THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

071 BIOLOGY 2

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2012**

Instructions

1. This paper consists of sections Five questions. Answer all questions

2. Each question carries ten marks.

1. A form two student was provided with a food mixture A_1 containing food extracts obtained from maize flour and honey. The student was asked to carry out food tests so as to identify the food substances contained in the mixture.

(a) Write down a report of the experiment the student was supposed to carry out using a table as the one shown below (Table 1).

Food tested	Procedure	Observations	Inference
Starch	Add iodine solution to the sample	Blue-black color appears	Starch is present
Reducing sugars	Add Benedict's solution and heat	Color changes to brick-red	Reducing sugars (glucose) are present
Proteins	Add Biuret solution	Purple color appears	Proteins are present
Lipids	Add ethanol and water	White emulsion forms	Lipids (fats) are present

(b) State the importance of the food substances stated in 1(a) to the human body.
- Starch: Provides energy as it is broken down into glucose.
- Reducing sugars: Provide quick energy since they are easily absorbed.
- Proteins: Essential for growth, repair, and body tissue formation.
- Lipids: Serve as an energy store and provide insulation.

2. (a) You are provided with the following organisms:
(i) Identify organisms A, B, C, D, E, F, G, and H by their common names.

- A: Bat
- B: Flying lizard
- C: Snake
- D: Bird
- E: Frog
- F: Fish
- G: Crocodile
- H: Butterfly

(ii) Classify the animals into three (3) groups using only one observable characteristic for each group. Tabulate your results as shown in Table 2.

Groups	Name of the animal(s)	One characteristic
Group 1	Bat, Bird, Butterfly	Have wings for flight
Group 2	Fish, Crocodile, Frog	Live in water or have aquatic adaptations
Group 3	Snake, Lizard	Have scales and crawl

(iii) What type of classification have you used?
- The classification is based on morphological characteristics (physical appearance).

(b) (i) Mention another system of classification used in Biology.
- Binomial nomenclature or Taxonomic classification.

(ii) Differentiate the system of classification mentioned in (b)(i) with the one used in (a)(iii).
- Binomial nomenclature is a universal system where organisms are named using two Latin words representing genus and species, while morphological classification groups organisms based on external observable features such as body structure and movement.

3. An experiment was set up as shown in Figure 1. The mixture of yeast and glucose solution was warmed for 10-15 minutes in a water bath at 40°C.

(a) (i) What changes would you expect to observe?
- Lime water will turn milky.
- Bubbles will be produced in the solution.

(ii) How do you explain the changes mentioned in (a)(i)?
- Yeast ferments glucose, releasing carbon dioxide, which reacts with lime water to form an insoluble precipitate, making it appear milky.

(b) What was the aim of the experiment?
- To investigate the process of anaerobic respiration (fermentation) in yeast.

(c) What is the purpose of using glucose in the experiment?
- Glucose is the substrate for respiration, providing energy for the yeast.

(d) Why was it necessary to have a layer of oil above the yeast and glucose solution?
- To prevent oxygen from entering the solution, ensuring that anaerobic respiration occurs.

(e) Suggest a suitable control experiment.
- Set up another test tube with boiled yeast (denatured enzymes) and glucose to confirm that no fermentation occurs.

(f) What conclusions can be drawn from the results of the experiment?
- Yeast undergoes anaerobic respiration and produces carbon dioxide.
- Fermentation occurs in the absence of oxygen.
(g) Mention the economic importance of the process that took place in the experiment in Figure 1.
- Used in the baking industry for making bread rise.
- Used in brewing for alcohol production.
- Helps in the production of biofuels.

4. Figure 2 shows different stages of an experiment that was carried out using seedlings. Seedlings were placed in two pots A and B. The seedlings in pot B had their tips cut off while those in pot A were left intact. The experiment was observed for 2-3 days.

(a) What was the aim of the experiment?

- The aim of the experiment was to investigate the role of the shoot tip in controlling plant growth and response to light (phototropism).

(b) (i) Briefly describe the mechanism behind the response of the seedlings in pot A.

- The seedlings in pot A responded to light due to the hormone auxin, which accumulates on the shaded side of the shoot.
- Auxin promotes cell elongation, causing the shoot to bend towards the light source.

(ii) Why were there no significant changes in pot B?

- The tips of the seedlings in pot B were removed, eliminating the source of auxin.
- Without auxin, the seedlings were unable to bend toward the light, leading to no observable directional growth.

(c) What conclusions can be drawn from the experiment?

- The shoot tip is essential for plant response to light as it produces auxin.
- Auxin promotes phototropism by causing differential growth on the illuminated and shaded sides of the shoot.

(d) Explain why shoots deprived of light grow very tall.

- In darkness, auxin is distributed evenly throughout the shoot.
- Without light, there is no inhibition of auxin activity, leading to uninhibited elongation of cells.
- This causes excessive elongation, making the shoot grow tall in search of light (etiolation).

5. Table 3 summarizes an experiment that was carried out to show the rate of water loss and uptake by a plant on a bright day.

Time (Hours)	Rate of water movement (mm^3/h)	
	Water uptake	Water loss
6 a.m.	17	10
8 a.m.	17	15
10 a.m.	30	55
12 noon	50	65

2 p.m.	58	68
4 p.m.	57	63
6 p.m.	58	58
8 p.m.	45	34
10 p.m.	20	15
12 midnight	17	10
2 a.m.	17	10
4 a.m.	17	10
6 a.m.	17	10

(a) Use Table 3 to find out the following:

(i) The time when optimum rate of water loss took place.

- The highest rate of water loss occurred at 2 p.m. (68 mm^3/h).

(ii) The time when the rate of water uptake was equal to the rate of water loss.

- This occurred at 6 p.m. (58 mm^3/h for both water uptake and loss).

(b) Explain why the water content of the plant increased during the time interval from 10 p.m. to 6 a.m.

- During this period, water loss was minimal due to reduced transpiration at night.
- However, water uptake continued at a steady rate, replenishing lost water.
- The stomata were mostly closed, reducing evaporation, allowing the plant to store more water.

(c) (i) What is the name of the process of water loss observed in the plant?

- Transpiration

(ii) State the importance of this process to the plant.

- Cools the plant by removing excess heat.
- Facilitates the uptake and transport of water and minerals from the roots.
- Maintains turgor pressure, keeping the plant firm.
- Aids in the exchange of gases through stomata.

(d) How do xerophytes adapt to avoid excessive loss of water?
- Have thick waxy cuticles to reduce evaporation.
- Possess sunken stomata to trap moisture and minimize transpiration.
- Store water in fleshy leaves, stems, or roots.
- Reduce the number of stomata or close them during the day.
- Have deep root systems to access underground water sources.