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: 2022**

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) “Fortification being a food-based method offers several benefits in health and food processing and preservation”. Justify this statement in four points.

   Fortification improves the nutritional status of a large section of the population by adding essential micronutrients to commonly consumed foods, helping prevent deficiencies such as anemia and goiter.

   It is a cost-effective public health strategy because it delivers essential nutrients without requiring people to change their eating habits, ensuring easy and wide coverage.

   Food fortification enhances the shelf life and stability of food products, especially when micronutrients such as antioxidants and preservatives are included, reducing spoilage and food losses.

   It supports better growth and productivity by improving the health of individuals, thus reducing healthcare costs and increasing the economic productivity of the population.

   (b) Identify two major methods of food fortification.

   Mass fortification, which involves adding nutrients to foods commonly consumed by the general public, such as iodized salt and fortified flour.

   Targeted fortification, where specific foods meant for particular groups like children or pregnant women are fortified with nutrients such as vitamin A in margarine or iron in baby cereals.

2. Not all dietary iron is absorbed equally in the body. Support this statement by analysing,

   (a) Three groups of food which enhance the body's ability to absorb iron.

   Foods rich in vitamin C, like citrus fruits, tomatoes, and green leafy vegetables, enhance iron absorption by reducing ferric iron to its more absorbable ferrous form.

   Animal proteins such as meat, poultry, and fish contain heme iron, which is readily absorbed and also promotes the absorption of non-heme iron from plant sources.

   Fermented foods like fermented cereals and vegetables improve iron absorption by reducing the presence of inhibitors such as phytates.

   (b) Two groups of food which hinder the body's ability to absorb iron.

   Foods rich in phytates such as whole grains, legumes, and unrefined cereals bind with iron and reduce its bioavailability in the body.

   Tannins found in tea, coffee, and some vegetables inhibit iron absorption by forming insoluble complexes with iron in the digestive tract.

3. Suppose you were invited to a training on baking process to present about raising agents;

   (a) Briefly explain four types of chemical raising agents you would include in your presentation.

   Bicarbonate of soda, a single-acting raising agent, releases carbon dioxide gas when it reacts with acidic ingredients in the mixture.

   Baking powder is a double-acting agent that contains bicarbonate of soda and a weak acid, releasing carbon dioxide both at room temperature and when heated.

Cream of tartar, an acidic compound often combined with bicarbonate of soda, helps release carbon dioxide during baking.

Baker's ammonia (ammonium bicarbonate) decomposes upon heating to release carbon dioxide and ammonia gases, creating a light and porous texture in baked goods.

(b) Advice the participants on how they should store the chemical raising agents.

Chemical raising agents should be stored in airtight containers to prevent them from absorbing moisture and losing effectiveness.

They should be kept in a cool, dry, and dark place, away from heat sources and direct sunlight to maintain their potency.

Containers must be properly labeled and tightly sealed after each use to prevent contamination and deterioration.

Old or expired raising agents should be discarded, as they lose their leavening power over time and can affect the quality of baked products.

4. (a) Differentiate chronic food insecurity from transitory food insecurity.

Chronic food insecurity is a long-term, persistent lack of access to adequate food, resulting from poverty, inadequate resources, or prolonged social and economic challenges.

Transitory food insecurity is a temporary situation caused by sudden changes such as droughts, floods, conflicts, or market price fluctuations that disrupt food supply or access for a short period.

(b) Analyse the effects of the following factors on food production in Tanzania:

(i) Rapid population growth increases food demand, putting pressure on agricultural resources, leading to land overuse, deforestation, and reduced soil fertility.

(ii) Civil conflicts disrupt farming activities, displace farmers, destroy crops and infrastructure, and reduce overall food production and supply.

(iii) Acquired Immune-Deficiency Syndrome (AIDS) reduces agricultural labor force as infected individuals and caregivers cannot engage in farming effectively, leading to lower productivity.

(iv) Environmental degradation caused by deforestation, soil erosion, and water pollution reduces land quality and water availability for farming, lowering crop yields and food supply.

5. A patient who is suffering from diabetes mellitus has been referred to you by a physician for nutritional counseling. Recommend five dietary practices of managing his/her illness.

The patient should consume a balanced diet rich in fiber from whole grains, legumes, vegetables, and fruits to slow glucose absorption and maintain stable blood sugar levels.

Frequent small meals should be taken instead of large meals to help regulate blood glucose throughout the day.

Foods high in simple sugars such as sweets, sugary drinks, and desserts should be avoided to prevent sudden spikes in blood sugar levels.

The patient should limit intake of saturated fats and cholesterol by choosing lean protein sources and healthy fats like vegetable oils and fish.

Regular hydration and avoiding alcohol are essential to maintaining blood glucose control and preventing complications.

6. (a) Briefly explain:

(i) How food safety differs from other characteristics of food quality.

Food safety focuses on ensuring that food is free from harmful substances like pathogens, toxins, and chemical contaminants that can cause illness. Other characteristics of food quality, such as appearance, texture, flavor, and nutritional value, relate to the sensory and functional attributes of food, not necessarily its safety.

