THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

033/2 **BIOLOGY 2**

ALTERNATIVE TO PRACTICAL

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: November, 1999**

Instructions

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

2. Each question carries ten marks.

1. A form two student who had just studied food test experiments and digestion of food in the mouth prepared two solutions for investigation as follows:

He took a piece of raw cassava, cut it into small pieces, and ground it using a mortar and pestle. He then added 3 cm^3 of cold water, decanted the mixture into a beaker, and labeled the beaker "Cassava extract".

He collected about 5 cm^3 of saliva in another beaker, added 5 cm^3 of water, stirred the mixture, and labeled the beaker "Saliva solution".

He then performed the following experiments:

experiment 1
5 cm^3 of the cassava extract was tested for the presence of carbohydrates.

experiment 2
5 cm^3 of saliva solution was added to 5 cm^3 of cassava extract in a test tube. The mixture was left to stand for 5 minutes, and then it was tested for the presence of carbohydrates.

experiment 3
5 cm^3 of cassava extract was boiled for 5 minutes, allowed to cool, and then tested for the presence of carbohydrates.

experiment 4
5 cm^3 of cassava extract was boiled for 5 minutes and allowed to cool. 3 cm^3 of saliva solution was added, and after 5 minutes, the mixture was tested for the presence of carbohydrates.

a) Present the student's experimental work for experiments 1 to 4 in a table form as shown below.

Experiment	Test for	Procedure	Observation	Inference
1	Starch	Add iodine solution to cassava extract	Blue-black color appears	Starch is present

| 2 | Starch conversion | Add saliva solution to cassava extract and leave for 5 minutes, then test with iodine | No blue-black color appears | Starch has been broken down into sugars by enzymes in saliva |

| 3 | Starch | Boil cassava extract for 5 minutes, allow to cool, then add iodine solution | Blue-black color appears | Starch is still present |

| 4 | Starch conversion | Boil cassava extract, allow to cool, add saliva solution, leave for 5 minutes, then add iodine | Blue-black color appears | Enzymes in saliva were denatured by heat, preventing starch breakdown |

b) Suggest the aim of the student's experiment.

The aim of the experiment was to investigate the action of enzymes in saliva on starch and how heat affects enzyme activity.

c) Explain the difference in observations between experiments 2 and 4.

- In experiment 2, starch was broken down by enzymes in saliva, leading to the disappearance of the blue-black color in the iodine test.
- In experiment 4, boiling the cassava extract before adding saliva denatured the enzymes, preventing starch breakdown, so the blue-black color remained.

2. The diagram below (figure 1) represents an apparatus set up for a biological investigation. Study the setup and then answer the questions which follow.

a) i) What biological process does the apparatus intend to demonstrate?

The apparatus demonstrates respiration in plants.

ii) Suggest the aim of the experiment for the above apparatus set up.

The aim of the experiment is to investigate the effect of carbon dioxide absorption on plant respiration.

b) Give the name of the liquid in flask X.

The liquid in flask X is limewater (calcium hydroxide solution).

c) Why should the flask containing the plant be covered with black cloth?

The flask is covered with black cloth to prevent photosynthesis from occurring, ensuring that only respiration is being investigated.

d) What is the purpose of soda lime?

Soda lime absorbs carbon dioxide from the air entering the setup, allowing the experiment to determine if the plant releases carbon dioxide during respiration.

3. The diagrams below, figures 2 to 6, represent organisms and a part of an organism. Study them and then answer the questions which follow.

a) Identify the organisms and part of an organism using common names.
- Figure 2: Turtle
- Figure 3: Mangrove root system

- Figure 4: Maize root
- Figure 5: Spirogyra
- Figure 6: Feather

b) i) Classify the organisms in figures 2, 3, and 5 to class level.
- Figure 2 (Turtle): Class Reptilia
- Figure 3 (Mangrove plant): Class Magnoliopsida (Dicotyledonae)
- Figure 5 (Spirogyra): Class Chlorophyceae

ii) Give two distinguishing characteristics of each of the classes named in b(i) above.
- Class Reptilia (Turtle)
  - Have dry, scaly skin
  - Are cold-blooded and breathe through lungs
- Class Magnoliopsida (Mangrove plant)
  - Have broad leaves with reticulate venation
  - Possess taproot systems
- Class Chlorophyceae (Spirogyra)
  - Have green chloroplasts for photosynthesis
  - Exhibit filamentous growth

c) Name
i) The mode of reproduction
- Turtle: Sexual reproduction through internal fertilization
- Spirogyra: Asexual reproduction by fragmentation and sexual reproduction through conjugation

ii) The mode of nutrition for the organism in figure 3.
The mangrove plant in figure 3 exhibits autotrophic nutrition, using photosynthesis to make its own food.

