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: 2013**

Instructions

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

2. Each question carries ten marks.

1. Study Figures 1 and 2, and then answer the questions that follow.

(a) (i) Identify Figures 1 and 2.

- Figure 1 represents a tuber, specifically a potato.
- Figure 2 represents a bulb, specifically an onion bulb.

(ii) What part of a plant is Figure 1?

- Figure 1 (potato tuber) is a modified underground stem used for storage.

(iii) Label structures represented by A, B, C, D, and E.

- A: Lenticel – Allows gas exchange.
- B: Bud (eye of potato) – Develops into a new shoot.
- C: Scales (modified leaves) – Store food and protect the inner layers.
- D: Basal plate – The region where roots emerge in a bulb.
- E: Roots – Absorb water and nutrients from the soil.

(b) (i) What roles do Figures 1 and 2 have in common?

- Both store food for the plant.
- Both serve as vegetative propagation structures.
- Both help the plant survive unfavorable conditions such as drought or winter.

(ii) How would you prepare Figure 1 for an experiment to identify the types of food found in it?

- Crush a small portion of the potato tuber into a paste.
- Place the paste on a white tile.
- Add a few drops of iodine solution.
- Observe the color change.

(iii) State the reagent you would use to identify the type of food in Figure 1 and Figure 2. What are the expected positive results for each?

- Figure 1 (Potato tuber): Use iodine solution to test for starch. A blue-black color indicates the presence of starch.
- Figure 2 (Onion bulb): Use Benedict's solution to test for reducing sugars. A brick-red precipitate upon heating confirms the presence of reducing sugars.

2. Figure 3 shows the structure of a flower. Carefully study it and then answer the questions that follow.

(a) Identify structures A, B, and C.

- A: Stigma – Receives pollen during pollination.
- B: Anther – Produces pollen grains.
- C: Petal – Attracts pollinators with color and scent.

(b) Name the agent(s) of pollination in Figure 3.

- Insects (Insect pollination or entomophily)

(c) State the observable features you used to recognize the agent of pollination in Figure 3.

- Large, brightly colored petals to attract insects.
- Presence of nectar to lure pollinators.
- Scented flowers to attract insects.
- Sticky stigma for pollen attachment.

(d) Outline any four examples of plants adapted for pollination facilitated by the agent(s) you named in (b) above.

- Hibiscus
- Sunflower
- Passionflower
- Rose

(e) Describe how the process of pollination is most likely to occur in such a flower.

- An insect visits the flower to collect nectar.
- As the insect moves around, pollen grains from the anther stick to its body.
- When the insect visits another flower, some of the pollen rubs off onto the stigma of that flower.
- Fertilization occurs after the pollen tube grows and reaches the ovary.

(f) What is the importance of pollination to agriculture?

- Ensures fertilization, leading to fruit and seed formation.
- Increases crop yield and quality.
- Enhances genetic variation in plants.
- Supports ecosystem balance by sustaining pollinators.

3. Figure 4 shows the body temperature of an animal that was placed in a water bath. The temperature of the bath water was 22°C. Study it and answer the questions that follow.

(a) Explain why the temperature of the animal dropped during the first 30 minutes.

- The animal was exposed to a lower temperature (22°C water), leading to heat loss through conduction and convection.
- The body loses heat faster than it can generate due to the surrounding cold environment.

(b) State two ways to show how the body temperature of the animal fell.

- Measuring the body temperature at regular intervals using a thermometer.
- Observing physical signs such as shivering, reduced movement, or cold skin.

(c) Briefly describe different processes that took place in the animal to return its body temperature to the normal condition.

- Shivering – Rapid muscle contractions generate heat.
- Vasoconstriction – Blood vessels near the skin constrict to reduce heat loss.
- Increased metabolism – The body burns stored energy to produce heat.
- Piloerection – Hair stands up to trap heat and insulate the body.

(d) (i) What is the name of the group of animals which respond to temperature changes in a similar manner as the animal in the experiment?
- Endotherms (Warm-blooded animals)

(ii) Mention any four organisms which belong to the group mentioned in (d) (i).

- Human
- Dog
- Bird
- Elephant

4. Study Figure 5 which shows the front part of a fish with a structure removed, and then answer the questions that follow.

(a) (i) Name the structures F and G.

- F: Operculum – A bony flap that covers and protects the gills.
- G: Gill filaments – Thin structures involved in gaseous exchange.

(ii) What is the name of the structure that has been removed?

- The gill cover or operculum has been removed.

(iii) Briefly explain the problems the specimen in Figure 5 would face in the absence of the structure you named in (ii) above.

- Without the operculum, the fish would have difficulty controlling water flow over the gills, leading to inefficient oxygen uptake.
- The gills would be exposed, making them more vulnerable to physical damage and infections.
- The fish would struggle to maintain proper water pressure over the gills, affecting respiration.

(iv) How is structure G adapted to the function it performs?

- Gill filaments have a large surface area to maximize oxygen absorption.
- They contain many capillaries to enhance gas exchange.
- They have thin membranes for efficient diffusion of gases.
- They remain moist, which is necessary for gas exchange in water.

(b) (i) Briefly describe the process that involves the structures identified in (a)(i).

- The process is gaseous exchange in fish.
- Water enters through the mouth and flows over the gill filaments.
- Oxygen from the water diffuses into the blood in the gill capillaries.
- Carbon dioxide from the blood diffuses into the water and is expelled.

(ii) Why can't a fish survive on land?

- The gill filaments collapse without water, reducing the surface area for gas exchange.
- The gills dry out, preventing efficient oxygen diffusion.
- Fish are adapted to extracting dissolved oxygen from water, not from air.

5. Study the diagram in Figure 6 and answer the questions that follow.

(a) (i) Name the organism from which Figure 6 was taken.

- The organism is a bird.

(ii) Name the parts of the animal's body where Figure 6 is located.

- The structure is found on the wings and body of the bird.

(b) (i) Classify the organism you named in (a)(i) to class level.

- Kingdom: Animalia
- Phylum: Chordata
- Class: Aves

(ii) State four general characteristics of the phylum to which the organism identified in (a)(i) above belongs.

- Presence of a notochord or backbone.
- Bilateral body symmetry.
- Presence of a closed circulatory system.
- Well-developed nervous system with a brain and spinal cord.

(iii) State two adaptations shown by the organism you named in (a)(i) to its mode of locomotion.

- Feathers provide lift and streamline the body for flight.
- Hollow bones reduce weight, making flight easier.
- Strong pectoral muscles power wing movement.
- Aerodynamic wing shape enhances efficient flight.