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: 2021**

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 specimens and materials: L_1, L_2, carton box, 2 battery capacity torch and a dark environment. Perform the following procedures:
   (i) Hold specimen L_1 between the thumb and fore finger.
   (ii) Using a torch, light a spotlight inside the carton box to the direction of a hole.
   (iii) Candle specimen L_1 by placing it with its large end facing the hole outside the carton box.
   (iv) Tilt specimen L_1 slightly to one side and rotate until you get the best view by looking through it to the light.
   (v) Repeat the same procedures for specimen L_2.

Questions

(a) Give the aim of the experiment.
The aim of the experiment is to determine the viability and developmental status of embryos in fertilized eggs through candling.

(b) Briefly describe the process involved in the experiment.
The process involves shining light through the egg in a dark environment while gently rotating it to observe the internal structures, embryo growth, air cell size, and any abnormalities in the yolk or albumen.

(c) Comment on the status of each of the specimen L_1 and L_2, giving two signs in each case to justify the status of the specimens.
Specimen L_1 shows a visible network of blood vessels and a developing embryo, indicating a viable fertile egg.
Specimen L_2 shows a clear interior with no signs of blood vessels or embryo, and the yolk floats freely, indicating an infertile or non-developing egg.

(d) Give three factors to be considered for the specimen that has passed the test not to suit the purpose of the experiment.
The egg must not be cracked or have a thin shell that can easily break.
The embryo should not show signs of abnormal development or stunted growth.
The air cell should be of appropriate size; too large indicates loss of viability.

(e) Briefly explain why yolkers and quitters cannot be winner specimens in the experiment.
Yolkers are infertile eggs with no embryo formation, so they cannot hatch. Quitters are eggs in which embryo development started but died prematurely, making them unfit for hatching.

(f) Account for the five necessary conditions for artificially developing the winner specimens in the experiment.
Constant incubation temperature of about 37–39°C must be maintained for proper embryo development.
Relative humidity must be controlled to prevent excessive moisture loss or retention.
Eggs must be turned regularly to avoid embryo adhesion to the shell membranes.
Adequate ventilation is necessary for oxygen supply and removal of carbon dioxide.
Sanitation and biosecurity must be observed to prevent contamination and spread of pathogens to developing embryos.

2. You are provided with the following specimens and materials: S_1, S_2, pH colour chart, pH colour indicator/dye, barium sulphate powder, test tubes, test tube rack, corks, dropper, spatula, beaker, distilled water, weighing balance and a wall clock. Perform the following procedures and answer the questions that follow:
   (i) Measure about 5 g for each of specimen S_1 and specimen S_2.
   (ii) Put the measured specimen S_1 and specimen S_2 into separate test tubes.
   (iii) Using spatula, add barium sulphate powder and mix it well with both specimen S_1 and specimen S_2.
   (iv) Add distilled water and few drops of pH colour indicator/dye to the mixture of both specimen S_1 and specimen S_2.
   (v) Cork the test tubes and shake the mixture vigorously to ensure thorough mixing.
   (vi) Allow the content to stand for 45 minutes.
   (vii) Observe the clear area formed in the middle of the test tubes.
   (viii) Match the colour of the solution with that of colour chart and record the pH value.

Questions
(a) Give the values and names of the pH range in each of the specimen S_1 and S_2.
Specimen S_1 shows a pH of 6, which is slightly acidic.
Specimen S_2 shows a pH of 8, which is moderately alkaline.

(b) Assess the significance of conducting the experimental test in crop production.
The test helps farmers determine soil reaction and select suitable crops for maximum yields.
It also guides in deciding whether liming or application of acid-forming fertilizers is necessary.

(c) Suggest one common crop in Tanzania suitable to be grown in the soil sample of specimen S_1 with regard to its pH value.
Rice is suitable as it tolerates slightly acidic soils.

(d) Give reason why the barium sulphate powder was added to the specimens during the experiment.
Barium sulphate prevents turbidity by binding with colloids, allowing the solution to settle and giving a clear extract for accurate pH determination.

(e) Give comments and advice to farmers who want to grow maize in the soil of specimen S_2.
Farmers should be cautious because maize does best in neutral to slightly acidic soils; the alkaline condition in specimen S_2 may limit nutrient availability.
To improve yields, farmers should apply acid-forming fertilizers such as ammonium sulphate and also use organic manure to buffer soil pH.

(f) Briefly explain three importance of advice given in part (e).
Applying acid-forming fertilizers lowers the soil pH to an optimum range suitable for maize growth.
Organic manure improves soil structure, enhances microbial activity, and gradually corrects soil reaction.
Following advice prevents nutrient deficiencies like iron and zinc, ensuring good crop growth and higher yields.

3. You are provided with specimen C as a sample brought to the plant clinic by a farmer. Carefully examine the specimen as plant pathologists and inform the farmer on the following:
   (a) Name of the disease affecting specimen C.
   Bacterial wilt.

   (b) Causative agent of the disease by its common and scientific names.
   Common name: Bacteria.
   Scientific name: Ralstonia solanacearum.

   (c) Three modes of transmission of the disease.

   Through contaminated irrigation water.

   By insect pests and nematodes creating wounds for entry.

   Via contaminated farm tools, planting materials, and infected soil.

   (d) Three observable symptoms that exhibit the presence of the disease.

   Sudden wilting of leaves even in moist soils.

   Brown discoloration of vascular tissues at the stem base.

   Milky bacterial ooze streaming from a cut stem immersed in water.

   (e) One measure that can be employed to restore the health of the infected plant.
   Uproot and destroy infected plants to prevent spread to healthy crops.

   (f) Six points to suggest ways to maintain health of the plant against the disease.

   Use resistant or tolerant crop varieties.

   Practice proper crop rotation with non-host plants.

   Improve field drainage to avoid waterlogging.

   Sterilize tools and equipment before use in the field.

   Control insect pests and nematodes that create wounds.

   Avoid planting in fields with a history of the disease by practicing long fallows.