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 : 2001**

Instructions

1. This paper consists of sections A and B.
2. Answer all questions in section A and **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 saturated and unsaturated fats.
(b) Identify the three major groups of carbohydrates and give one example in each.
(c) State three functions of dietary fiber in the human body.

(a) Saturated fats are fats in which all carbon atoms in their fatty acid chains are fully bonded with hydrogen atoms, meaning they have no double bonds. These fats are solid at room temperature and are mainly found in animal products such as butter, cheese, and fatty cuts of meat. They are associated with raising levels of low-density lipoprotein (LDL) cholesterol, which can contribute to heart disease.

Unsaturated fats are fats that contain one or more double bonds in their fatty acid chains. These fats are liquid at room temperature and are mostly found in plant oils such as olive oil, sunflower oil, and nuts. They are considered healthier as they help lower LDL cholesterol and support cardiovascular health.

(b) The first group of carbohydrates is monosaccharides. These are the simplest forms of carbohydrates made of single sugar molecules, for example glucose. Monosaccharides are easily absorbed into the bloodstream and provide immediate energy.

The second group is disaccharides. These are formed when two monosaccharide molecules combine, for example sucrose (table sugar). They need to be broken down into monosaccharides before absorption but still provide a quick source of energy.

The third group is polysaccharides. These are complex carbohydrates made of many monosaccharides linked together, for example starch. Polysaccharides take longer to digest and therefore provide sustained energy to the body.

(c) Dietary fiber helps in maintaining healthy digestion by adding bulk to stool and preventing constipation. This ensures smooth movement of food through the digestive tract.

Dietary fiber slows down the absorption of sugar into the bloodstream, which helps regulate blood sugar levels and reduces the risk of type 2 diabetes.

It also helps lower cholesterol levels by binding to bile acids in the intestines and aiding their excretion. This reduces the risk of cardiovascular diseases.

2. (a) Define food security.

(b) Mention three essential requirements of household food security.

(c) Analyse the impact of HIV/AIDS on food security in developing countries.

(a) Food security is the condition in which all people, at all times, have physical, social, and economic access to sufficient, safe, and nutritious food that meets their dietary needs and food preferences for an active and healthy life. It emphasizes availability, accessibility, utilization, and stability of food resources.

(b) One essential requirement of household food security is food availability. This means there must be a reliable and adequate supply of food within the community through production, imports, or storage.

The second requirement is food accessibility. Even if food is available, households must have the means, such as income or resources, to obtain it for their daily consumption.

The third requirement is food utilization. This involves proper preparation, consumption, and biological use of food, including safe water, sanitation, and knowledge of nutrition to ensure that the food eaten contributes effectively to health.

(c) HIV/AIDS impacts food security by reducing agricultural productivity. Infected individuals often become too weak to engage in farming activities, leading to decreased food production.

It also increases household expenditures on healthcare, leaving fewer resources for purchasing food or farm inputs, which further lowers food security.

The disease reduces the labor force at the community level, as both affected individuals and caregivers spend less time on farming or food-related activities.

Furthermore, HIV/AIDS creates food insecurity by causing the loss of knowledge transfer. When adults die prematurely, agricultural knowledge and skills are not passed to the next generation, weakening long-term food security.

3. (a) Explain briefly four factors which influence Basal Metabolic Rate (BMR).
(b) Why is BMR usually higher in men than in women?

(a) Age influences BMR because younger people, especially children and adolescents, have higher energy demands due to growth and development, while older individuals experience a natural decline in metabolic rate.

Body size and composition affect BMR, as larger bodies and individuals with more muscle mass burn more energy even at rest compared to smaller or leaner individuals.

Hormonal activity, particularly thyroid hormones, plays a role in regulating metabolism. Overproduction of thyroid hormones raises BMR, while low production reduces it.

Environmental temperature also influences BMR. In cold conditions, the body requires more energy to maintain its internal temperature, thereby increasing the metabolic rate.

(b) BMR is usually higher in men than in women because men generally have more muscle mass relative to body weight. Muscle tissue is metabolically more active than fat tissue, so men burn more calories at rest.

Additionally, men often have larger body sizes and higher levels of testosterone, which supports greater muscle development, further raising their metabolic rates compared to women.

4. (a) Describe the importance of the following in bread making: (i) Wheat flour, (ii) Yeast, (iii) Salt, (iv) Warm water.
(b) What would happen if excess yeast is added to bread dough?

(a) Wheat flour is essential because it contains gluten, a protein that provides elasticity and strength to the dough. Gluten traps carbon dioxide during fermentation, allowing the dough to rise and giving bread its structure.

Yeast is a biological raising agent that ferments sugars in the flour to produce carbon dioxide and alcohol. The gas causes the dough to expand, while the alcohol contributes to bread flavor.

Salt enhances the flavor of bread and helps strengthen the gluten structure. It also slows down yeast activity to prevent the dough from over-fermenting.

Warm water activates the yeast and allows enzymes in the flour to work efficiently. If the water is too cold, fermentation slows down; if too hot, it kills the yeast.

(b) If excess yeast is added, the dough will ferment too quickly, producing too much carbon dioxide in a short time. This can cause the dough to rise excessively and then collapse, leading to poor bread texture.

It may also give the bread a strong yeasty or sour flavor, making it unpleasant to eat. Additionally, over-fermentation weakens the gluten network, resulting in dense or sticky bread.

5. (a) Distinguish between food safety and food quality.
(b) Explain the aim of food quality assurance in the food industry.
(c) State three reasons for implementing food quality assurance programmes.

