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: 2000**

Instructions

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

2. Each question carries ten marks.

1. Three food solutions S_1, S_2, and S_3 were made from a sugar cane, germinating maize seeds, and maize grains, respectively. When a starch test, a reducing sugar test, and a non-reducing sugar test were carried out for each of the three solutions, the results were as shown in Table 1 below.

Type of test	Solution S_1 (sugar cane)	Solution S_2 (germinating maize seeds)	Solution S_3 (maize grains)
Starch test	Solution retained color of iodine	Solution retained color of iodine	Dark-blue color formation
Reducing sugar test	Solution retained color of Benedict's solution	Brick-red precipitate formed	Solution retained blue color of Benedict's solution
Non-reducing sugar test	Green/brown precipitate formed	Solution retained blue color of Benedict's solution	Solution retained blue color of Benedict's solution

a) From the above results, what conclusion can be drawn about the type of carbohydrates contained in solutions S_1, S_2, and S_3?

- Solution S_1 contains reducing sugars, as it retained color in the Benedict's solution but formed a precipitate in the non-reducing sugar test.
- Solution S_2 contains reducing sugars, as shown by the formation of a brick-red precipitate.
- Solution S_3 contains starch, as indicated by the dark-blue color in the starch test.

b) In a point form, write down the procedure you would follow to carry out the starch, reducing sugar, and non-reducing sugar tests on solutions S_1, S_2, and S_3.

- Starch test
  - Add iodine solution to each sample.
  - Observe for color change.
  - A blue-black color indicates the presence of starch.

- Reducing sugar test
  - Add Benedict's solution to each sample.
  - Heat the mixture in a water bath.
  - A brick-red precipitate indicates the presence of reducing sugars.

- Non-reducing sugar test
  - First, carry out the reducing sugar test.
  - If no precipitate forms, add dilute hydrochloric acid and boil.
  - Neutralize with sodium hydrogen carbonate.
  - Repeat the Benedict's test.
  - A color change indicates the presence of non-reducing sugars.

c) Give reasons to explain why there is a difference in the type of carbohydrates contained by germinating maize seeds (S_2) and maize grains (S_3).

- Germinating maize seeds contain reducing sugars because enzymes break down stored starch into simple sugars to provide energy for growth.
- Maize grains contain starch as a stored form of carbohydrate, which has not yet been broken down since the grains are not germinating.

2. Two experiments were conducted using the apparatus setups described below.

experiment I

Some soaked beans were pushed into a test tube completely filled with oil. The tube was then inverted in a dish containing oil, and the apparatus was connected as shown in Figure 1A below. A second apparatus in Figure 1B, exactly like the first, was set but using boiled soaked beans.

The above experiment was left to stand for 24 hours.

experiment II

Some unboiled soaked bean seeds and boiled soaked bean seeds were washed in 10 percent formalin and then placed in two vacuum flasks labeled C and D, respectively. A thermometer was fitted into each of the flasks, as shown in Figure 2 below. The experiment was left to stand for 3 days.

a) i) Name a biological process which was being investigated in experiments I and II.

The biological process being investigated was respiration.

ii) What is the importance of this process to living organisms?

- It provides energy for metabolic activities.
- It enables growth and repair of tissues.
- It allows organisms to maintain body functions and movement.

b) i) Suggest the aim of each experiment.

- experiment I: To investigate oxygen consumption during respiration.
- experiment II: To investigate heat production during respiration.

ii) Which of the two sets of apparatus in Figures 1 and 2 is a control experiment?

- experiment I: The boiled beans act as the control setup.
- experiment II: The boiled beans in flask D act as the control.

c) Write down the possible observations made at the end of each experiment and explain them.

- experiment I
  - In the test tube with unboiled beans, oxygen is consumed, creating a vacuum that pulls oil up the tube.
  - In the test tube with boiled beans, no oxygen is consumed, and the oil level remains unchanged.

- experiment II
  - In flask C with unboiled beans, the temperature increases due to heat produced by respiration.
  - In flask D with boiled beans, the temperature remains constant as no respiration occurs.

d) i) Why were the seeds in experiment II washed in 10 percent formalin?

The seeds were washed in 10 percent formalin to kill any microorganisms that might contribute to heat production, ensuring that only the beans' respiration is measured.

ii) Why were vacuum flasks used instead of ordinary flasks?

Vacuum flasks were used to prevent heat loss to the surroundings, ensuring accurate measurement of heat produced by respiration.

iii) Why do you think the flasks were set upside down?

