THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

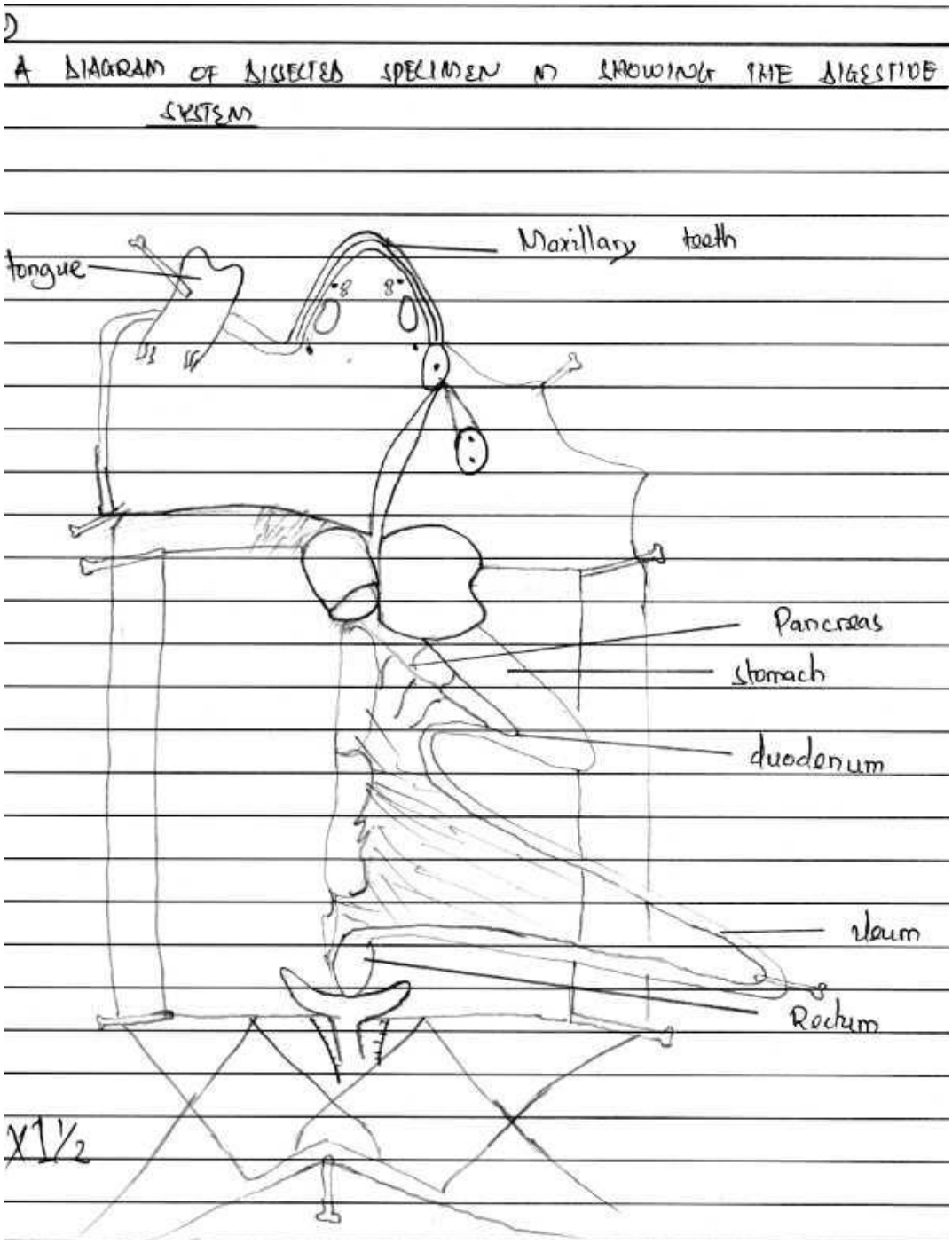
Time: 3 Hour. **ANSWERS** **Year: 2020**

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 labelled Q (a male or female frog) to display the digestive system.
(a) Draw a well-labelled diagram of the dissected specimen showing six parts of the digestive system.

This should be done practically. Six parts to be labelled may include: oesophagus, stomach, small intestine, liver, pancreas, and large intestine.



(b) Identify the organ responsible for:
(i) Producing bile

The liver is responsible for producing bile in the frog. It is a large, dark organ located in the upper part of the abdominal cavity. Bile aids in the emulsification of fats during digestion.

(ii) Absorbing digested nutrients

The small intestine is responsible for absorbing digested nutrients. It is a long, coiled tube where enzymatic digestion continues, and the end products of digestion are absorbed into the bloodstream.

