THE UNITED REPUBLIC OF TANZANIA

NATIONAL EXAMINATIONS COUNCIL

ADVANCED CERTIFICATE OF SECONDARY EDUCATION EXAMINATION

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

(For Both School and Private Candidates)

Time : 3 Hours **ANSWERS** **Year : 2000**

Instructions

1. This paper consists of sections **A** and **B**.
2. Answer all questions in section **A** and only **three (3)** 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. (a) Differentiate between chronic food insecurity and transitory food insecurity.
(b) Analyse the effects of the following on food production in Tanzania:
(i) Rapid population growth
(ii) Civil conflicts
(iii) HIV/AIDS
(iv) Environmental degradation

(a) Chronic food insecurity is a long-term condition where individuals or households consistently lack access to sufficient, safe, and nutritious food for a healthy life. It often results from persistent poverty, structural weaknesses in the economy, and limited access to productive resources. People facing chronic food insecurity experience constant hunger and undernourishment.

Transitory food insecurity, on the other hand, is temporary and occurs when there is a sudden disruption in food access or availability. It may result from natural disasters, seasonal food shortages, sudden price hikes, or conflicts. People experiencing transitory insecurity may recover when the shock passes, but it can still cause severe malnutrition if prolonged.

(i) Rapid population growth increases the demand for food at a faster rate than production capacity. In Tanzania, this puts pressure on land, leading to over-cultivation and reduced soil fertility. It also strains food distribution systems, making it harder to achieve food security.

(ii) Civil conflicts disrupt farming activities by forcing people to flee their land and abandon production. They also destroy infrastructure like roads and storage facilities, making it difficult to transport food. Conflicts often cause loss of livestock and crops, leading to a significant drop in national food supply.

(iii) HIV/AIDS reduces agricultural productivity because affected individuals are often too weak to engage in farming. Families spend more resources on healthcare instead of farm inputs, which further lowers yields. The disease also reduces household labor force, creating a direct negative impact on food availability.

(iv) Environmental degradation, such as deforestation, soil erosion, and climate change, reduces the land's ability to sustain agriculture. Degraded soils produce lower yields, while deforestation leads to unreliable rainfall patterns. In Tanzania, this worsens food shortages and makes farming less sustainable.

2. (a) Briefly describe three temporary methods of storing food grains used by Tanzanian villagers.
(b) State four disadvantages of using underground storage methods.
(c) Suggest three modern methods that can improve traditional grain storage.

(a) One temporary method of storing food grains is the use of clay pots. Villagers often clean and dry clay pots before filling them with grain. These pots are then sealed to keep out moisture and insects. This method is cheap and accessible to households with limited resources.

Another method is the use of traditional baskets woven from reeds or bamboo. Grains are filled inside and the basket is covered with leaves or cow dung plaster to reduce insect attack. Although common in rural areas, it is more vulnerable to pests compared to improved methods.

A third method is the use of gunny bags. Farmers fill dried grain into these bags and stack them in their houses. This allows easy access for consumption or sale, though it requires regular monitoring to prevent moisture or rodent damage.

(b) Underground storage exposes grains to high moisture levels, which encourages fungal growth and spoilage.

It is difficult to control pests such as termites and rodents in underground storage, leading to significant grain losses.

This method often reduces the nutritional value of the stored food because moisture and microorganisms break down nutrients.

It requires much labor to dig and maintain storage pits, which makes it less convenient compared to modern storage structures.

(c) One modern method that can improve traditional storage is the use of metallic silos. These are airtight, reducing oxygen and controlling insects and mold growth.

Another method is hermetic storage bags, which create a sealed environment that limits the survival of pests without chemicals.

The use of improved warehouses with controlled ventilation and fumigation is also effective in reducing post-harvest grain losses.

3. (a) Identify three groups of foods that enhance the absorption of iron in the human body.
(b) Explain two groups of foods that hinder the absorption of iron.

(a) Foods rich in vitamin C enhance iron absorption. Examples include oranges, lemons, and tomatoes, which convert non-heme iron into a form more easily absorbed by the body.

Animal-based proteins such as meat, poultry, and fish also promote iron absorption. These foods contain heme iron, which is absorbed more efficiently than plant-based iron.

Fermented foods like sour porridge and fermented vegetables aid iron absorption because the fermentation process reduces compounds that normally bind to iron, making it more bioavailable.

(b) Foods high in phytates, such as whole grains, legumes, and seeds, hinder iron absorption. Phytates bind to iron and form insoluble complexes that the body cannot absorb.

Foods rich in tannins, like tea, coffee, and certain leafy vegetables, also reduce iron absorption. Tannins bind with iron in the gut and prevent it from being taken up into the bloodstream.

4. (a) Define Basal Metabolic Rate (BMR).
(b) Explain four factors which affect the Basal Metabolic Rate of an individual.
(c) Briefly state three reasons why BMR is higher in infants than in adults.

(a) Basal Metabolic Rate (BMR) is the amount of energy the body uses at rest to maintain basic physiological functions such as breathing, blood circulation, and maintaining body temperature.

(b) Age affects BMR because younger people generally have higher energy requirements compared to older people.

Sex influences BMR since men typically have higher BMR than women due to having more muscle mass.

Body size and composition play a role because people with larger bodies or more muscle mass burn more calories at rest.

Hormonal activity, particularly thyroid hormones, can increase or decrease the metabolic rate depending on their levels.

(c) Infants have a higher BMR because they are growing rapidly and need more energy to build tissues.

They have a higher surface area to body weight ratio, which leads to faster heat loss and greater energy use for thermoregulation.

Infants have more active cells and organs relative to their body size, which makes their metabolism naturally higher than that of adults.

5. (a) Describe the importance of each of the following in bread making: (i) wheat flour (ii) fresh yeast (iii) warm liquid (iv) table salt
(b) State two determinants of the choice of a raising agent to be used and give one example of a product and the raising agent used.
(c) Explain what will happen if a filler material is not added to baking powder.

(a) Wheat flour is important because it contains gluten, which provides elasticity and structure to the bread. It allows the dough to stretch and trap gases during fermentation, resulting in soft and fluffy bread.

Fresh yeast produces carbon dioxide and alcohol through fermentation, which causes the dough to rise. It also contributes to the flavor and aroma of the bread.

Warm liquid activates yeast, ensuring efficient fermentation and gas production. If the liquid is too cold, yeast activity slows down, while excessively hot liquid kills the yeast.

Table salt enhances the flavor of bread and strengthens the gluten network. It also slows down yeast activity, preventing over-fermentation.

(b) One determinant is the type of product being prepared. For example, cakes may require baking powder as a raising agent, while bread needs yeast.

Another determinant is the desired texture of the final product. For instance, baking soda is used in cookies to produce a coarse texture.

(c) If a filler is not added to baking powder, the mixture may become too concentrated, leading to uneven distribution in the flour mixture.

This would cause uneven rising in the baked product, resulting in poor texture and possible bitter taste from excess leavening agent.

6. Food fortification is an important practice to improve micronutrient intake. Discuss the benefits of fortification and explain the necessary conditions for its success.

Fortification improves public health by reducing the prevalence of micronutrient deficiencies such as anemia, goiter, and rickets. It provides vitamins and minerals to a wide population without requiring changes in eating habits.

It is cost-effective compared to supplementation programs because fortified foods reach many people through existing food supply systems.

Fortification helps in enhancing the nutritional value of commonly consumed foods such as salt, flour, and oil, which ensures regular intake of essential nutrients.

For fortification to be successful, there must be government regulation and quality control to ensure consistent nutrient content.

The fortified food must remain acceptable in taste, color, and texture so that consumers continue to purchase and consume it.

Public awareness campaigns are necessary to educate people about the benefits of fortified foods and encourage their use.

7. Describe six natural compounds used to protect food grains against pest infestation and explain how they act on pests.

Neem leaves are used because they have insecticidal properties that repel pests and disrupt their reproductive cycle.

Ash is sprinkled on stored grains, creating a physical barrier that suffocates insects and prevents their movement.

Chili powder is added in small amounts to repel pests through its pungent smell and irritant effect.

Sand is mixed with grains to restrict pest movement and prevent egg-laying, as it fills air spaces between grains.

Lime is applied to reduce the pH and create an unfavorable environment for pest survival.

Dry herbs like eucalyptus leaves are placed in grain storage because their strong aroma acts as a natural repellent against insects.

8. Explain traditional methods of storing food grains in Tanzania and assess their effectiveness in minimizing losses during storage.

One traditional method is the use of clay pots, which protect grains from moisture and insects to some extent, though their small capacity limits effectiveness.

Another method is storing in woven baskets plastered with cow dung or mud, which provides a temporary barrier against pests but is prone to damage and infestation.

Underground pits are also used, but they expose grains to moisture and fungal contamination, reducing quality.

Hanging grain cobs under the roof of houses is common, allowing airflow and reducing moisture. However, this method leaves the grains vulnerable to rodents and birds.

Overall, traditional methods help in preserving food temporarily, but they are less effective compared to modern storage technologies, which offer better protection against pests and spoilage.

9. A diabetic patient has been referred to you for nutritional counseling. Recommend appropriate dietary practices and lifestyle adjustments that can help in managing the illness.

The patient should consume foods with a low glycemic index, such as whole grains and legumes, to prevent rapid spikes in blood sugar.

Regular small meals should be taken instead of large meals, as this helps to stabilize blood glucose levels throughout the day.

High-fiber foods like vegetables and fruits with low sugar content should be included in the diet to slow down glucose absorption.

Sugar-sweetened beverages and processed foods should be avoided to reduce unnecessary calorie and sugar intake.

The patient should maintain a balanced intake of carbohydrates, proteins, and fats to ensure proper nutrition without overloading the system with glucose.

Apart from dietary practices, regular physical exercise should be encouraged, as it helps the body use insulin more effectively.

Stress management is also important because stress hormones can affect blood sugar levels.

Finally, the patient should avoid smoking and alcohol, as these can worsen complications related to diabetes.

10. "Handling procedures in food processing convert food into consumable form." Discuss this statement with reference to stages of food processing and the effects of drying on food grains.

Food processing begins with primary handling, which includes cleaning, sorting, and grading raw materials to make them suitable for consumption.

The secondary stage involves transforming raw foods into finished products through cooking, milling, or fermenting. This makes food safer, tastier, and easier to digest.

The tertiary stage focuses on packaging and storage, which preserves the food and makes it convenient for distribution and sale.

Drying food grains reduces their moisture content, preventing microbial growth and spoilage.

It improves the shelf life of grains, making them available for consumption over a longer period.

Drying reduces the weight of food grains, which makes transportation and storage easier and cheaper.

However, excessive drying may lead to loss of nutrients and affect the texture and taste of food.