The flasks were set upside down to prevent condensation from interfering with the experiment by ensuring uniform temperature distribution.

iv) Draw conclusions for the two experiments.

- experiment I: Living beans consume oxygen during respiration.
- experiment II: Respiration in living seeds produces heat, confirming that it is an exothermic process.

3. Study the organisms represented by figures 3, 4, 5, and 6.

a) Identify the organisms in figures 3 to 6 by their common names.

- Figure 3: Praying mantis
- Figure 4: Octopus
- Figure 5: Mushroom
- Figure 6: Crocodile

b) i) Name the phylum to which each organism belongs.

- Praying mantis: Phylum Arthropoda

- Octopus: Phylum Mollusca
- Mushroom: Phylum Basidiomycota (Fungi Kingdom)
- Crocodile: Phylum Chordata

ii) Give two distinguishing characteristics of the classes to which organisms in figures 3 and 6 belong.

- Praying mantis (Class Insecta)
  - Has three body segments (head, thorax, and abdomen)
  - Possesses jointed legs and an exoskeleton

- Crocodile (Class Reptilia)
  - Has dry, scaly skin
  - Is cold-blooded and breathes through lungs

c) i) State the mode of nutrition for the organism in figure 5.

The mushroom exhibits saprophytic nutrition, obtaining nutrients by decomposing organic matter.

ii) State the habitats of the organisms in figures 4 and 6.

- Octopus (Figure 4): Aquatic (marine environment)
- Crocodile (Figure 6): Semi-aquatic (lives in both water and land)

4. Figures 7, 8, 9, and 10 below represent different types of fruits.

a) i) Identify the above fruits (figures 7 – 10) by their common names.

- Figure 7: Apple
- Figure 8: Pineapple
- Figure 9: Maize
- Figure 10: Pea pod

ii) Which fruit is a caryopsis and which one is a drupe?

- Caryopsis: Maize
- Drupe: Apple

b) i) Which one of the four fruits is a false fleshy fruit?

The apple is a false fleshy fruit.

ii) Which part of the original flower is the fleshy part of the fruit you have named in 4(b)(i) formed from?

The fleshy part of the apple is formed from the receptacle of the flower.

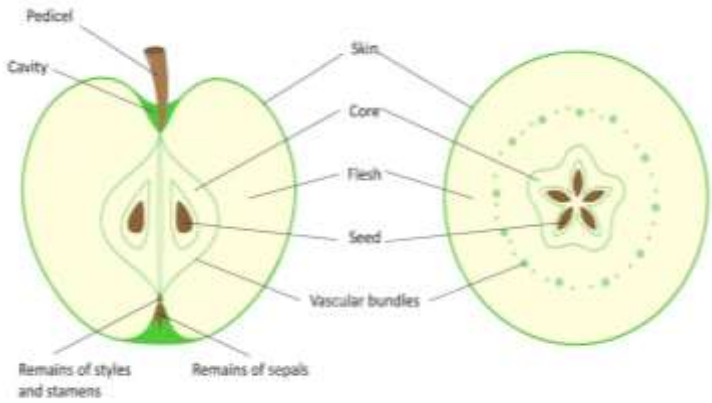
c) i) How is the seed of the fruit in figure 7 dispersed?

The apple seed is dispersed by animals (endozoochory).

ii) How is the fruit adapted for this kind of dispersal?

- The fruit is sweet and fleshy, attracting animals to eat it.
- The seeds have a hard coat to resist digestion and pass through the animal's digestive tract unharmed.

d) Draw large labeled diagrams of longitudinal sections of the fruits represented by figures 7 and 8.



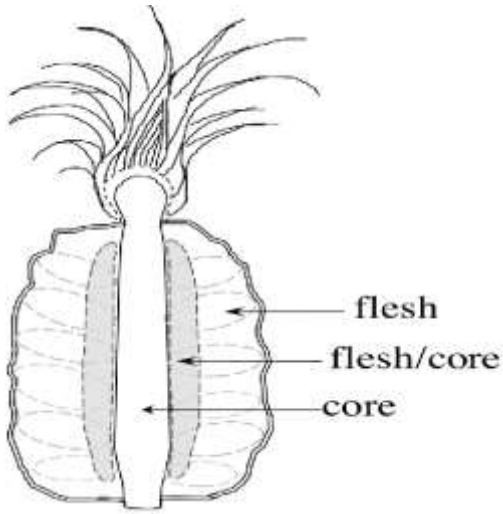


figure 8: