THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

155/3 **FOOD AND HUMAN NUTRITION 3**

(For Both School and Private Candidates)

Time : 3 Hours **ANSWERS** **Year : 2005**

Instructions

1. This paper consists of sections **three (3)** questions
2. Answer all questions
3. Question **one (1)** carries **twenty (20)** marks and question **two (2)** and **three (3)** carries **fifteen (15)** marks each.
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 wheat flour, water, and iodine solution. Perform the following experiments:

   (a) When 50 g of wheat flour is mixed with 30 ml of water and kneaded, the dough forms a cohesive, elastic mass. This texture results from the hydration and interaction of gluten proteins, which form a network that traps water and provides elasticity.

   (b) Washing the dough under running water separates starch and gluten. The gluten remains as an elastic, sticky mass, while starch particles wash away with water and can be collected separately as a white powdery substance.

   (c) Testing the starch with iodine solution produces a blue-black colour. This occurs because iodine molecules fit into the helical structure of amylose, forming a starch-iodine complex that is coloured.

   (d) Testing the gluten with Biuret reagent produces a violet or purple colour. This indicates the presence of protein, as the Biuret reagent reacts with peptide bonds in the gluten.

   (e) Starch turns blue-black with iodine due to the formation of a helical starch-iodine complex, indicating the presence of amylose. The functional role of gluten in bread making is to provide elasticity and structure, allowing the dough to trap gases during fermentation and rise properly.

2. You are given fresh egg, lemon juice, and boiling water.

   (a) Beating the egg white creates a foam due to air incorporation, which stabilizes proteins in an unfolded state. Dividing it into two portions allows comparison of heat and acid effects.

   (b) Heating the first portion over a water bath causes the proteins to denature, coagulate, and turn opaque, forming a firm mass.

   (c) Adding lemon juice to the second portion and exposing it to air causes slight acid-induced coagulation and may change the colour to pale or slightly opaque, depending on pH.

   (d) Heat denatures egg white proteins by breaking hydrogen bonds, causing them to unfold and aggregate. Acid lowers pH, destabilizing protein structures and causing partial coagulation.

(e) Protein denaturation is applied in cooking and food processing, such as making custards, cheese, or meringues, where controlled coagulation produces desired texture and consistency.

3. You are provided with cooking oil, NaOH solution, and phenolphthalein indicator.

(a) When 10 g of oil is mixed with alcohol containing NaOH and gently heated, saponification occurs, forming soap and glycerol.

(b) Observations include thickening of the mixture and possible mild foaming.

(c) Adding phenolphthalein detects free fatty acids. A pink colour indicates the presence of free fatty acids due to neutralization of NaOH.

(d) Determining free fatty acids is significant for assessing oil quality, as high levels indicate hydrolysis or rancidity, affecting taste, safety, and suitability for cooking.