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 : 2018**

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).

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1. You are provided with wheat dough (sample AA). Perform the following:

    (i) Knead the dough under water to wash out a substance.

    (ii) Collect the residue and stretch it between your fingers.

    (iii) Heat a portion of the residue in nitric acid, cool, and add ammonium hydroxide.

    Questions

    (a) Identify the residue in step (ii).

    The residue is gluten, a protein complex.

    (b) Explain its role in baking.

    Gluten provides elasticity and traps carbon dioxide, allowing dough to rise and bread to develop structure.

    (c) What does step (iii) demonstrate?

    This demonstrates the xanthoproteic test, confirming the presence of proteins containing aromatic amino acids.

    (d) State the principle of separating sample AA into components.

    The principle is differential solubility, where starch is washed away in water, leaving insoluble gluten.

2. You are provided with butter (sample BB). Carry out the following experiment:

    (i) Melt 5 g of sample BB in a test tube.

    (ii) Add 2 ml of ethanol, shake well and add 2 drops of phenolphthalein.

    (iii) Titrate with 0.1 M NaOH until pale pink colour appears.

    Questions

    (a) Calculate the acid value of sample BB.

    If 2.5 ml of NaOH was used:

    Moles NaOH = $0.1 \times 2.5 \div 1000 = 0.00025$ mol.

    Mass NaOH = $0.00025 \times 56.1 = 0.014$ g.

    Acid value = $(0.014 \div 5) \times 1000 = 2.8$ mg KOH per g fat.

    (Value depends on exact titre recorded.)

    (b) State the significance of this value in food processing.

    Acid value indicates the degree of rancidity. A high value means fat is deteriorating.

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(c) Explain the purpose of ethanol in step (ii).

Ethanol helps dissolve the fat and free fatty acids, allowing titration to proceed effectively.

(d) Outline two storage problems associated with high acid values in fats.

High acid values cause unpleasant odours and flavours. They also reduce the shelf life of fats and oils.

3. You are provided with apple slices (sample CC). Perform the following experiment:
   (i) Place one slice on a bench surface.
   (ii) Dip another slice in hot water for 3 minutes.
   (iii) Rub lemon juice on the third slice.

Questions

(a) State the changes in colour for each slice.

In step (i), the slice turns brown. In step (ii), no browning occurs. In step (iii), no browning occurs.

(b) Explain the reaction observed in step (i).

The browning is due to enzymatic oxidation of phenols by polyphenol oxidase, producing brown pigments.

(c) Why did changes not occur in steps (ii) and (iii)?

In step (ii), hot water denatures the enzyme. In step (iii), the acidic lemon juice inactivates the enzyme.

(d) Explain the importance of controlling this reaction in fruit preservation.

Controlling browning maintains the colour, flavour and market quality of fruits, extending their shelf life.

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