**THE UNITED REPUBLIC OF TANZANIA**

**NATIONAL EXAMINATION COUNCIL**

**DIPLOMA IN SECONDARY EDUCATION EXAMINATION**

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

**Time: 3 Hour.** **ANSWERS** **Year: 2012**

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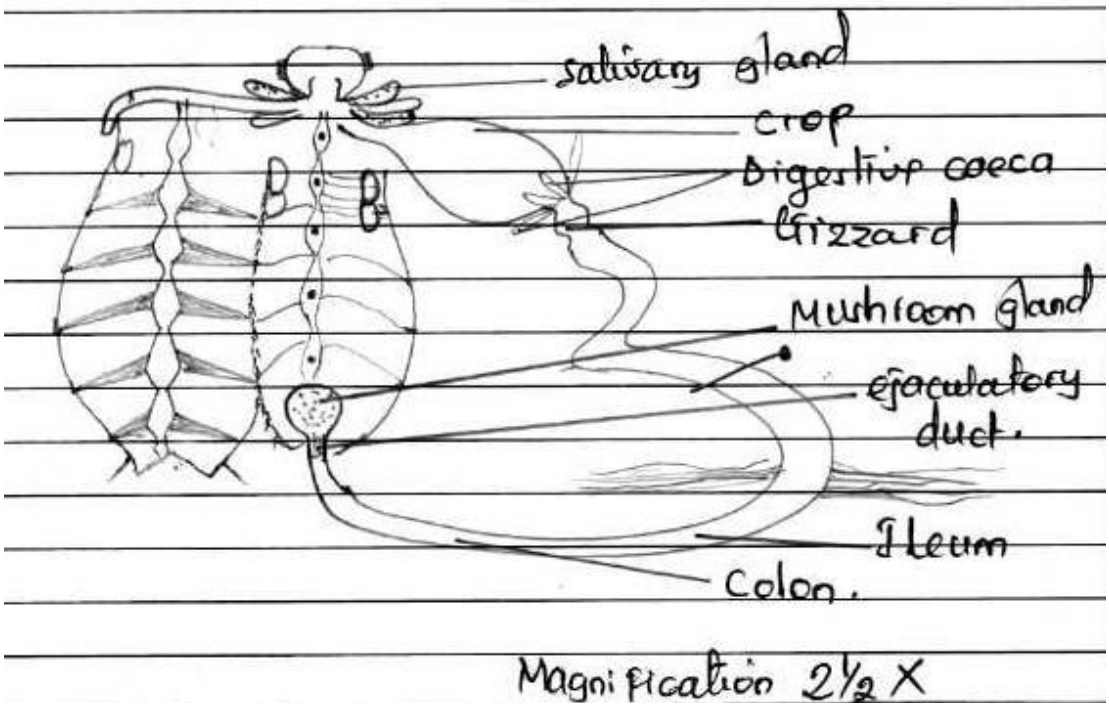
**Instructions**

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 Z (a cockroach male or female) to expose reproductive and excretory systems.**
**(a) Draw a well-labelled diagram showing two parts from each of the two systems.**




**(b) State the function of each reproductive part drawn.**
The ovary produces female gametes (ova) in female cockroaches, while the testis produces male gametes (sperm) in males. These organs are responsible for the continuation of the species through reproduction. The oviduct in females transports the eggs from the ovaries to the outside, and the vas deferens in males carries the sperm from the testis to the ejaculatory duct for release.

**(c) What is the sex of specimen Z? Give three justifications.**
If specimen Z is male, it will have a pair of testes located at the posterior end of the body cavity and vas deferens extending from them. Males also show external genitalia called anal styles. If it is a female, the ovaries will be visible as masses of small white beads, and the oviduct will appear as a large tube joining the ovaries. Females lack anal styles but have ovipositor structures for laying eggs.

**(d) Observe the threadlike structures present and state why they are numerous.**
The threadlike structures observed are malpighian tubules. They are numerous to increase the surface area for efficient removal of nitrogenous wastes from the hemolymph and for maintaining osmoregulation in the cockroach. Their abundance ensures effective excretion across a wide range of conditions.

**2. Use solution M and reagents provided to perform food tests.**
**(a) Carry out food tests on solution M and fill the table below:**

| Food Test | Procedure | Observation | Inference |
|---|---|---|---|
| Starch | Add iodine solution to a sample of solution M | Solution turned blue-black | Starch is present |
| Reducing sugar | Add Benedict's solution and heat in a water bath for 5 minutes | Brick-red precipitate formed | Reducing sugar is present |
| Protein | Add Biuret solution (copper sulfate + sodium hydroxide) to solution M | Purple/violet color appeared | Protein is present |
| Lipid | Mix with ethanol, then add water and shake well | A white emulsion formed | Lipid (fat/oil) is present |

**(b) State three biological roles of food substances identified.**

Starch serves as a long-term energy reserve in the body. When needed, it is broken down into glucose for respiration, especially during times of fasting or prolonged activity.

Reducing sugars provide an immediate source of energy. Glucose, for example, is used in aerobic respiration to release ATP, which powers various cellular activities.

Proteins are essential for tissue growth and repair. They also play structural roles in muscles, enzymes, hormones, and antibodies that support immunity.

**(c) (i) Name one enzyme responsible for digestion of the food identified.**

Amylase is responsible for breaking down starch into maltose, a disaccharide. It starts its action in the mouth and continues in the small intestine.

**(ii) State the end products of digestion.**

Starch is eventually digested into glucose, which is absorbed into the bloodstream. Proteins are broken down into amino acids, which are used to build new proteins in the body. Reducing sugars like maltose are further digested into glucose. Lipids are broken down by lipase into fatty acids and glycerol.

**3. Observe specimens U (Palm plant), N (Fish scale), and R (Groundnut seedling).**
**(a) Give two observable features used to classify specimen U into its kingdom.**
Specimen U shows the presence of green leaves, indicating chlorophyll, which places it in the kingdom

Plantae. Another observable feature is the presence of roots and stems, which are characteristic structures of higher plants.

**(b) Give three adaptive features of specimen U for dry conditions.**
Palm plants typically have thick waxy cuticles on their leaves to reduce water loss. Their leaves are often reduced in size or split into segments to minimize transpiration. They also develop deep or wide-spreading root systems to access water from deep underground or over a large area.

**(c) (i) Name the organism where specimen N originated.**
Specimen N, a fish scale, originates from an aquatic organism such as a tilapia or other bony fish species.

**(ii) State two functions of N to the organism.**
Fish scales protect the body from physical injuries and act as a barrier against infections. They also aid in streamlining the body, reducing water resistance during swimming.

**(d) What features are used to place specimen R into its class? State three.**
The presence of two cotyledons in the seed places specimen R (groundnut seedling) into the class Dicotyledonae. Its leaves show a net-like venation pattern. It also develops a taproot system, which is a typical feature of dicots.