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: 2003**

Instructions

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

2. Each question carries ten marks.

1. Juma was feeding his child continuously with mashed potatoes and eggs. The child's health kept on deteriorating. The following symptoms developed in the child:

- Cracked skin
- Bleeding gums
- Night blindness

a) Name the food substances you think were present in the child's diet.

The child's diet consisted of mashed potatoes and eggs, which primarily contain carbohydrates and proteins.
- Mashed potatoes are rich in carbohydrates but lack essential vitamins such as vitamin A and vitamin C.
- Eggs provide proteins and some vitamins but are not a sufficient source of vitamin C, which is crucial for preventing bleeding gums.

b) Design an experiment that you would carry out to investigate the type of food substances present in the food of Juma's child. Using a table as shown below, write down the experimental work which leads to the identification of the food substances.

Test	Procedure	Observation	Inference
Test for starch	Add a few drops of iodine solution to mashed potatoes.	A blue-black color appears.	Starch is present.
Test for proteins	Add Biuret reagent to eggs.	A purple color appears.	Proteins are present.
Test for vitamin C	Add a few drops of DCPIP solution to mashed potatoes and eggs.	The blue color of DCPIP does not disappear.	Vitamin C is absent.
Test for vitamin A	Add the food sample to a test tube with chloroform, shake, then add antimony trichloride reagent.	No color change to blue.	Vitamin A is absent or insufficient.

c) Name one natural food in each case that may be fed to the child to prevent:

i) Bleeding gums
- Oranges. Oranges are rich in vitamin C, which helps in collagen formation, preventing bleeding gums.

ii) Night blindness and cracked skin
- Carrots. Carrots contain beta-carotene, which the body converts into vitamin A, necessary for good vision and healthy skin.

d) Name the vitamin(s) whose deficiency results in:

i) Night blindness and cracked skin
- Vitamin A. Vitamin A is essential for good vision, skin health, and proper immune function. Its deficiency causes night blindness and dry, cracked skin.

ii) Bleeding gums
- Vitamin C. Vitamin C is required for collagen synthesis, and its deficiency leads to scurvy, which causes bleeding gums and weak connective tissues.

5.(a) (i) Identify the organisms in Figure 3, 4, 5, and 6.
- Figure 3: Lizard (a reptile)
- Figure 4: Spirogyra (a filamentous green algae)
- Figure 5: Mushroom (a type of fungi)
- Figure 6: Amoeba (a unicellular protozoan)

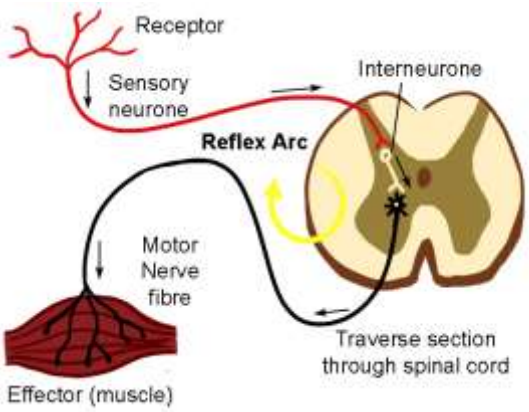
(ii)Place organisms in Figure 3, 4, 5, and 6 in their respective kingdoms.
- Figure 3: Kingdom Animalia (Lizard)
- Figure 4: Kingdom Plantae (Spirogyra)
- Figure 5: Kingdom Fungi (Mushroom)
- Figure 6: Kingdom Protista (Amoeba)

(b)(i). Write down two general features which place the organisms in Figure 3 and Figure 5 into their respective kingdoms.
- Lizard (Kingdom Animalia):
  1. It is a multicellular organism with specialized body organs.
  2. It is heterotrophic, meaning it consumes other organisms for food.
- Mushroom (Kingdom Fungi):
  1. It lacks chlorophyll and does not photosynthesize.
  2. It feeds by absorbing nutrients from decomposing organic matter (saprophytic nutrition).

(ii) State the economic importance of the organism in Figure 5 (Mushroom).
- Mushrooms have economic significance as a source of food for humans.
- Some species are used in medicine for their antibiotic properties.
- Certain mushrooms are cultivated commercially for sale.
- Some mushrooms decompose organic matter, helping in nutrient recycling.

(c) State the similarities and differences between the organisms in Figure 4 (Spirogyra) and Figure 5 (Mushroom).
- Similarities:
  1. Both are eukaryotic organisms.
  2. Both reproduce through spores or fragmentation.
- Differences:
  1. Spirogyra is autotrophic (photosynthesizes), while mushrooms are heterotrophic.
  2. Spirogyra belongs to Kingdom Plantae, whereas mushrooms belong to Kingdom Fungi.

5.(a) Draw a large diagram of a reflex arc.



A reflex arc is the neural pathway that mediates an involuntary and nearly instantaneous response to a stimulus, known as a reflex. It involves a direct route from sensory neurons to motor neurons, bypassing the brain to allow for quick reactions.

Components of a Reflex Arc:
1. Stimulus: A change in the environment that triggers a response, such as touching a hot object.
2. Receptor: Sensory organs or cells that detect the stimulus and generate an impulse. In the case of touching something hot, thermoreceptors in the skin serve this function.
3. Sensory Neuron (Afferent Neuron): Transmits the impulse from the receptor to the spinal cord.
4. Interneuron (Relay Neuron): Located within the spinal cord, it processes the impulse and conveys it to the motor neuron.
5. Motor Neuron (Efferent Neuron): Carries the impulse from the spinal cord to the effector.
6. Effector: The muscle or gland that executes the response, such as withdrawing a hand from a hot surface.
Pathway of a Reflex Arc:

- Stimulus Detection: A stimulus, like heat, is detected by receptors in the skin.
- Impulse Transmission: The sensory neuron carries the impulse to the spinal cord.
- Processing: Within the spinal cord, the impulse is relayed through an interneuron.
- Response Initiation: The motor neuron transmits the impulse to the effector muscle.
- Action: The muscle contracts, resulting in the withdrawal of the hand.

(b). Using arrows, show the path taken by an impulse involved in a simple reflex action.
- The impulse path follows this sequence: stimulus ---> receptor ----> sensory neuron ---> spinal cord ---> motor neuron ---> effector ---> response.

(c). Give examples of reflex actions.
- Blinking of the eyes when exposed to bright light.
- Withdrawal of a hand from a hot object.
- Sneezing when irritants enter the nose.
- Knee-jerk reflex when the patellar tendon is tapped.