THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL OF TANZANIA

CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

034/2 AGRICULTURE 2

Time : 3 Hours ANSWERS Year : 2024

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. (a) You are provided with specimen P. Perform the following procedures and answer the questions that follow:

Procedure

(i) Weigh an empty dry crucible.

(ii) Weigh 100 g of sample P and put it in the crucible.

(iii) Strongly heat the sample in a crucible until the sample becomes brown red in colour.

(iv) Allow the sample to cool.

(v) Weigh the sample after heating and record.

Questions

(a) What is the aim of the experiment?

The aim of the experiment is to determine the thermal stability of specimen P by observing weight changes and colour change after strong heating. It helps to identify whether the sample contains substances that decompose on heating, such as carbonates or hydrates.

(b) From the experiment, is there any significant change of weight observed in sample P before and after heating? Give a reason for your answer.

Yes, there is a significant loss of weight observed in the sample after heating. This is because on heating, specimen P decomposes and releases gases such as carbon dioxide or water vapour, leaving behind a solid residue of lower mass.

(c) Suggest two possible materials present in the sample P before heating.

Two possible materials in sample P before heating are calcium carbonate and hydrated iron(III) oxide.

(d) Give two significance of each of the materials suggested in part (c) in crop production.

Calcium carbonate neutralizes soil acidity, which improves soil pH for crop growth. It also supplies calcium, an essential nutrient for strengthening plant cell walls.

Hydrated iron(III) oxide provides iron, which is vital for chlorophyll formation in plants. It also plays an important role in enzyme activities that support respiration and photosynthesis.

(b) You are provided with specimens K, L and M.

Procedure

(i) Measure 300 cm^3 of clean lukewarm water and put it into a 500 cm^3 beaker.

(ii) Whip/break specimen K and pour it into 500 cm^3 beaker containing lukewarm water.

(iii) Add one dessert spoonful of specimen L into the beaker.

(iv) Add one dessert spoonful of specimen M into the beaker.

(v) Stir the mixture by using stirring rod.

(vi) Measure the volume of mixture obtained.

Questions

(a) From the experiment, suggest the probable volume of the mixture obtained.

The probable volume of the mixture obtained is slightly less than the expected total of 300 cm^3 plus the added specimens, due to partial dissolution and mixing of the particles in water.

(b) If a newly born calf requires 4 liters of the mixture made in 12 hours, how many times would you need to prepare the same amount of the mixture made to satisfy the requirement of the calf in 12 hours?

Since one preparation produces 0.3 liters, the number of times needed is 4 ÷ 0.3 = about 13 times.

(c) Why was lukewarm water used in the preparation of the mixture?

Lukewarm water was used because it enhances proper mixing and dissolution of specimens K, L, and M, making the mixture more digestible for the calf.

(d) Briefly explain the role of specimens K, L, and M in the mixture.

Specimen K provides carbohydrates that supply energy to the calf. Specimen L provides proteins needed for growth and body repair. Specimen M provides vitamins and minerals that boost immunity and support healthy development.

(e) Examine three importance of the mixture that formed in the procedure (b) (i) – (vi).

The mixture provides a balanced diet essential for healthy calf growth. It increases the calf's resistance against diseases by providing nutrients. It enhances faster growth and development, allowing the calf to reach maturity in good condition.

(f) Suggest the time frame for the formed substance in (e) to be used.

The formed substance should be used immediately after preparation or within a few hours, since it spoils quickly if left for long.

(g) Why the substance formed in (e) should not be used after the time frame you have suggested in part (f)?

It should not be used because after a long time it undergoes fermentation and contamination, which reduces its nutritive value and may cause digestive problems to the calf.

(h) What is the circumstance that necessitates the substance to be made?

The substance is made when natural milk from the mother cow is insufficient or unavailable. It is also necessary when the calf is separated from the mother for management reasons, hence requiring an artificial milk replacer.

2. You are provided with specimen X, table spoon, match box with match sticks, 250 cm^3 beakers, iodine solution, dropper, 50 cm^3 measuring cylinder and stirring rod. Perform the following procedures and answer the questions that follow:

Procedure for Experiment I

(i) Take a dry match box with match stick.

(ii) Dip the tip of the match stick into the specimen X.

(iii) Strike the same match stick against the rough surface of the match box and make observation.

Procedure for Experiment II

(i) Put a table spoon full of specimen X in the beaker; add 10 cm^3 of water and 3 drops of iodine solution.

(ii) Mix it well with stirring rod and make observation.

Questions

(a) What is the aim of the two experiments?

The aim of the two experiments is to test the presence and behavior of starch in specimen X, as well as to determine whether specimen X can act as a source of energy through combustion.

(b) Why is it important to carry out these two experiments?

It is important to carry out these two experiments because they help to identify the chemical composition of specimen X, confirming the presence of starch which is an important nutrient. They also help to test its flammability, which shows that the specimen is an energy-rich material that can burn when ignited.

(c) What is your observation in each of the two experiments?

In experiment I, the match stick tipped with specimen X burns easily when struck against the rough surface, showing that specimen X supports combustion. In experiment II, when iodine solution is added to specimen X mixed with water, the solution turns blue-black in colour, showing the presence of starch.

(d) Based on observations in the two experiments, what can you conclude about the status of the specimen?

The specimen contains starch and is therefore a carbohydrate-rich material. It is also combustible, which shows it is an organic substance that can serve as a source of energy.

(e) Briefly describe seven steps on how you would obtain and process the given specimen.

First, select and harvest the mature plant tubers containing specimen X from the field. Second, wash the harvested tubers thoroughly to remove soil and dirt. Third, peel off the outer covering to obtain the edible part. Fourth, cut the peeled specimen into smaller pieces to ease drying and grinding. Fifth, dry the pieces under the sun or using controlled heat to remove moisture. Sixth, grind the dried pieces into fine powder using a mill. Seventh, sieve the powder to obtain fine flour ready for use and storage.

(f) Give four significance of processing the specimen.

Processing increases the shelf life of the specimen by reducing moisture and preventing spoilage. It makes the specimen easier to transport and store since it is reduced to a more stable form like flour.

It improves the palatability of the specimen, making it suitable for various food preparations. It also enhances the nutrient availability because the processed form is easier to cook and digest.

(g) Examine four usefulness of the specimen.

The specimen is useful as a staple food that provides carbohydrates for energy to humans. It can be used as livestock feed, supplying energy to animals. It is useful in industries for making products such as starch, glue, and alcoholic beverages. It also plays a role in household food preparation, where it can be cooked in different forms such as porridge, bread, or snacks.