviduct. For the excretory system, label the Malpighian tubules and rectum. Use arrows to indicate sperm or eggs moving from gonads to reproductive ducts, and waste from Malpighian tubules to the rectum.

(b) (i) Explain how fertilization occurs in specimen S.

In cockroaches, fertilization is internal. Sperm from the male is transferred to the female's spermatheca during mating. The eggs are later fertilized by stored sperm before being enclosed in an ootheca for laying.

(ii) What excretory waste is commonly removed?

Cockroaches excrete uric acid as the main nitrogenous waste. This is a solid, non-toxic substance that helps conserve water.

(c) (i) What is the sex of specimen S?

(ii) Provide three physical features to support your answer.

If the specimen has a broad, rounded abdomen, visible ootheca, or a pair of ovipositors, it is female. If it has a slender abdomen with claspers at the end and more visible styli, it is male.

2. Use solutions U and V to perform food tests.

(a) (i) Record your results in this format:

Food Tested	Procedure	Observation	Inference
Starch (U)	Add iodine solution	Blue-black color	Starch present
Reducing sugar (V)	Add Benedict's, heat in water bath	Brick-red precipitate	Reducing sugar present
Protein (V)	Add Biuret solution	Purple coloration	Protein present
Lipid (U)	Add ethanol and shake, then add water	Milky emulsion	Lipid present

(b) (i) State the role of each food substance in human metabolism.

Starch provides energy as it is broken down into glucose. Reducing sugars are readily used by cells for energy. Proteins are essential for growth, repair, and enzyme production. Lipids provide stored energy and insulation.

(ii) Which digestive juices act on the identified food substances?

Salivary amylase acts on starch. Pancreatic amylase and maltase act on reducing sugars. Pepsin and trypsin act on proteins. Lipase acts on lipids in the small intestine.

(c) (i) What would happen if excess glucose is found in urine?

This condition, called glucosuria, often indicates diabetes mellitus. It occurs when blood glucose exceeds the kidney's reabsorption capacity.

(ii) Why do athletes require a carbohydrate-rich diet?

Carbohydrates provide quick and efficient energy to support muscle activity and endurance during intensive physical activity.

3. Observe specimens W (Bean seedling), X (Fern), and Y (Cactus).

(a) (i) List two observable features placing W in class dicotyledonae.

Specimen W has two seed leaves (cotyledons) and broad leaves with net-like venation. Its stem has vascular bundles arranged in a ring.

(ii) Mention three adaptive features of Y.

Specimen Y has thick, succulent stems to store water, reduced leaves (spines) to minimize water loss, and extensive shallow roots to absorb moisture quickly.

(b) (i) Observe the lower side of specimen X. What structures are seen?

You would observe sori, which are clusters of sporangia on the underside of fern leaves.

(ii) State their function.

Sori produce and release spores for asexual reproduction in ferns.

(c) Draw specimen W and label four parts.

The diagram should show the root, stem, leaves, and cotyledons clearly. Label each part accordingly.