THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

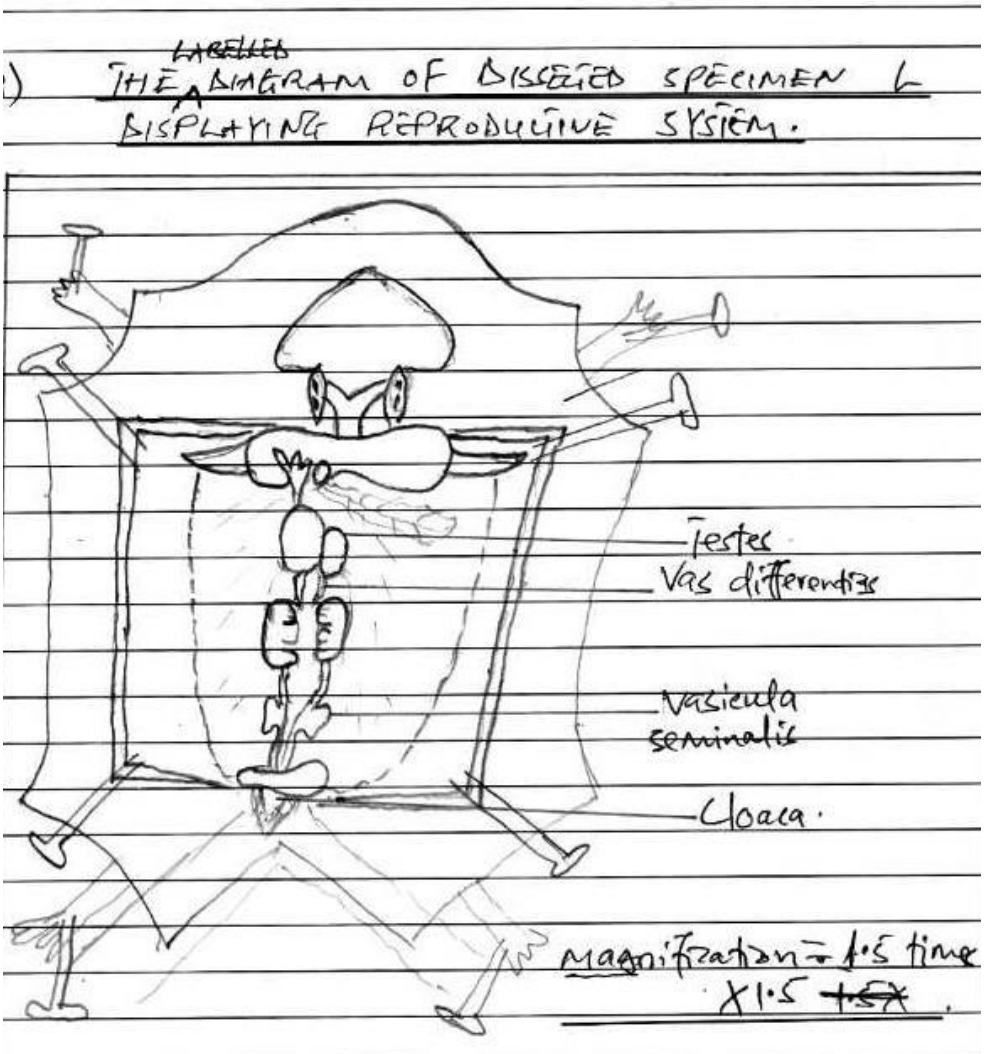
Time: 3 Hour. **ANSWERS** **Year: 2002**

Instructions

1. This paper has three papers.
2. Answer **all** questions.
3. Question **1** contains 30 marks while question 2 and 3 have 10 marks each.
4. Mobile phones are not allowed inside the examination room.
5. Write your Examination Number on every page of your answer booklet.

1. Dissect the provided specimen V (a male rat) in the usual way to display both reproductive and digestive systems.

(a) Draw the dissected specimen and label five parts of the digestive system and two parts of the reproductive system.



