THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATION COUNCIL OF TANZANIA

ADVANCED CRTIFICATE OF SECONDARY EDUCATION EXAMINATION

134/3 **AGRICULTURE 3**

(For Both School and Private Candidates)

Time: 3 Hours. **ANSWER** **Year: 2023**

Instructions

1. This paper consists of **three (3)** questions.
2. Answer **two (2)** questions.
3. Cellular phones and unauthorized 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 the following specimen, apparatuses and materials: X, 100 cm^3 beaker, 100 cm^3 measuring cylinder, spatula, stirring rod, blue and red litmus paper and distilled water. Carry out procedures hereafter and answer questions that follow:
Procedures:
(i) Measure 50 cm^3 of distilled water and pour it into a beaker.
(ii) Put five spatulaful of specimen X into a beaker containing distilled water.
(iii) Stir the mixture well.
(iv) Deep each of the red and blue litmus paper into the mixture and make observation.

Questions:
(a) Record the observations in the following table:

Experiment with litmus papers	Observations
Red litmus paper	Turns blue
Blue litmus paper	Remains blue

(b) State the pH of the specimen from the result of the experiment.

The specimen has a pH greater than 7, indicating that it is alkaline.

(c) Briefly explain, in two points, the intension of farmers to use specimen X in the soil when growing cabbage in Kilimanjaro, Mbeya, Bukoba and Rungwe.

Farmers use specimen X to reduce soil acidity, since cabbage performs well in neutral to slightly alkaline soils.

Specimen X also improves the availability of nutrients like calcium and magnesium, which are important for the growth of cabbages.

(d) Why farmers living in semi desert areas are not advised to use specimen X when growing coffee crop?

Semi desert soils are already less acidic and may tend to be alkaline. Adding specimen X increases alkalinity further, leading to nutrient deficiencies such as iron and zinc in coffee.
Coffee crops prefer slightly acidic soils; therefore, adding specimen X would negatively affect crop growth and yield.

(e) Suggest by giving a reason, in reference to part (d), the suitable management practices to be adopted by farmers.

Farmers should apply organic manure instead of specimen X because it improves soil structure and fertility without raising soil alkalinity beyond the tolerance level of coffee.

(f) Give three precautions to be observed when using specimen X in the soil.

Specimen X should be applied in recommended amounts to avoid over-liming which may damage the soil.
It should be applied uniformly to ensure equal soil pH correction across the field.
Application should be done some weeks before planting to allow proper mixing and reaction with soil.

(g) Write down three functions of each of the important nutrient elements that are contained in specimen X.

Calcium strengthens plant cell walls, enhances root development, and helps in neutralizing soil acidity.
Magnesium is a central element in chlorophyll formation, helps in enzyme activation, and supports photosynthesis.
Phosphorus promotes root establishment, improves flowering and fruiting, and facilitates energy transfer in plants.

2. You are provided with experimental set up 1 and 2 with plants planted in two rows and 30 cm ruler. Perform procedures and answer questions that follow:
Procedure:
Use the ruler to measure the plant spacing between and within rows in the experimental set up 1 and 2.

Questions
(a) Record the results obtained in the stated procedure in the table provided:

Experimental set up 1	Between rows spacing 30 cm	Within rows spacing 10 cm.
Experimental set up 2	Between rows spacing 50 cm	Within rows spacing 20 cm.

(b) Calculate, by referring to the experimental set up 1, the number of plants which will be available if the farmer has established 1 ha of pastureland.
Area per plant = $0.30 \text{ m} \times 0.10 \text{ m} = 0.03 \text{ m}^2$.
Number of plants per hectare = $10{,}000 \text{ m}^2 \div 0.03 \text{ m}^2 = 333{,}333$ plants.

(c) Calculate, by referring to the experimental set up 2, the amount of viable seeds in kg that will be required to plant 1 ha of pastureland if each seed that germinates into the plant seedling weighs 0.5 g.

Area per plant = $0.50 \text{ m} \times 0.20 \text{ m} = 0.10 \text{ m}^2$.
Number of plants per hectare = $10{,}000 \text{ m}^2 \div 0.10 \text{ m}^2 = 100{,}000$ plants.
Total seed mass = $100{,}000$ seeds $\times$ 0.5 g per seed = 50,000 g = 50 kg.

(d) Briefly explain the five factors that guide farmers in deciding the spacing to be used for a certain crop.

Crop species and variety determine final plant size and canopy spread, so tall or vigorously tillering types require wider spacing than dwarf or compact types.

Soil fertility influences spacing because fertile soils support larger plants that compete strongly, therefore wider spacing reduces competition, while poor soils may use closer spacing to maximize ground cover and yield per area.

Moisture availability and climate guide spacing, since low rainfall or dry areas favor wider spacing to reduce competition for water, while reliable rainfall or irrigation allows closer spacing without causing moisture stress.

Intended field operations and mechanization affect spacing because the width must allow weeding, spraying, and harvesting equipment or animal-drawn tools to pass without damaging plants.

Purpose of production and target yield shape spacing, for example seed production often needs wider spacing for uniform seed set and aeration, while forage or grain for bulk yield may use closer spacing to close the canopy quickly and suppress weeds.

3. You are provided with specimen C with the following scenario: When fruits of specimen C began to mature, a farmer observed abnormalities in the field. Careful examination of the sample specimen by the plant pathologist indicated injuries to the roots and upon cutting the stem base and soaking it into water, a sticky, milk-white substance oozed into water.
Assuming you are a plant pathologist:
(a) Outline three observable signs of the disease in specimen C.
Sudden wilting of leaves and stems during the day even where soil moisture is adequate, followed later by permanent wilt and plant collapse.

Brown to dark discoloration of the vascular tissues at the stem base when the stem is split longitudinally, indicating blockage of water-conducting vessels.

Milky bacterial streaming from a freshly cut stem placed in clean water, visible as cloudy threads or ooze spreading from the cut surface.

(b) Identify the problem facing specimen C based on the signs and diagnostic examination observed.
Bacterial wilt disease affecting the crop.

(c) Give the scientific name of the causative agent facing specimen C.
Ralstonia solanacearum.

(d) Briefly explain to the farmer how the specimen became infected with the agent.
The bacterium survives in soil, crop residues, and water, then enters the plant through wounds or natural openings on the roots caused by cultivation, nematodes, or insect feeding.

Irrigation water, contaminated tools, and infected planting materials move the bacterium from plant to plant within the field and between fields.

Warm temperatures and high soil moisture favor bacterial multiplication in the xylem, leading to vessel blockage, wilting, and the milky ooze observed from the cut stem.