THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

133/3 **BIOLOGY 3**

(ACTUAL PRACTICAL)

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 1993**

Instructions

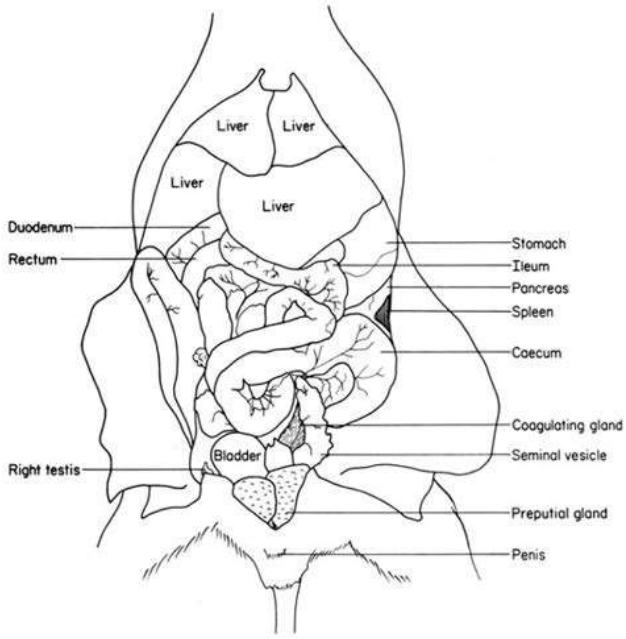
1. This paper consists of three questions.

2. Answer all questions.

1. Dissect specimen S_1 to display the contents of the abdominal cavity. To be able to display clearly the various structures of your dissection:

(i) remove all the fat if present
(ii) move the bulk of the intestines to your right
(iii) rearrange the parts so that they can be seen easily by tearing the mesentery holding them but taking care not to damage the blood vessels.

(a) Make a large drawing of your dissection.



(b) Label the following structures on your drawing:
pancreas
pancreatic duct
duodenum
ileum
hepatic portal vein
bile duct
stomach
colon
liver
caecum

LEAVE YOUR DISSECTION PROPERLY DISPLAYED FOR ASSESSMENT AFTER THE EXAMINATION.

2. You have been provided with specimen S_2. Using the apparatus and reagents provided, carry out food tests to identify the food substances present in S_2. Leaving out the details of the procedure, copy the table

(Table 1) in your answer book. Follow the procedure for each step and record the observation and inference.

(a) Table 1

Step	Procedure	Observation	Inference
1	Add a drop of iodine solution to 2 drops of S_2 on a white tile.	Blue-black color appears	Starch is present
2	Boil 3 cm^3 of S_2 in a water bath with Benedict's solution.	Brick-red precipitate forms	Reducing sugar is present
3	Boil 3 cm^3 of S_2 with 2 cm^3 of dilute hydrochloric acid. Cool and neutralize with sodium hydroxide, then add Benedict's solution and warm.	Brick-red precipitate forms	Non-reducing sugar is present

3. (a) Discuss the structure and function of the epithelial tissue in plants and animals. Illustrate your answer.

In animals, epithelial tissue covers body surfaces, lines cavities, and forms glands. It may be squamous (flat), cuboidal, columnar, or ciliated, depending on the location and function. Functions include protection, absorption, secretion, and sensation.
In plants, epidermal tissue acts as a protective outer layer, prevents water loss, and may contain stomata for gas exchange and guard cells. Illustration may show human skin cross-section and a leaf epidermis with stomata.

4. (a) Explain why the spermatophytes are often referred to as the higher plants.

They possess well-developed vascular tissues, true roots, stems, and leaves, and reproduce via seeds, allowing for wide dispersal and protection of embryos.

(b) (i) What is the economic importance of gymnosperms?

Gymnosperms provide timber, resins, turpentine, and are used in paper production. Some are used ornamentally and in traditional medicine.

(ii) What do you understand by the term exoskeleton?
Outline the advantages and disadvantages of exoskeleton in arthropods.
How are these disadvantages overcome?

An exoskeleton is a rigid outer covering that provides protection and support.

Advantages: Protection against predators, support for muscles, and water retention.
Disadvantages: Limits growth, requires molting which is risky, and restricts movement.
Disadvantages are overcome by periodic molting (ecdysis) and development of joints for flexibility.

(c) In what ways are insects harmful to man?

They transmit diseases (e.g., malaria by mosquitoes), damage crops, act as pests in stored foods, and cause allergic reactions.

5. (a) In what ways are carbohydrates important in the metabolism and structure of plants?

Carbohydrates store energy (e.g., starch), are structural components (e.g., cellulose), and provide raw materials for synthesis of other compounds.

(b) Listing examples, discuss the main adaptations of parasites.

Parasites like tapeworms have hooks/suckers, reduced digestive systems, produce many eggs, and have thick cuticles to resist host enzymes. Malarial parasites have complex life cycles and antigenic variation.

(c) Describe the various ways in which a terrestrial mammal such as a rat reduces heat loss in a cold environment.

It has dense fur for insulation, reduced surface area to volume ratio, huddling behavior, and fat layers for insulation.

6. A geneticist who was verifying Mendel's First and Second laws of inheritance crossed a pure-breeding red-flowered plant (RR) with a pure-breeding white-flowered plant (rr). All F_1 plants had pink flowers. When the F_1 plants were self-pollinated, the F_2 generation gave the following:
1290 plants with red flowers
2570 plants with pink flowers
1290 plants with white flowers

(a) Illustrating, using symbols, the crosses made and the results obtained in the experiment described above.

P: RR x rr
F_1: Rr (all pink)
F_2: Rr x Rr → RR (Red): Rr (Pink): rr (White) → 1:2:1 ratio
Red = 1290
Pink = 2570
White = 1290

(b) (i) What name given to the mode of inheritance of flower colour exhibited in the above experiment?

Incomplete dominance

(ii) How do the above observations differ from the results of Mendel's work which led him to formulate the 1st and 2nd laws of inheritance?

Mendel observed complete dominance where one trait masks another, not blending or intermediate forms like pink flowers.

(c) Describe the genetical test you would carry out to prove whether or not the appearance of pink flower colour in the above experiment is a true deviation from Mendel's principles of inheritance.

A test cross: Cross the pink-flowered plant (Rr) with white (rr).
Expected results: 1 pink : 1 white if inheritance is incomplete dominance.

8. (a) Discuss the role of the following in an ecosystem:
(i) Primary producers – Convert solar energy to chemical energy via photosynthesis and form the base of the food chain.
(ii) Decomposers – Break down dead organisms and recycle nutrients into the ecosystem.

(b) Briefly discuss any four activities of man that pollute the air and outline four measures which may be used to prevent further pollution.

Activities: Burning fossil fuels, industrial emissions, deforestation, use of aerosols.
Prevention: Use clean energy, enforce emission laws, plant trees, promote public transport.

9. (a) Using the theory of evolution as proposed by Jean Baptiste Lamarck, explain how ducks have developed webbed feet.

Lamarck's theory suggests ducks stretched their feet when swimming, and this acquired trait was passed on to offspring, leading to webbed feet over generations.

(b) (i) How did Charles Darwin, with his theory of natural selection, explain the evolution of webbed feet in ducks?

Ducks with slight webbing swam better and survived more, passed their genes, increasing frequency of webbed feet in population.

(ii) Mention the major areas of:
I. Darwin's theory of evolution – Natural selection, variation, survival of the fittest, and inheritance.
II. Darwin's theories of evolution – Adaptation to environment, gradual change, common ancestry, descent with modification.