THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

034/2 AGRICULTURE 2

Time : 3 Hours ANSWERS Year : 2023

Instructions

1. This paper consists of two questions.
2. Answer **all** questions.
3. Communication devices and any unauthorised materials are **not** allowed in the examination room.
4. Write your **Examination Number** on every page of your answer booklet(s).

1. You are provided with parts of goat digestive system labeled W, X, Y and Z. Perform the following procedures then answer the questions that follow:

Procedures

(i) Wear the hand gloves.

(ii) With the aid of a hand lens and scalpel, carefully observe the inner linings of the labeled parts.

Questions

(a) Giving the characteristic feature, identify each of the parts W, Y and Z.

Part W is the rumen, which is identified by its thick muscular wall and presence of numerous microorganisms for fermentation.

Part Y is the omasum, characterized by many thin muscular leaves or folds that increase surface area for absorption of water and minerals.

Part Z is the abomasum, the true stomach with glandular linings that secrete gastric juices like pepsin and hydrochloric acid.

(b) (i) Why is part W known as a hardware stomach?

Part W is known as a hardware stomach because it is the largest compartment where food first enters and contains strong muscles that churn and mix the feed with microorganisms for fermentation.

(ii) Apart from its role in part (b)(i), what is the function of part W?

Apart from fermentation, part W serves as a storage chamber for ingested food, allowing microbial digestion of cellulose to occur before regurgitation.

(iii) Give the adaptation of part W to its function in part (b)(ii).

Part W is adapted with a large volume and a well-developed muscular wall to allow storage of large amounts of feed and to facilitate mixing during fermentation.

(c) Why is part X considered to be a true stomach? Give a reason.

Part X is considered a true stomach because it contains gastric glands that secrete hydrochloric acid and enzymes, which chemically digest proteins, just like in non-ruminant animals.

(d) Examine three functions and three adaptations of part Y to its functions.

One function of part Y is to absorb water from the digested feed to make the ingesta semi-solid. Another function is the absorption of minerals that have been released during fermentation. A third function is the reduction of particle size by grinding food with muscular leaves.

Part Y is adapted to these functions by having numerous muscular folds that increase surface area for absorption. It also has thick muscular walls that help in grinding food particles. In addition, its small cavity allows close contact between food and absorptive surfaces.

(e) What are the three functions of part Z?

One function of part Z is the secretion of hydrochloric acid which kills harmful microorganisms. Another function is the secretion of digestive enzymes such as pepsin that break down proteins into peptides. A third function is the initial digestion of food before it passes into the small intestine for further absorption.

(f) Briefly explain the process of rumination in animals with the digestive system containing parts W, X, Y and Z.

Rumination begins when partially digested food from part W is regurgitated back into the mouth for further chewing. This process is called chewing the cud and it reduces the particle size of food. The re-chewed food is then swallowed again and passes back into part W for further fermentation. It then moves to part Y for water absorption and particle reduction, and finally to part Z where enzymatic digestion takes place.

(g) (i) Briefly describe the common health problem associated with each of part W and Y.

In part W, a common health problem is bloating, caused by excessive accumulation of gases during fermentation. In part Y, impaction may occur when the omasum becomes overloaded with dry indigestible material, leading to reduced movement of food.

(ii) How can the health problems in part (g)(i) be prevented?

Bloating in part W can be prevented by avoiding excessive feeding on highly fermentable feeds and by allowing access to roughage. Impaction in part Y can be prevented by providing adequate water and avoiding feeding the animal on too much dry fibrous material.

2. (a) You are provided with the following: 100 cm^3 dry sand soil, 500 cm^3 measuring cylinder, 100 cm^3 beaker and 200 cm^3 water. Use them to design and carry out experiment to verify that the soil contains air and write a report for your experiment.

To verify that soil contains air, first measure 100 cm^3 of dry sand soil using the 100 cm^3 beaker and pour it into the 500 cm^3 measuring cylinder. Then, measure 200 cm^3 of clean water and slowly add it into the measuring cylinder containing the sand soil. As the water enters the soil, air bubbles are observed rising to the surface of the water. These bubbles indicate that the spaces between soil particles were initially filled with air, which is displaced by the water.

The aim of the experiment is to show that soil contains air in its pores. The apparatus used are a beaker, measuring cylinder, dry sand soil, and water. The procedure involves measuring soil, adding water, and observing the rising bubbles. The observation is that bubbles appear as water penetrates the soil. The conclusion is that the presence of bubbles proves that soil contains air trapped between its particles, which is essential for supporting plant root respiration and soil organisms.

(b) You are provided with specimens P and Q suspected with plant diseases. Using a hand lens, make careful examination on the specimens then answer the following questions:

(i) Point out the characteristic symptoms and the disease affecting each of the specimens P and Q.

Specimen P shows yellowing of leaves and stunted growth, which are symptoms of mosaic disease. The affected leaves may also show mottled light and dark green patches. Specimen Q shows powdery whitish patches on the surface of leaves and stems, which are symptoms of powdery mildew disease. The disease causes the leaves to wither and reduces the plant's ability to photosynthesize.

(ii) What is the causative agent of the disease affecting specimen P and Q?

The causative agent of the disease affecting specimen P is a virus, specifically the tobacco mosaic virus or a related plant virus. The causative agent of the disease affecting specimen Q is a fungus, specifically powdery mildew fungi such as Erysiphe species.

(iii) Suggest three preventive measures for the disease affecting specimen P and four for the disease affecting specimen Q.

For specimen P, preventive measures include planting resistant crop varieties, practicing crop rotation to avoid re-infection, and controlling insect vectors such as aphids which spread viral diseases.

For specimen Q, preventive measures include pruning overcrowded plants to reduce humidity that favors fungal growth, applying fungicides to kill the fungus, removing and burning infected plant parts to prevent spread, and practicing proper spacing during planting to improve aeration.