THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

133/3B **BIOLOGY 3B**

(ACTUAL PRACTICAL B)

(For Both School and Private Candidates)

Time : 3:20 Hours **ANSWERS** **Year : 2023**

Instructions

1. This paper consists of three questions, answer all questions
2. All writing should be in **blue** or **black** ink.
3. Communication devices and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

1. You are provided with the specimen S1. Dissect it to display its digestive system and pin the ileum to their right hand side.
   Questions
   (a) Draw a large diagram of the specimen S1 and label nine parts.

The large diagram of specimen S1 (a rabbit or small mammal) should include nine labeled parts such as the mouth, teeth, tongue, esophagus, stomach, small intestine, ileum, caecum, large intestine, and anus.

(b) Explain the adaptations of a structure used for mechanical digestion in specimen S1.

The teeth are adapted for mechanical digestion. Incisors are sharp and chisel-shaped for cutting food. Canines are pointed for tearing food. Premolars and molars have broad surfaces with ridges for grinding and crushing food. The jaws are strong and can move up and down as well as sideways to allow effective mastication of food.

(c) (i) State the enzymes found in the structure used for mechanical digestion.

The enzymes found in the mouth, where mechanical digestion occurs, include salivary amylase (ptyalin).

(ii) Give the digestive role played by each of the enzymes named in (c)(i).

Salivary amylase breaks down starch into maltose, which is a simpler sugar. This helps initiate the process of chemical digestion as food is being mechanically broken down.

(d) State two locations in specimen S1 where absorption takes place in its body.

Absorption takes place in the small intestine, specifically the ileum, where nutrients are absorbed into the blood. It also occurs in the large intestine, where water and some salts are absorbed.

2. You are provided with a sample labeled M, boiled and unboiled potatoes, water trough, knife/scalpel, scooper and water. Perform the following procedure:

(i) Cut the cross section to obtain two equal halves for each Irish potato by using a knife/scalpel.
(ii) Label the 2 halves of the unboiled Irish potato as A and B respectively, and one half of the boiled

potato as C.

(iii) Use a scooper to make the holes of about 2.5 cm deep from the cut surface for the three halves of Irish potatoes A, B and C while making sure that the wall of the holes must be thin (about 5 - 8 mm thick) to create a semi-permeable membrane and not damaged.

(iv) Put 3 g of sample M in each hole of B and C while keeping hole A empty.

(v) Place all the three Irish potatoes in a trough.

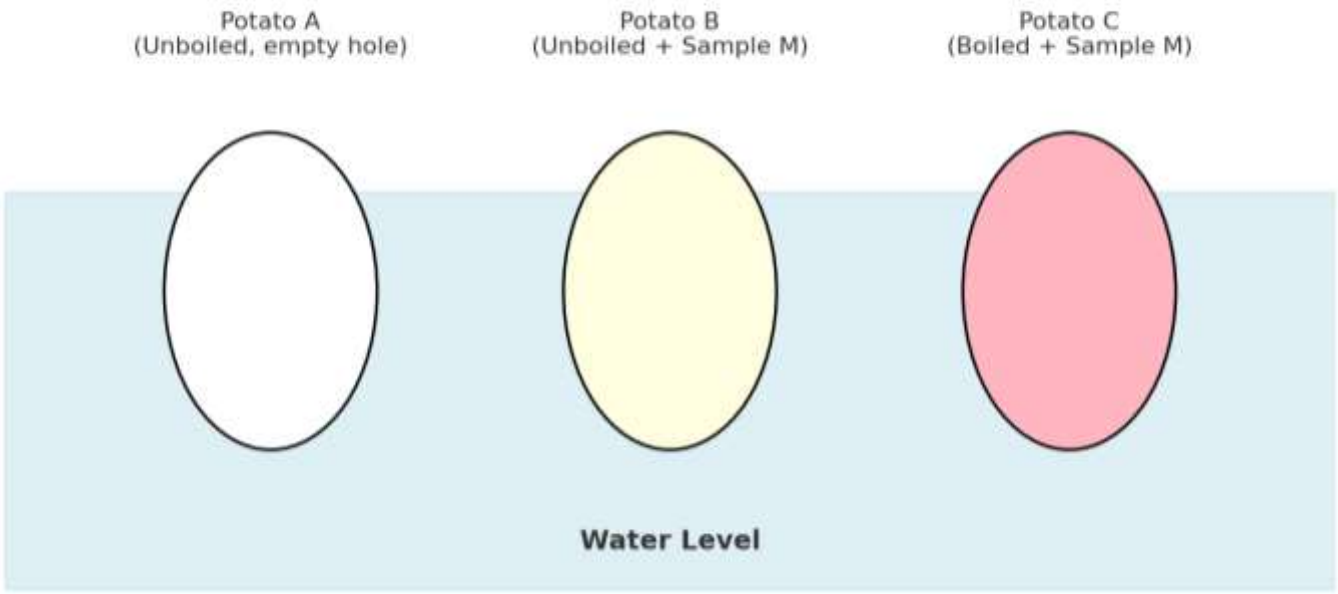
(vi) Put water in a trough until the Irish potatoes are half immersed. Carefully observe the experiment and note the set up and the level of water at the beginning.

