THE UNITED REPUBLIC OF TANZANIA
NATIONAL EXAMINATIONS COUNCIL OF TANZANIA
ADVANCED CERTIFICATE OF SECONDARY EDUCATTION EXAMINATION

155/1 **FOOD AND HUMAN NUTRITION 1**

(For Both School and Private Candidates)

Time: 3 Hours **ANSWERS** **Year: 2023**

Instructions

1. This paper consists of sections **A** and **B**.
2. Answer **all** questions in section **A** and only **Three (3)** questions from section **B**.
3. Cellular phones and any unauthorised materials are **not** allowed in the examination room.
4. Write your **examination Number** on every page of your answer booklet(s).

1. (a) The role of the following agents in ensuring that food quality and safety is met and maintained:

   (i) The government
   The government establishes and enforces food safety laws and regulations to protect public health. It monitors food production, imports, and sales through inspections and testing to ensure compliance with safety standards. The government also provides education and awareness programs on food safety for producers and consumers.

   (ii) Food companies
   Food companies implement quality control procedures throughout the production process to ensure their products meet safety and quality standards. They conduct regular testing, maintain hygiene, and follow good manufacturing practices to prevent contamination. Companies also ensure proper labeling and traceability to protect consumers.

   (iii) Customers
   Customers play a role by demanding safe and quality food products, which motivates producers to maintain standards. They provide feedback and report unsafe or poor-quality products, creating consumer-driven pressure for improvements. Customers also follow proper food handling and storage practices at home to prevent foodborne illnesses.

   (b) The rationale for quality management systems to a food production organization:

   Quality management systems ensure consistency in the production of safe and high-quality food products, reducing the risk of contamination and product recalls.

   They improve operational efficiency and customer satisfaction by standardizing procedures and continuously monitoring production processes to meet regulatory and consumer requirements.

2. Five basic steps in the industrial thermo-processing of vegetables by canning method:

   Preparation: Sorting, washing, peeling, trimming, and cutting vegetables to ensure quality and uniformity before canning.

   Blanching: Briefly heating vegetables in hot water or steam to inactivate enzymes that cause spoilage and to preserve color, texture, and nutrients.

   Filling: Placing vegetables into sterilized cans and adding brine, syrup, or water as a packing medium to cover the contents.

   Sealing: Hermetically sealing the cans to prevent contamination by microorganisms and oxygen.

   Heat processing (sterilization): Heating sealed cans at specific temperatures and times to kill pathogenic and spoilage microorganisms, ensuring product safety and extending shelf life.

3. (a) Three basic components of household food security:

   Food availability: Having sufficient quantities of food physically present within the household or accessible from local markets or own production.

   Food accessibility: The ability of the household to obtain food through purchasing, production, or exchange, influenced by income and infrastructure.

Food utilization: Proper use of food through adequate diet, clean water, sanitation, and health care to absorb and benefit from nutrients.

(b) Four qualitative conditions for adequate nutrient supply for active and healthy life:

Variety of foods from different food groups to ensure a balanced intake of essential nutrients.

Food safety and hygiene to prevent contamination and foodborne diseases.

Adequate nutrient density, meaning foods should provide sufficient nutrients relative to their energy content.

Proper food preparation and cooking methods that preserve nutrient quality.

4. (a) Three causes of food crop spoilage and deterioration:

Microbial activity such as bacteria, fungi, and molds growing on crops, causing decay and off-flavors.

Insect infestation that damages grains and other crops by feeding and contaminating them.

Poor storage conditions like high humidity, temperature fluctuations, and exposure to air and light accelerate deterioration.

(b) Three indicators of spoiled and deteriorated food crops:

Presence of mold growth or discoloration on the surface.

Unpleasant odor or sour smell indicating fermentation or decay.

Physical damage such as shriveling, softness, or insect holes in the grains or crops.

(c) Four control measures of food crop spoilage and deterioration:

Proper drying of crops before storage to reduce moisture content and inhibit microbial growth.

Use of airtight and pest-proof storage containers or structures to protect from insects and rodents.

Applying natural or approved chemical preservatives to prevent microbial and insect damage.

Maintaining clean and dry storage environments with good ventilation to prevent humidity buildup.