(b) Identify three organs associated with food digestion.

The stomach is responsible for mechanical breakdown of food and chemical digestion through gastric juices, including hydrochloric acid and pepsin.

The small intestine is the main site for enzymatic digestion and nutrient absorption. It receives bile and pancreatic juice which facilitate digestion of fats, proteins, and carbohydrates.

The caecum plays a role in fermentation and partial digestion of fibrous materials, especially in herbivorous rodents. It contains symbiotic microorganisms that assist in breaking down cellulose.

(c) Give one observable difference between male and female specimen V.

The male rat has visible testes located in the scrotal sac external to the abdominal cavity, while the female lacks these and instead has a uterus and ovaries internally located.

2. You are provided with specimen Y (Liver). Perform the following:

(i) Cut into pieces and grind with sand.
(ii) Divide into two test tubes: test tube 1 and test tube 2.
(iii) Add H_2O_2 to both tubes.
(iv) Boil the contents in test tube 2 before adding hydrogen peroxide.
(v) Observe reaction and test for gas with a glowing splint.

(a) What was the purpose of this experiment?

The purpose was to demonstrate the presence and activity of catalase enzyme in the liver tissue and to observe how heat affects enzyme activity.

(b) Why was sand used when grinding?

Sand helps break cell walls and tissues more effectively during grinding, thereby releasing more enzymes from the liver for reaction.

(c) What were the observations in each test tube? Give reasons.

In test tube 1, there was vigorous bubbling upon addition of hydrogen peroxide, due to active catalase breaking down the hydrogen peroxide into water and oxygen.

In test tube 2, which was boiled, there was little or no bubbling because high temperatures denatured the catalase enzyme, making it inactive and unable to catalyze the reaction.

(d) Identify the active component in specimen Y responsible for the reaction.

The enzyme catalase is responsible for breaking down hydrogen peroxide into water and oxygen gas.

(e) Write the chemical equation of the reaction.

$$2H_2O_2 \rightarrow 2H_2O + O_2$$

(f) Name the gas evolved and explain how it was confirmed.

The gas is oxygen. It was confirmed by inserting a glowing splint into the test tube, which relit due to the presence of oxygen gas that supports combustion.

(g) What conclusion can you draw from this investigation?

Catalase is present in the liver and actively breaks down hydrogen peroxide. However, enzyme activity is destroyed by heat, as seen when boiling denatures the enzyme and stops the reaction.

3. Observe specimens A (Millipede), B (Centipede), and C (Spider). Then answer:

(a) State three differences between specimen A and B.

The millipede has two pairs of legs per body segment, while the centipede has only one pair per segment.

Millipedes move slowly and coil when threatened, whereas centipedes are fast-moving and usually aggressive.

Millipedes have cylindrical bodies, while centipedes have flattened bodies.

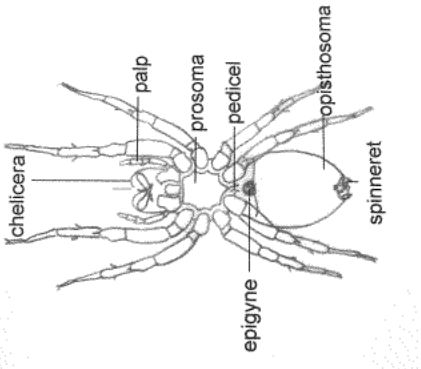
(b) How is specimen C adapted to capturing prey? Give three points.

The spider has chelicerae (fangs) that inject venom into prey, paralyzing or killing it before feeding.

It spins webs using spinnerets located at the posterior end, which help trap flying or crawling insects.

The spider has multiple eyes for detecting movement, and sensory hairs on legs to detect vibrations from trapped prey.

(c) Draw specimen C and label four parts.



(d) Name three structural features placing all three specimens under Arthropoda.

They all have segmented bodies divided into distinct regions.

Each has jointed appendages such as legs and antennae.

They possess a hard external skeleton (exoskeleton) made of chitin for protection and muscle attachment.