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: 2009**

Instructions

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

2. Each question carries ten marks.

1. Three food samples A, B, and C were analyzed to identify the food substances they contained using reagents X, Y, and Z. The procedure and observations of the experiments were carried out as shown in the table below.

Experiment	Observations	Inference
1. (i) To 2mls of sample A in a test tube add an equal amount of reagent Z and shake well to mix	No change	-
(ii) Immerse the test tube with contents in 1(i) above in a beaker of boiling water for three minutes	No change	-
2. (i) To 2mls of sample A in a test tube add 3 drops of dilute hydrochloric acid and boil for two minutes. Then dilute the contents with dilute sodium hydroxide solution	No change	-
(ii) Add reagent Z to content in 2(i), then boil in a water bath for three minutes	Brick-red color	-
3. Add 2mls of sample B in a test tube and boil it for two minutes, allow cooling. After cooling add one drop of reagent Y	A blue-black color appears	-
4. To 2mls of sample C in a test tube add reagent X and shake well. Heat the contents in a water bath for three minutes	A red color appears	-

(a) Give the inferences in experiments 1(ii), 2(ii), 3, and 4.

- 1(ii): No reducing sugars were present in sample A.
- 2(ii): Reducing sugars were present in sample A after hydrolysis.
- 3: Starch was present in sample B.
- 4: Proteins were present in sample C.

(b) (i) Give the names of reagents X, Y, and Z respectively.

- X: Biuret solution
- Y: Iodine solution
- Z: Benedict's solution

(ii) What is the name of the process(es) taking place in experiment 2(i)?

- Hydrolysis

(c) What are the food substances in samples A, B, and C?

- Sample A: Non-reducing sugars
- Sample B: Starch
- Sample C: Proteins

2. Observe the drawings represented in Figure 1.

(a) (i) Identify organisms represented by A, B, C, and D using their common names.

- A: Pineapple
- B: Crab
- C: Comb
- D: Seed

(ii) Name the kingdom to which each of the organisms belongs.

- A: Plantae
- B: Animalia
- C: Animalia
- D: Plantae

(b) Suggest the habitat for organisms represented by B, C, and E.

- B: Aquatic environments such as oceans and freshwater.
- C: Terrestrial environments such as trees or ground vegetation.
- E: Soil or inside a fruit where seeds develop.

(c) Discuss the economic importance of the organisms represented by A, C, and E.

- A (Pineapple): Provides food, used in juice production, and has medicinal benefits.
- C (Comb-like organism): May be used in animal husbandry for grooming.
- E (Seed): Essential in agriculture for plant propagation and food production.

3. Carefully study the diagrams represented in Figure 2 and answer the questions that follow.

(a) (i) Name the bones labeled M and N.

- M: Lumbar vertebra
- N: Thoracic vertebra

(ii) Identify their location in the body.

- M: Lower back (lumbar region)
- N: Upper back (thoracic region)

(b) Label any three parts on each of the bones M and N.

- M: Neural spine, transverse process, centrum
- N: Neural spine, rib facet, centrum

(c) (i) State one function of each bone.

- M: Supports body weight and allows flexibility in the lower back.
- N: Provides attachment for ribs and protects the thoracic organs.

(ii) Explain briefly how these bones are adapted to their functions.

- M: Has large, thick centrum for weight-bearing.
- N: Has rib facets for articulation with ribs, providing protection to vital organs.

(d) Write down two differences between the bones M and N.

- M has a larger and more robust centrum compared to N.
- N has rib facets for rib attachment, while M lacks them.

4. A Form Four student at Igole Secondary School carried out the following procedures to investigate respiration:

(a) Filled two 100ml conical flasks with water which had previously been boiled and cooled to room temperature.

(b) Labeled the flasks A and B.

(c) Poured the water from conical flask A into a beaker and agitated it so as to get aerated and then poured it back into flask A. He did not disturb the water in flask B.

(d) Gently placed live small fish in each of the flasks and observed.

(e) The fish in flask A continued swimming while the fish in flask B swam for a short period and then became motionless.

(i) Suggest the aim of the experiment.