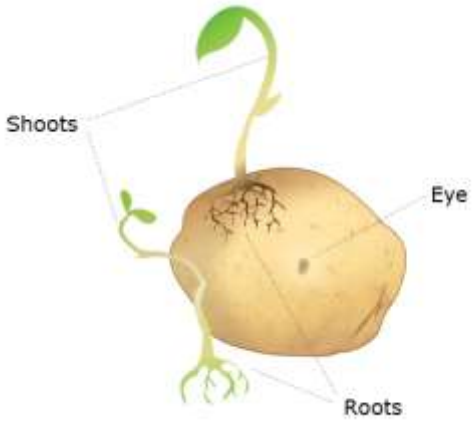
d) i) Name the habitat of the organism in figure 5.
Spirogyra lives in aquatic habitats, commonly found in freshwater bodies such as ponds and lakes.

ii) Give two functions of the structure in figure 6 to the organism in which it is found.
- The feather provides insulation by trapping air to maintain body temperature.
- It aids in flight by reducing air resistance and increasing lift in birds.

4. A student uprooted three plants and represented them diagrammatically as shown in figures 7, 8, and 9. Study the diagrams and answer the questions which follow.

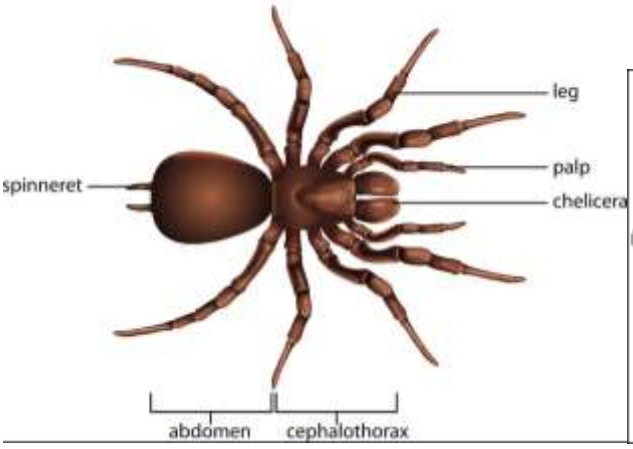
a) Name the parts labeled A to G.
- A: Shoot apex
- B: Stem
- C: Prop roots
- D: Fibrous roots
- E: Stolon
- F: Adventitious root
- G: Taproot

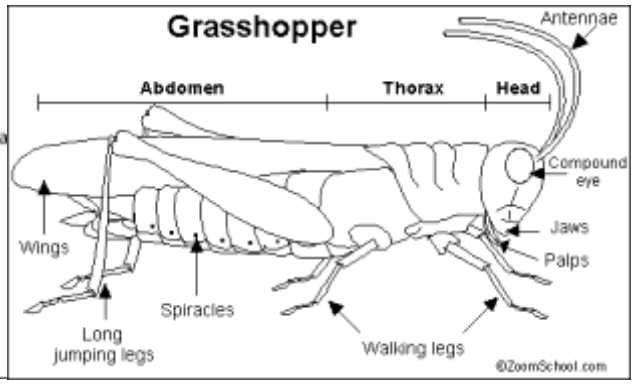
b) In which part of the plant does each of the plants store its food?
- The plant in figure 7 stores food in the stem.
- The plant in figure 8 stores food in the roots.
- The plant in figure 9 stores food in stolons.
c) What names do we give to plants which store food like the plants in figures 7, 8, and 9?
Plants that store food in their roots, stems, or stolons are called storage organs or perennating plants.
d) Draw a large labeled diagram of a stem tuber.



This diagram should clearly show the swollen underground stem with buds and stored nutrients.

5. a) i) Draw large well-labeled diagrams of a spider and a grasshopper.





ii) State the habitat of each of the two organisms.

- Spider: Terrestrial, commonly found in trees, soil, and human dwellings.

- Grasshopper: Terrestrial, commonly found in grasslands and farms.

b) i) State the phylum and class for each of the two organisms.

- Spider: Phylum Arthropoda, Class Arachnida
- Grasshopper: Phylum Arthropoda, Class Insecta

ii) Name five observable features present in the spider which distinguish it from that of the grasshopper.

- The spider has eight legs, while the grasshopper has six.
- The spider has two body segments (cephalothorax and abdomen), while the grasshopper has three (head, thorax, and abdomen).
- The spider has simple eyes, while the grasshopper has compound eyes.
- The spider lacks antennae, while the grasshopper has a pair of antennae.
- The spider has specialized silk-spinning organs, which the grasshopper lacks.

ii) Explain how this limb is adapted for the function it performs.

- The femur is large and muscular to store energy for powerful jumps.
- The tibia is long and equipped with spines for gripping surfaces.
- The joint structure allows for effective movement and rapid propulsion.