5. Five uses of Recommended Dietary Allowance (RDA):

To guide individuals and health professionals in planning balanced diets that meet the nutrient requirements for health.

To assess and monitor the nutritional status of populations and identify deficiencies or excesses.

To assist food manufacturers in formulating fortified foods and dietary supplements.

To develop nutrition policies, programs, and dietary guidelines for public health interventions.

To educate the public about proper nutrition and promote healthy eating habits.

6. (a) Differentiating traditional storage structures from modern storage structures:

Traditional storage structures are usually made from locally available natural materials such as mud, clay, straw, and wood, often simple in design and construction, providing basic protection against pests and weather.

Modern storage structures use improved materials like metal, concrete, and plastic, feature airtight sealing, controlled temperature and humidity, and incorporate pest control technologies to ensure better preservation and longer shelf life.

(b) Four characteristics of improved storage structures:

They provide airtight or hermetic conditions that limit oxygen and moisture, reducing spoilage and insect activity.

They have good ventilation systems to control temperature and humidity, preventing mold growth and deterioration.

They are constructed from durable, pest-resistant materials that protect grains from rodents and insects.

They allow easy loading, unloading, cleaning, and monitoring to maintain hygiene and grain quality.

7. (a) Six factors which accelerate the development of oxidative rancidity in fats and oils:

Exposure to oxygen in the air increases the oxidation process that breaks down fats, leading to rancidity.

High temperature accelerates the chemical reactions involved in fat oxidation, causing faster rancidity development.

Light, especially sunlight or ultraviolet rays, promotes oxidation by providing energy that breaks down fat molecules.

Presence of metal ions such as iron and copper acts as catalysts and speeds up the oxidation process.

Moisture or water can promote hydrolytic rancidity which indirectly accelerates oxidative rancidity by breaking down fats.

Unsaturated fats, which contain double bonds, are more prone to oxidation than saturated fats, making them more susceptible to rancidity.

(b) Six methods of preventing rancidity:

Store fats and oils in airtight containers to limit exposure to oxygen.

Keep storage areas cool and avoid high temperatures that speed up oxidation.

Use opaque or dark containers to protect fats from light exposure.

Add antioxidants such as vitamin E or synthetic preservatives to slow oxidation.

Keep fats and oils away from metals and avoid contamination with metal particles.

Minimize moisture by keeping fats dry and using proper sealing to prevent water contact.

8. (a) Six benefits of meal planning:

Ensures a balanced diet by providing the right nutrients required by all family members.

Helps control food costs by reducing impulse buying and minimizing food waste.

Saves time and reduces stress during meal preparation by organizing meals in advance.

Improves health by promoting regular meal times and appropriate portion sizes.

Encourages variety in meals, preventing monotony and increasing nutrient intake.

Supports special dietary needs, such as for children, elderly, or those with health conditions.

(b) Six factors to consider when planning family meals:

Nutritional needs and preferences of all family members including age and health status.

Availability and seasonality of food ingredients to ensure fresh and affordable options.

Budget constraints to plan meals within the family's financial means.

Time available for meal preparation considering work and school schedules.

Cultural and religious food practices that influence food choices.

Storage facilities and cooking equipment available at home.

9. Seven stages of the experiment to determine crude fat content using the Soxhlet method

Stage 1: Preparation of the sample involves drying and grinding the food sample to a fine powder for uniform extraction.

Stage 2: Weigh accurately a known amount of the dried sample and place it into a thimble made of filter paper.

Stage 3: Place the thimble inside the Soxhlet extractor, which is connected to a round-bottom flask containing a solvent such as ether or hexane.

Stage 4: Heat the solvent in the flask to boil, causing the solvent vapor to rise through the extractor and condense in the condenser above.

Stage 5: The condensed solvent drips into the thimble and dissolves the fat from the food sample; once the solvent level reaches a siphon tube, it siphons back into the flask carrying extracted fat.

Stage 6: Repeat the cycle several times over a period (usually several hours) to ensure complete extraction of fats.

Stage 7: After extraction, evaporate the solvent from the flask to leave behind the extracted fat, then weigh the flask with fat and subtract the empty flask weight to calculate the crude fat content percentage.