- The aim of the experiment was to investigate the role of oxygen in respiration, particularly in aquatic organisms. The experiment was designed to show that fish require dissolved oxygen to survive and that a lack of oxygen leads to death or inactivity.

(ii) What was the aim of boiling the water in procedure 4(a)?

- Boiling the water removes dissolved gases, including oxygen. This ensures that the water in flask B lacks oxygen, allowing the student to test the effect of oxygen deprivation on the fish. By cooling the water afterward, the temperature is normalized, ensuring that heat does not affect the fish's behavior.

(iii) What was observed in procedure 4(e)?

- The fish in flask A remained active and continued swimming normally, while the fish in flask B swam for a short period and then became motionless. This happened because flask A contained oxygen, which allowed the fish to carry out normal respiration. However, flask B lacked oxygen, leading to the fish's inability to breathe, eventually making it motionless due to suffocation.

(iv) What conclusion could the student make?

- The student can conclude that oxygen is necessary for respiration in fish. The fish in flask B became motionless due to the absence of oxygen, while the one in flask A remained active because the water had been aerated. This confirms that aquatic animals rely on dissolved oxygen for respiration.

5. An experiment has been set up as in Figure 3. The rims of the bell jars were smeared with petroleum jelly. The bell jars were then left in the sun.

(a) (i) What was the aim of the experiment?

- The experiment aimed to investigate transpiration, which is the process by which plants lose water in the form of vapor through their stomata. By setting up this experiment, the student was able to observe whether plants release water vapor into the surrounding environment.

(ii) What has been formed on the inside of the bell jar B?

- Water droplets were formed on the inside of bell jar B. This occurred because the plant inside the bell jar released water vapor through transpiration. The vapor condensed on the cooler surface of the bell jar, forming tiny droplets of liquid water. This confirms that plants lose water to the atmosphere through transpiration.

(iii) What was the purpose of putting the waterproof material?

- The waterproof material was used to prevent evaporation from the soil. If evaporation from the soil were allowed, it would interfere with the results of the experiment because some of the water inside the bell jar could come from the soil instead of the plant. By ensuring that all the water collected inside the bell jar comes from the plant only, the experiment remains valid and accurate.

(b) (i) What are the findings of the experiment?

- The findings show that plants lose water in the form of vapor through transpiration. The appearance of water droplets on the inside of the bell jar indicates that the plant released water, which then condensed on the glass.

(ii) Based on the results, what conclusions can be drawn from this experiment?

- The experiment confirms that transpiration is a natural process in plants. It also demonstrates that plants lose water primarily through their leaves. The amount of transpiration can be influenced by environmental conditions such as temperature, humidity, and wind.

(c) (i) Mention the importance of the process involved.

- Transpiration plays a critical role in plant survival. It helps cool the plant by releasing excess heat, preventing overheating on hot days.
- It facilitates the uptake of water and minerals from the roots. As water is lost through the leaves, more water is drawn up from the roots through the xylem in a continuous process known as the transpiration stream. This allows essential minerals to be transported to different parts of the plant.
- Transpiration also helps in maintaining turgor pressure in plant cells. When plant cells are full of water, they remain firm, giving the plant structural support and preventing wilting.

(ii) What are the factors affecting the process you have mentioned in (c)(i) above?

- Temperature: Higher temperatures increase the rate of transpiration because heat causes more water to evaporate from the leaf surface.
- Humidity: High humidity reduces transpiration because the air is already saturated with water vapor, making it difficult for the plant to release more water. Low humidity increases transpiration as dry air readily absorbs water from the plant.
- Wind speed: Wind increases the rate of transpiration by carrying away the water vapor from the leaf surface, maintaining a steep concentration gradient between the leaf and the air. In contrast, still air slows down transpiration.
- Light intensity: More light causes the stomata to open wider, increasing transpiration. In low light conditions, stomata close partially, reducing water loss.
- Availability of water in the soil: When there is sufficient water in the soil, the plant can maintain high transpiration rates. However, if water is scarce, the plant closes its stomata to conserve moisture, reducing transpiration.