(vii) Leave the experiment for 30 minutes thereafter observe the experiment again and note the changes.

Questions

(a) State the changes observed after 30 minutes of the experiment.

In potato A, no significant change is observed since the hole is empty. In potato B, water enters the hole by osmosis because of the higher solute concentration of sample M, causing the level of solution in the hole to rise. In potato C, since the cells of boiled potato are dead and membranes destroyed, no osmosis occurs and the level of solution remains the same.



(b) Explain how the solute potential in hole A, B and C acted to bring about the observed results of the experiment.

In hole A, there was no solute, so no osmotic gradient was created, hence no movement of water. In hole B, the solute potential of sample M was lower than that of the surrounding potato tissue, creating a gradient that allowed water molecules to move into the hole by osmosis. In hole C, boiling destroyed the semi-permeable membranes of the potato, preventing osmosis, so no change occurred.

(c) Explain the necessity of potato A for this experiment.

Potato A served as a control experiment to show that without solute in the hole, no water movement or osmosis takes place. This ensures that the observed results in B and C are due to osmosis and not other factors.

(d) Explain the six ways in which the investigated process is important in nature.

Osmosis helps plants absorb water from the soil through root hairs.
It maintains turgor pressure in plant cells, which supports the plant structure.
It regulates the opening and closing of stomata, thereby controlling gas exchange.
It allows reabsorption of water in the kidney tubules, helping maintain water balance in animals.
It facilitates nutrient transport across cell membranes in both plants and animals.
It supports the movement of water in and out of red blood cells to maintain their shape and proper functioning.

3. You are provided with specimens S2, S3 and S4, study them carefully and answer the following questions:

(a) Name the phylum in which the specimen S3 and S4 belong.

Specimen S3 and S4 belong to phylum Arthropoda.

(b) Classify the specimen S2, S3 and S4 to class level.

Specimen S2 is in class Amphibia.
Specimen S3 is in class Insecta.
Specimen S4 is in class Arachnida.

(c) Identify features in both specimen S3 and S4 which justify their representation of their respective classes.

Specimen S3 (Insecta) has three body parts (head, thorax, abdomen), three pairs of legs, and one or two pairs of wings.
Specimen S4 (Arachnida) has two body parts (cephalothorax and abdomen), four pairs of legs, and lacks antennae and wings.

(d) State where specimen S3 is found naturally.

Specimen S3 (grasshopper or other insect) is found naturally in grassy fields, farmlands, and bushes where they feed on plant material.

(e) Give ways in which specimen S2 is useful for economic development.

Specimen S2 (frog) is useful as it helps control insect pests that damage crops. It also serves as a source of food in some communities. Frogs are used in biological research and teaching. They contribute to the ecosystem by being both predator and prey, maintaining ecological balance.

(f) Explain how specimen S4 adapted to its environment.

Specimen S4 (spider) has developed silk-producing glands to spin webs for trapping prey. It has eight strong legs adapted for quick movement. It has venomous fangs to immobilize and digest prey. It has multiple eyes for detecting movement and orientation. Its body is covered with hair-like structures that enhance its sense of touch and vibration detection.