THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

155/2 **FOOD AND HUMAN NUTRITION 2**

(For Both School and Private Candidates)

Time : 3 Hours **ANSWERS** **Year : 2013**

Instructions

1. This paper consists of sections **A** and **B**.
2. Answer all questions in section **A** and only **two (2)** question from section **B**.
3. Non-programmable calculators may be used.
4. Communication devices and any unauthorised materials are **not** allowed in the examination room.
5. Write your **Examination Number** on every page of your answer booklet(s).

1. You are provided with sweet potato tuber (sample U). Carry out the following procedures:
   (i) Peel and cut thin slices of sample U. Place one slice on a glass slide, stain with iodine, and observe under a microscope.
   (ii) Boil another slice in water for 5 minutes, cool, and add iodine solution. Record colour changes.
   (iii) Roast a third slice over a flame until brown, then crush and test with Benedict's solution after boiling.

   Questions
   (a) Draw the microscopic structures seen in step (i) and describe their properties.
   Starch granules appear oval or rounded with a distinct hilum at the centre. They stain blue-black with iodine.

   (b) Explain the colour changes in step (ii).
   The boiled slice turns blue-black with iodine, confirming the presence of starch. Heat makes starch granules swell, but they still react with iodine.

   (c) Identify the nutrient tested in step (iii).
   The nutrient tested is reducing sugars, formed after roasting starch.

   (d) State the nutritional importance of sample U.
   Sweet potatoes provide carbohydrates for energy. They also supply dietary fibre, vitamins such as vitamin A, and minerals.

2. You are provided with two food samples V and W. Perform the following experiment:
   (i) Place 3 ml of sample V (egg white solution) in a test tube and add 2 ml of 10% sodium hydroxide, then add 1% copper sulphate drop by drop. Record your observation.
   (ii) Place 3 ml of sample W (gelatin solution) in a test tube, heat gently in boiling water for 5 minutes and cool. Add a few drops of trichloroacetic acid. Record observations.

   Questions
   (a) Identify the nutrients present in samples V and W.
   Sample V contains proteins. Sample W also contains proteins.

(b) Explain the scientific principle behind the colour change in step (i).
This is the Biuret test, which works because peptide bonds react with copper ions in alkaline medium to produce a violet colour.

(c) Outline the functional property of the nutrient in step (ii).
Gelatin proteins denature and form gels on cooling, demonstrating their gelling property.

(d) Give two food uses of the nutrient in samples V and W.
Proteins are used for body growth and repair. They also provide structural properties in foods, such as foaming in egg whites and gelling in gelatin desserts.

3. You are provided with ripe banana slices (sample X) and lemon juice. Perform the following experiment:
   (i) Place a slice of sample X on plain paper and leave for 10 minutes.
   (ii) Place another slice in lemon juice for 10 minutes.
   (iii) Place a third slice in boiling water for 3 minutes, then leave for 10 minutes.

   Questions
   (a) State the observations in steps (i), (ii), and (iii).
   In step (i), the banana slice turns brown. In step (ii), the slice remains yellow. In step (iii), the slice also remains unchanged.

   (b) Explain the enzymatic reaction responsible for the changes in step (i).
   Enzymatic browning occurs due to polyphenol oxidase, which oxidizes phenolic compounds to quinones that polymerize to form brown pigments.

   (c) Why did colour change not occur in steps (ii) and (iii)?
   In step (ii), lemon juice provides an acidic environment that inactivates the enzyme. In step (iii), heat denatures the enzyme, preventing browning.

   (d) State two benefits of browning in food processing.
   Browning improves flavour and aroma in baked goods. It also enhances colour appeal in roasted and fried foods.