THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL

DIPLOMA IN SECONDARY EDUCATION EXAMINATION

733/2B **BIOLOGY 2B**

Time: 3 Hour. **ANSWERS** **Year: 2016**

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 specimen U (a rat or guinea pig) to expose the digestive system.
(a) Draw a labelled diagram showing six parts of the digestive system.

This should be done practically. The diagram should include labelled parts such as the mouth, oesophagus, stomach, small intestine, large intestine, and rectum or anus.

(b) Identify organs responsible for:
(i) Transferring food from mouth to stomach
The oesophagus is responsible for transporting food from the mouth to the stomach using peristaltic movements. It is a muscular tube located behind the trachea that serves as a passageway during digestion.

(ii) Production of ptyalin
The salivary glands produce ptyalin (also known as salivary amylase). This enzyme initiates the breakdown of starch into maltose while the food is still in the mouth.

(iii) Bile secretion
The liver is the organ responsible for secreting bile. Although bile is stored in the gall bladder, its production takes place in the liver and helps emulsify fats during digestion.

(c) Is a gall bladder present in specimen U? Justify your answer.
Yes, a gall bladder is present in most rats but absent in some rodents like guinea pigs. If the specimen is a rat, a small sac-like gall bladder would be found underneath the liver. It stores and concentrates bile before releasing it into the small intestine. If it's a guinea pig, the gall bladder would be absent, and bile flows directly from the liver to the duodenum.

2. You are provided with specimen N. Carry out the following experiment:
(a) Cut specimen N into two. Grind one half and place into test tube A.
(b) Put the other half whole into test tube B.
(c) Add 2 ml of 2% hydrogen peroxide into both tubes. Observe and test for gas using a glowing splint.

Questions:
(i) What is the aim of this experiment?
The aim is to investigate the presence of the catalase enzyme in specimen N and observe its role in the breakdown of hydrogen peroxide into water and oxygen.

(ii) Which test tube serves as control?
Test tube B, which contains the unground specimen, acts as the control. It serves to show the difference in enzyme activity when cells are not broken open.

(iii) What are your observations and explanations in both tubes?
In test tube A, there is rapid bubbling and a glowing splint reignites, indicating oxygen gas release due to catalase action. Grinding released more enzyme, increasing the reaction rate.

In test tube B, less or no bubbling is observed because the catalase remains mostly trapped in intact cells, reducing the reaction with hydrogen peroxide.

(iv) Name the enzyme responsible and the evolved gas.
The enzyme is catalase. The gas evolved is oxygen, which rekindles a glowing splint during the test.

(v) Write the chemical equation and give two deductions from this experiment.
The chemical equation is:
$2H_2O_2 \rightarrow 2H_2O + O_2$ (catalysed by catalase)

One deduction is that specimen N contains catalase, which accelerates the breakdown of hydrogen peroxide.
Another deduction is that grinding the tissue increases enzyme accessibility and enhances the rate of reaction.

3. Observe specimens H (Grasshopper), I (Cockroach), J (Butterfly), K (Spider), and L (Animal skin).
(a) State five observable features shared by specimens H and J.
Both have a body divided into three segments: head, thorax, and abdomen.
They each possess compound eyes that are adapted for wide visual fields.
Each has a pair of antennae for sensing the environment.
They both have three pairs of jointed legs attached to the thorax.
Wings are present in both specimens, with the butterfly typically having two pairs of membranous wings and the grasshopper having forewings and hindwings.

(b) How is specimen L useful in industries? Give four ways.
Animal skin is used in the leather industry to produce shoes, belts, bags, and jackets.
It is also processed to create industrial gloves and protective gear for workers.
Certain animal skins, such as sheepskin, are used for upholstery and fine garments.
Additionally, animal hides can be a source of gelatin and collagen used in food, cosmetics, and pharmaceuticals.

(c) Observe the lower side of specimen K.
(i) Identify any structures present.
On the lower side of the spider (specimen K), spinnerets are visible. These are small, finger-like projections at the rear of the abdomen.

(ii) State their function.
Spinnerets produce silk used to spin webs, build egg sacs, create draglines for movement, or wrap prey.

(d) Give three observable features placing specimens H, I, and J into one phylum.
They all have segmented bodies with bilateral symmetry.
Each possesses an exoskeleton made of chitin.
All three have jointed appendages, which is a characteristic feature of Arthropoda.