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: 2010**

Instructions

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

2. Each question carries ten marks.

1. Four cylinders of potato named A, B, C, and D were carefully dried using a piece of blotting paper and weighed. Each cylinder weighed 0.3 g. One cylinder was placed in each beaker as shown in Figure 1 below.

(a) (i) After 48 hours, which potato cylinder would be the heaviest?

- The heaviest would be B (placed in distilled water).
- Reason: Water enters the potato cells by osmosis, causing it to gain mass.

(ii) After 48 hours, which potato cylinder would be the lightest?

- The lightest would be D (placed in 20 percent sucrose solution).
- Reason: Water moves out of the potato cells into the concentrated sucrose solution by osmosis, causing it to shrink and lose mass.

(b) (i) Which set acts as a control?

- A (placed in air) acts as the control.

(ii) Why is a control necessary in biological experiments?

- A control provides a baseline for comparison to determine the actual effect of the variable being tested.

(c) (i) Name the biological process being investigated in this experiment.

- Osmosis.

(ii) Define the biological process mentioned in (c)(i) above.

- Osmosis is the movement of water molecules from a region of low solute concentration to a region of high solute concentration across a semi-permeable membrane.

(d) What is the importance of the process identified in (c) in flowering plants?

- Helps in the absorption of water from the soil.
- Maintains cell turgidity, providing structural support.
- Facilitates the movement of water from cell to cell.
- Aids in the opening and closing of stomata.

2. In an experiment, some bean seeds were germinated on moist cotton wool in a flask and the apparatus set up as shown in Figure 2. The setup was left for two days.

(a) What do you think was the aim of the experiment?

- To investigate the production of carbon dioxide during respiration in germinating seeds.

(b) What do you think happened to the level of water in the tube? Give a reason.

- The water level in the tube rose.
- Reason: The germinating seeds produced carbon dioxide, which was absorbed by potassium hydroxide (KOH), creating a vacuum that pulled the water up the tube.

(c) What conclusion would you draw from the results of this experiment?

- Germinating seeds undergo respiration and produce carbon dioxide.

(d) State the precaution which should be taken when conducting an experiment as the one shown in Figure 2.

- Ensure the setup is airtight to prevent external air from affecting the results.
- Use freshly prepared KOH to effectively absorb carbon dioxide.
- Handle KOH with care as it is corrosive.

(e) Draw a diagram similar to that in Figure 2 for the control experiment, clearly showing the control(s) needed.

- The control setup should have boiled seeds instead of germinating seeds to confirm that respiration does not occur in dead tissue.

3. A potted plant was kept in a dark place for 12 hours after which it was set up in an experiment as shown in Figure 3. The plant was then left in the sun for 6 hours. A leaf from each of the flasks was tested for starch.

(a) What was the aim of the experiment?

- To investigate whether carbon dioxide is necessary for photosynthesis.

(b) Explain what was the purpose of using KOH.

- KOH absorbs carbon dioxide from the air, ensuring that no carbon dioxide is available for photosynthesis in the experimental setup.

(c) Which of the two leaves responded positively to the starch test?

- The leaf in the flask without KOH responded positively (turned blue-black with iodine).

(d) What can you conclude from the results of the above experiment?

- Photosynthesis requires carbon dioxide.
- The leaf in the flask with KOH did not turn blue-black, indicating that no starch was formed due to the absence of carbon dioxide.

4. In Figure 4, A represents part of an organism while B, C, and D represent whole organisms. Study them and then answer the questions that follow.

(a) (i) How do the organisms represented by A and B obtain their food?

- Organism A (insect) obtains food by piercing and sucking nutrients from plants or other organisms.
- Organism B (plant) obtains food through photosynthesis, using sunlight, water, and carbon dioxide.

(ii) What name is given to organisms whose feeding habits are like those exhibited by the organisms A and B?

- Organisms like A are called parasites if they feed on other living organisms.
- Organisms like B are called autotrophs because they produce their own food.

(b) (i) Classify the organism C to class level.

- Organism C (crustacean) belongs to the class Crustacea.

(ii) What observable characteristic(s) have you used to place C in the phylum stated in (b)(i) above?

- Presence of jointed appendages.
- Possession of a hard exoskeleton.
- Segmented body divided into head, thorax, and abdomen.

(c) (i) State the habitat of organism D.

- Organism D (cactus) is found in desert and arid regions.

(ii) How is the organism adapted to its habitat?

- Thick, fleshy stem for water storage.
- Reduced leaves (spines) to minimize water loss.
- Deep root system to absorb water efficiently.

- Waxy cuticle to reduce evaporation.

5. A form three student at Mjengi Secondary School performed an experiment to determine the temperature of two animals when subjected to different conditions. Animal A and Animal M were tested under varying environmental conditions, and the results were as shown in the table below.

Environmental conditions	Body Temperature	
	Animal A	Animal M
Temperature at the beginning of the experiment	38°C	38°C
Two animals were kept in a refrigerator at 10°C for ½ an hour	15°C	36°C
The two animals were then kept in an environment of around 35°C for half an hour	33°C	37°C

(a) Interpret the observations made by the student.

- Animal A's body temperature changed significantly with environmental conditions, dropping in the cold and rising in warmth.
- Animal M maintained a relatively constant body temperature, with only slight changes.

(b) What is the name given to organisms which behave as

(i) Animal A?

- Poikilotherms (Cold-blooded animals or ectotherms).

(ii) Animal M?

- Homeotherms (Warm-blooded animals or endotherms).

(c) Name two animals which possess characteristic behaviors as Animal A.

- Fish
- Frog

(d) What advantages or disadvantages does animal A have over animal M?

Advantages:
- Requires less energy for maintaining body temperature.
- Can survive on less food compared to homeotherms.

Disadvantages:
- Body functions depend on external temperatures, making activity levels unpredictable.
- Limited ability to survive in extreme cold or heat environments.