THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

133/3A **BIOLOGY 3A**

(ACTUAL PRACTICAL A)

(For Both School and Private Candidates)

Time: 2:30 Hours **ANSWERS** **Year: 2023**

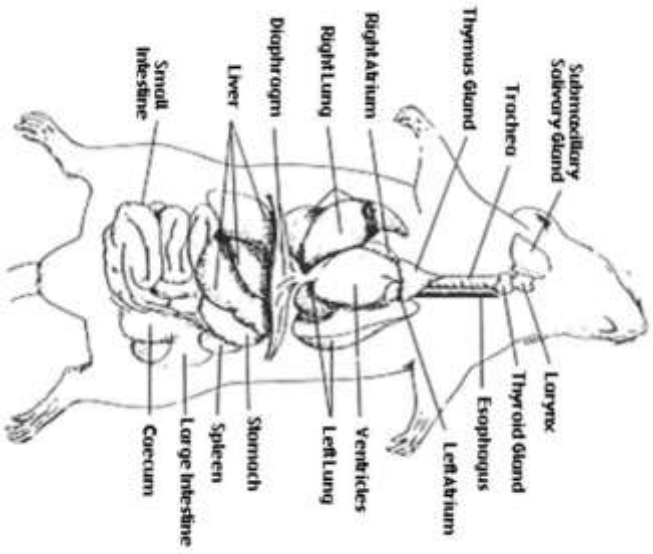
Instructions

1. This paper consists of three questions.

2. Answer all questions.

1. You have been provided with specimen B. Dissect the specimen in a usual way to fully display the digestive system.

(a) Draw a large diagram of your dissection and label ten parts.
Leave your dissection properly displayed for assessment.



(b) Explain five adaptations of the digestive system to its role in specimen B.

The oesophagus is muscular and capable of peristalsis, allowing smooth transport of food.
The stomach is large with strong muscles and acidic secretions for breaking down food.
The small intestine is long with villi to increase surface area for absorption.
The liver produces bile which helps in the emulsification of fats, aiding digestion.
The large intestine reabsorbs water and forms feces for elimination, conserving body water.
(c)(i) Identify two structures of digestive system which are more developed in specimen B than in human being.

Caecum
Incisors

(ii) What effects will specimen B face if the structures you mentioned at 1(c)(i) will fail to function normally?

Without a functional caecum, cellulose digestion would be inefficient, leading to reduced energy from fibrous food.
Failure of incisors would hinder effective gnawing or cutting of food, leading to feeding difficulty and poor digestion.

2. You are provided with solution Q. Carry out the experiments in item (i) – (v), then answer the questions that follow:

(i) Take three test tubes and label them as test tube A, B and C.
(ii) Put 2 ml of the solution Q to each of the test tubes A, B and C.
(iii) Add 2 ml of dilute hydrochloric acid to test tube A and warm the mixture. Then add 4 ml of Benedict's solution and observe the changes.
(iv) Add 2 ml of dilute hydrochloric acid to test tube B and warm the mixture. Then add 3 ml of sodium hydroxide solution followed by 4 ml of Benedict's solution and observe the changes.
(v) Warm the solution contained in test tube C, then add 2 ml of Benedict's solution and observe the changes.

Questions
(a) Present your observations in experiments (iii) – (v) as shown in Table 1.

Table 1
Experiment (iii): Solution remains blue or slightly changes due to presence of unhydrolyzed substance.
Experiment (iv): Brick-red precipitate forms, indicating presence of reducing sugars after hydrolysis and neutralization.
Experiment (v): No significant color change, or remains blue, due to absence of reducing sugars.

(b) Name the type of food substance contained in solution Q.

Non-reducing sugar (e.g. sucrose)

(c) Why the experiments (iii) – (v) provided different results on Benedict's test? Give two reasons for each.

In (iii), the solution was acidic but not neutralized, so Benedict's test was not effective due to acidic pH.
In (iv), the solution was first hydrolyzed by acid, then neutralized with alkali, allowing reducing sugars to form and be detected.
In (v), the non-reducing sugar was not hydrolyzed, so no reducing sugar was present to react with Benedict's reagent.

(d) Briefly explain how the following factors affect enzyme activity in experiment (iv):
(i) Temperature
Increased temperature raises enzyme activity up to optimum level, beyond which enzymes denature and lose function.

(ii) pH
Each enzyme has an optimal pH; deviation from this pH affects the shape of the active site, reducing efficiency or denaturing the enzyme.
3. You have been provided with specimens P_1, P_2, P_3, P_4 and P_5. Observe the specimens carefully then, answer the following questions:

(a) Why were specimens P_1, P_2, P_3, P_4 and P_5 formally placed in the same Phylum? Give two reasons.

They all have jointed appendages.
They all possess exoskeleton made of chitin.

(b) Use the following classification key to identify the specimens P_1, P_2, P_3, P_4 and P_5:

1a Wings present – Go to 2
1b Wings absent – Go to 3
2a Outer wings are soft – Likely P_4 (but confirm with image)
2b Outer wings are harder – Likely P_3 (beetle-type insect)
3a Have numerous similar limbs – Likely P_2 (centipede/millipede)
3b Similar limbs absent – Go to 4
4a The first appendage bear prehensile chelicerae – Likely P_5 (spider or scorpion)
4b The first appendage serves as jaw – Likely P_1 (crustacean)

(c) Identify the structures concerned with gaseous exchange in each of the specimens P_1, P_2, P_3, P_4 and P_5.
P_1 – Gills
P_2 – Spiracles and tracheae
P_3 – Spiracles and tracheae
P_4 – Spiracles and tracheae
P_5 – Book lungs or tracheae
(d) Outline two common adaptation features for the structures you named in 3(c).

They have large surface area to increase gas exchange.
They are thin and moist to allow easy diffusion of gases.

(e) Draw a large, neat and well labeled diagram of specimen P_1.