(ii) The aim of food quality assurance system in a food company.

The aim is to consistently produce safe, high-quality food products that meet regulatory standards, consumer expectations, and legal requirements while minimizing risks of contamination and spoilage.

(b) What are the reasons for implementation of food quality assurance programmes in food industry? Give four points.

To protect public health by preventing the distribution of unsafe or contaminated food products.

To maintain consumer confidence and ensure customer satisfaction through consistent product quality.

To comply with national and international food safety regulations and avoid legal penalties or business closure.

To reduce production costs and losses by preventing product recalls, spoilage, and waste through effective monitoring and control of production processes.

7. Explain six primary causes of food losses in the post-harvest food chain.

Poor harvesting practices such as harvesting immature crops or delaying harvest lead to significant losses as overripe or unripe produce deteriorates quickly during handling and storage.

Inadequate storage facilities contribute to food losses because poor ventilation, dampness, pests, and temperature fluctuations create conditions for spoilage, mold growth, and pest infestation.

Poor handling and transportation practices such as rough handling, improper packaging, and delays during transportation cause physical damage to food, increasing spoilage and losses.

Pest infestations during storage and transportation, including insects, rodents, and birds, lead to both quantitative and qualitative food losses.

Lack of appropriate processing techniques such as drying, sorting, and grading results in poor-quality products that spoil faster or are rejected by markets.

Poor market infrastructure and delayed market access cause perishable foods to remain unsold for long periods, leading to spoilage and waste before reaching consumers.

8. (a) Describe the three major components of total energy expenditure.

Basal Metabolic Rate (BMR) is the energy required by the body to maintain essential physiological functions such as breathing, circulation, and cell repair while at rest.

Physical Activity Energy Expenditure (PAEE) is the energy used during various physical activities, including work, exercise, and daily tasks, and it varies with activity intensity and duration.

Thermic Effect of Food (TEF) is the energy used by the body to digest, absorb, and metabolize nutrients from the food consumed.

(b) Calculate the components mentioned in (a) and the total energy expenditure by Dr. Aggrey.

Dr. Aggrey weighs 65 kg.
Using the given table:

Energy expenditure per activity = weight × time (minutes) × expenditure rate (kcal/kg/min)

Now calculating each:

1. Showering: 65 × 20 × 0.047 = 61.1 kcal
2. Dressing: 65 × 10 × 0.038 = 24.7 kcal
3. Driving: 65 × 50 × 0.056 = 182.0 kcal
4. Walking upstairs: 65 × 10 × 0.254 = 165.1 kcal
5. Walking down stairs: 65 × 7 × 0.098 = 44.6 kcal
6. Walking normally: 65 × 70 × 0.069 = 313.95 kcal
7. Having meals & drinks: 65 × 50 × 0.020 = 65.0 kcal
8. Marking assignments: 65 × 188 × 0.029 = 354.58 kcal
9. Lecturing: 65 × 240 × 0.035 = 546.0 kcal
10. Watching TV: 65 × 65 × 0.017 = 71.78 kcal
11. Attending natural calls: 65 × 15 × 0.027 = 26.32 kcal
12. Sitting & chatting: 65 × 60 × 0.026 = 101.4 kcal
13. Writing journal: 65 × 165 × 0.027 = 289.58 kcal
14. Sleeping: 65 × 494 × 0.016 = 514.18 kcal

Total Energy Expenditure (TEE):
= sum of all values
= 2820.29 kcal

(basal metabolic rate is embedded in activities like sleeping, sitting etc., so total activity value represents TEE here)

(c) If Dr. Aggrey consumed 540g carbohydrate, 250g protein, 80g fat:

Energy provided by:
Carbohydrate: 540g × 4 kcal/g = 2160 kcal
Protein: 250g × 4 kcal/g = 1000 kcal
Fat: 80g × 9 kcal/g = 720 kcal

Total energy intake = 2160 + 1000 + 720 = 3880 kcal

Comparison and advice:
Energy intake (3880 kcal) exceeds energy expenditure (2820.29 kcal) by 1059.71 kcal.

This surplus may lead to gradual weight gain if it persists. He should reduce intake of high-calorie foods, particularly fats and carbohydrates, increase physical activity, or both to balance intake and expenditure.

9. Describe six traditional methods used in storing food grains in order to minimize losses during storage.

Using earthen or clay pots for storage helps keep grains dry and cool while protecting them from pests and moisture, preserving their quality for longer periods.

Storing grains in underground pits lined with dry leaves or ash minimizes exposure to air, light, and pests, thus prolonging shelf life in villages.

Mud silos or granaries built using local materials like mud and straw provide an airtight environment, reducing moisture and pest access.

Use of woven baskets smeared with cow dung and ash is a traditional technique for storing grains while deterring insects through natural repellents.

Drying and treating grains with natural repellents like neem leaves, pepper, or dried chili before storage helps prevent insect and fungal attacks.

Smoking grain stores or storage containers regularly with local herbs or wood smoke creates an environment unfavorable for insects and fungi, thus preserving the grains effectively.