(iii) Connecting the mouth and stomach

The oesophagus connects the mouth to the stomach. It is a short, muscular tube that transports food from the buccal cavity to the stomach through peristaltic movement.

(c) Does specimen Q have a gall bladder? Explain your answer.

Yes, specimen Q (frog) has a gall bladder. It is a small, greenish sac located beneath the liver. The gall bladder stores bile produced by the liver and releases it into the small intestine to aid in fat digestion when needed.

2. You are given specimen S, suspected to contain catalase enzyme. Carry out the following:
(a) Crush half of specimen S and place it into test tube A.
(b) Put the other half uncrushed into test tube B.
(c) Add 2 ml of hydrogen peroxide into both tubes.
(d) Observe and test the gas released using a glowing splint.

(i) What is the aim of this experiment?

The aim of this experiment is to demonstrate the presence and activity of the enzyme catalase in specimen S by observing its reaction with hydrogen peroxide and comparing results between crushed and uncrushed samples.

(ii) Which test tube is the control?

Test tube B is the control. It contains the uncrushed specimen, which limits enzyme exposure and allows for a comparison with the crushed sample in test tube A to assess the effect of increased surface area.

(iii) What did you observe in each test tube? Explain the reason for the observation.

In test tube A, brisk bubbling or frothing was observed. This is due to the crushed specimen exposing more catalase enzyme, which breaks down hydrogen peroxide into water and oxygen.

In test tube B, there was little or no bubbling because the uncrushed specimen had less surface area exposed, limiting the contact between hydrogen peroxide and catalase enzyme.

(iv) Name the enzyme involved and write the chemical equation for the reaction.

The enzyme involved is catalase.
The chemical equation for the reaction is:
$2H_2O_2 \rightarrow 2H_2O + O_2$

(v) What gas was released? Give two deductions.

The gas released was oxygen. This was confirmed by using a glowing splint, which relit when inserted into the test tube.

This experiment confirms that catalase is present in living tissues and is capable of decomposing hydrogen peroxide into water and oxygen.

The reaction rate increases when tissues are crushed, showing that more enzyme surface area enhances enzymatic activity.

3. Observe specimens T (Dragonfly), U (Beetle), and V (Spider).
(a) List four observable features shared by specimens T and U.

Specimens T and U both have three distinct body parts: head, thorax, and abdomen, which is characteristic of insects.

They each possess one pair of antennae used for sensing their environment.

They have compound eyes, allowing them to detect movement and light from multiple directions.

Both specimens have three pairs of jointed legs attached to the thorax, which is a key feature of insects.

(b) Differentiate between specimen V and U using three features.

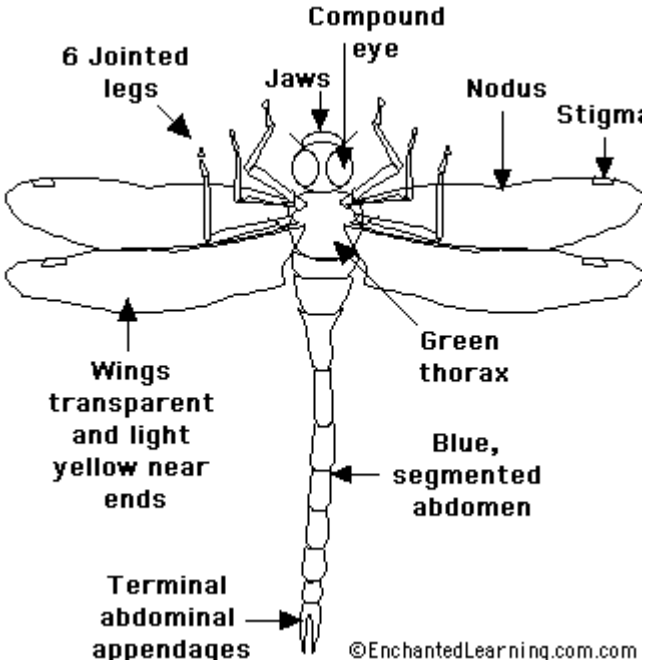
Specimen V (spider) has two main body parts: cephalothorax and abdomen, while specimen U (beetle) has three body parts.

Specimen V has four pairs of legs, while specimen U has three pairs, indicating that the spider belongs to class Arachnida and the beetle to class Insecta.

Specimen V lacks antennae, while specimen U has one pair of antennae on its head.

(c) Draw specimen T and label five parts.

This should be done practically. Five labelable parts include: head, thorax, abdomen, wings, and compound eye.



(d) Mention two economic importance of specimen U.

Beetles play a role in pollination of crops and plants, thereby aiding in reproduction of flowering plants and increasing agricultural productivity.

Some beetles help in decomposition by breaking down dead organic matter, enriching the soil and aiding nutrient recycling in ecosystems.