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: 1997**

Instructions

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

2. Each question carries ten marks.

1. In an experiment, 5 cm^3 of starch solution was placed in each of the 5 test tubes labeled A, B, C, D, and E. The contents of the 5 test tubes were then varied as shown in the diagram below (Fig. 1).

The five test tubes were placed in a water bath at 36°C. At timed intervals for a period of 10 minutes, samples from each test tube were tested with iodine for the presence of starch.

a) In which test tube do you think the starch disappeared fastest? Why?
The starch disappeared fastest in the test tube containing starch solution and saliva at normal pH. This is because saliva contains amylase, an enzyme that breaks down starch into maltose, and the normal pH allows the enzyme to function efficiently.

b) What do you think happened to the starch in the test tube you have mentioned in (a) above?
The starch was hydrolyzed into maltose by the action of the amylase enzyme present in saliva.

c) How could you test what the starch changed into?
To test for maltose, Benedict's test can be performed. A few drops of Benedict's solution are added to the test solution and heated. A color change from blue to brick-red indicates the presence of maltose.

d) What was the purpose of including test tube A and E in the experiment?
- Test tube A (starch only) was used as a control to show that starch alone does not break down without enzymes.
- Test tube E (starch with boiled saliva) was used to confirm that enzymes are denatured by heat, making them non-functional.

2. Two completely dry soil samples A and B were placed in two filter funnels and the apparatus set as shown below (Fig. 2).
100 cm^3 of water was poured into each funnel. After the water had stopped dripping through each funnel, it was noted that 20 cm^3 of water had passed through soil sample A and 90 cm^3 had passed through soil sample B.
a) What do you think was the purpose of the experiment?
The purpose of the experiment was to determine the water retention capacity of different soil samples.

b) From the information you have been given, what conclusion can you make about soil samples A and B?
- Soil sample A has high water retention because it absorbed most of the water, allowing only 20 cm^3 to pass through.
- Soil sample B has low water retention because it allowed most of the water (90 cm^3) to pass through.

c) Suggest the names of soil samples A and B.
- Soil sample A is likely to be clay soil because clay has fine particles and high water retention.
- Soil sample B is likely to be sandy soil because sand has large particles and allows water to drain quickly.

d) In good well-watered soils, the water should take up to a quarter (1/4) of the total volume. With this information in mind, are soils A and B suitable for agriculture? Give reasons for your answer.

- Soil A is suitable for agriculture as it retains enough water for plant growth but may need proper aeration.
- Soil B is not suitable for agriculture because it drains water too quickly, making it difficult for plants to access moisture.

3. Study the diagrams of organisms in figures 3-10.
a) Identify the organisms illustrated in figures 3-10 by their common names and state the phylum to which each of them belongs.

- Figure 3: Fungus – Phylum Fungi
- Figure 4: Butterfly – Phylum Arthropoda
- Figure 5: Bacteria – Phylum Monera
- Figure 6: Grasshopper – Phylum Arthropoda
- Figure 7: Bird – Phylum Chordata
- Figure 8: Scorpion – Phylum Arthropoda
- Figure 9: Snail – Phylum Mollusca
- Figure 10: Fern – Phylum Pteridophyta

b) Name the classes to which organisms 3, 6, 7, and 8 belong.
- Figure 3 (Fungus) does not belong to a specific class as fungi are classified under their kingdom.
- Figure 6 (Grasshopper) belongs to Class Insecta.
- Figure 7 (Bird) belongs to Class Aves.
- Figure 8 (Scorpion) belongs to Class Arachnida.

c) State the habitats of organisms 3, 8, 9, and 10.
- Figure 3 (Fungus): Lives in moist environments, decaying organic matter.
- Figure 8 (Scorpion): Lives in dry terrestrial habitats like deserts and forests.
- Figure 9 (Snail): Lives in moist terrestrial and freshwater environments.
- Figure 10 (Fern): Found in damp, shaded terrestrial environments.

4. The diagrams below, figures 11 and 12, show half flowers of angiosperms.

a) Identify the structures labeled A - H.

- A: Ovary
- B: Style
- C: Stigma
- D: Petal
- E: Sepal
- F: Anther
- G: Filament
- H: Receptacle

b) Which structures in figure 11 have the same functions as structures J, K, L, and M in figure 12? Mention the functions in each case.

- Structure A (Ovary) in figure 11 corresponds to structure J in figure 12, both containing ovules and developing into fruit after fertilization.
- Structure B (Style) in figure 11 corresponds to structure K in figure 12, both acting as passageways for pollen tubes to reach the ovary.
- Structure C (Stigma) in figure 11 corresponds to structure L in figure 12, both receiving pollen during pollination.
- Structure F (Anther) in figure 11 corresponds to structure M in figure 12, both producing pollen grains for fertilization.

c) i) Suggest the modes of pollination shown by the flowers represented by figures 11 and 12.

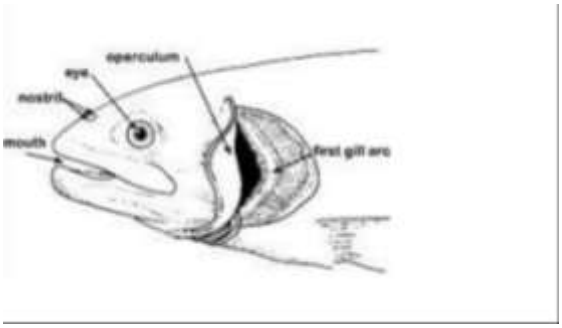
- Figure 11 suggests insect pollination (entomophily).
- Figure 12 suggests wind pollination (anemophily).

ii) Write down the adaptive features that are associated with the suggested modes of pollination in each flower.

- Insect-pollinated flowers (figure 11):
  - Have brightly colored petals to attract insects.
  - Produce nectar to lure pollinators.
  - Have sticky pollen to adhere to insect bodies.
  - Possess large, sticky stigmas to catch pollen from visiting insects.

- Wind-pollinated flowers (figure 12):
  - Have small or absent petals to allow easy movement of air.
  - Produce large amounts of lightweight pollen.
  - Have feathery stigmas to trap airborne pollen.
  - Have long, exposed anthers for easy pollen dispersal.

5. a) Draw a big well-labeled diagram of a head of a bony fish showing the structures exposed when the operculum is removed from it.



b) What is the function of those main structures beneath the operculum?

- The gills beneath the operculum facilitate gas exchange by absorbing oxygen from water and expelling carbon dioxide.
- Gill filaments increase the surface area for efficient oxygen diffusion.
- Gill rakers help filter debris and prevent food particles from clogging the gills.