(a) Food safety refers to the conditions and practices that protect food from contamination and hazards such as harmful bacteria, toxins, or chemicals that could make it unsafe to eat. It ensures that food does not cause harm to consumers when prepared and consumed.

Food quality, on the other hand, refers to the overall attributes of food such as taste, texture, color, appearance, nutritional value, and shelf life. While safety focuses on preventing harm, quality focuses on meeting consumer expectations.

(b) The aim of food quality assurance in the food industry is to ensure that food products consistently meet established standards for safety, nutritional value, and consumer acceptability. It builds confidence among consumers and ensures compliance with regulations.

(c) One reason for implementing food quality assurance programmes is to protect public health by ensuring that food is free from contaminants and hazards.

Another reason is to improve consumer satisfaction by maintaining high standards in taste, appearance, and nutritional value.

A third reason is to facilitate trade, as adherence to quality assurance standards allows local food products to meet both national and international market requirements.

6. "Food fortification is an important practice to improve micronutrient intake." Discuss this statement with suitable examples.

Food fortification improves public health by addressing micronutrient deficiencies that are common in developing countries. For example, adding iodine to table salt helps prevent goiter and other thyroid-related illnesses.

It increases the nutritional value of staple foods without requiring changes in dietary habits. People continue consuming their usual foods while benefiting from added vitamins and minerals.

Fortification is cost-effective because it uses existing food distribution systems. Once fortification is introduced into widely consumed foods like flour or oil, it reaches a large population with minimal extra expense.

It helps prevent conditions such as anemia by fortifying flour with iron, and rickets by fortifying milk with vitamin D. These interventions reduce disease burden and improve productivity.

Fortification can be implemented in both industrial and small-scale food processing, making it flexible and adaptable to different settings.

However, for fortification to succeed, there must be proper regulation to ensure the nutrients added are safe, stable, and in the right amounts. Consumer education is also needed to promote acceptance of fortified foods.

7. Describe the major causes of food losses in the post-harvest food chain.

One major cause is poor harvesting practices, where crops are harvested either too early or too late. This results in damage or spoilage that reduces their market value.

Inadequate storage facilities also cause food losses. Grains and other crops stored in poor conditions are prone to moisture damage, mold growth, and pest infestations.

Transportation problems lead to significant losses, especially when perishable foods like fruits and vegetables are transported over long distances without refrigeration or proper packaging.

Processing and handling errors, such as contamination or mechanical damage during milling and packaging, result in both quality and quantity losses.

Another cause is inadequate market infrastructure. When farmers cannot access markets quickly, their produce often spoils before being sold.

Environmental conditions, including high temperatures and humidity in tropical regions, further accelerate spoilage and reduce food shelf life.

8. A patient has been diagnosed with diabetes mellitus. Recommend appropriate dietary practices and lifestyle modifications to manage this condition.

The patient should consume foods with a low glycemic index such as whole grains, legumes, and non-starchy vegetables. These foods release sugar slowly into the blood, preventing spikes in glucose levels.

Regular meals should be taken at consistent times throughout the day. This helps regulate blood sugar levels and prevents hypoglycemia or hyperglycemia.

Sugary foods, sweetened drinks, and refined carbohydrates should be avoided as they quickly raise blood glucose and worsen the condition.

The diet should include high-fiber foods like fruits, vegetables, and whole cereals, which slow down sugar absorption and improve digestion.

Moderate amounts of healthy fats, such as those from nuts and olive oil, should be included to provide energy without increasing blood sugar.

Apart from diet, the patient should engage in regular physical exercise such as walking or light jogging, which helps improve insulin sensitivity.

Stress management techniques such as relaxation, meditation, or counseling are important because stress hormones can interfere with blood sugar control.

Finally, avoiding smoking and alcohol is essential as both can increase the risk of complications such as cardiovascular diseases in diabetic patients.

9. Explain traditional and modern methods of food preservation, assessing their effectiveness in maintaining food quality.

One traditional method is drying, where foods like grains, fish, and vegetables are exposed to the sun to reduce moisture. This extends shelf life but may cause nutrient losses if drying is prolonged.

Salting is another traditional method where salt is applied to meat or fish. It reduces microbial growth by drawing out water but can alter the taste and texture of food.

Smoking is also widely used, especially for fish and meat. It adds flavor and preserves food by exposing it to smoke, though it may introduce harmful compounds if not carefully managed.

Modern preservation includes refrigeration, which keeps food at low temperatures and slows down microbial activity, maintaining freshness for longer.

Freezing is more effective than refrigeration because it halts microbial growth completely. Nutritional value is generally preserved, though texture may be affected after thawing.

Canning is another modern method that seals food in containers and sterilizes it. It is highly effective for long-term storage but requires specialized equipment and may alter the taste.

Overall, modern methods provide better control of food quality and safety, but traditional methods remain useful in rural areas with limited access to technology.

10. Governments in developing countries face challenges in ensuring food security. Discuss the strategies that can be applied to improve household food security.

One strategy is to promote sustainable agricultural practices such as crop rotation, use of organic fertilizers, and conservation farming. These practices maintain soil fertility and increase food production.

Governments can invest in infrastructure, including roads, storage facilities, and irrigation systems. This reduces post-harvest losses and ensures that food can be transported efficiently to markets.

Supporting smallholder farmers through subsidies, access to credit, and provision of improved seeds and inputs can increase productivity and household food availability.

Education on nutrition and food utilization is another strategy. Households that understand balanced diets and food preparation can make better use of available resources.

Strengthening agricultural extension services helps farmers adopt modern techniques and technologies that boost yields.

Governments can also develop safety net programs, such as food aid or cash transfers, to support vulnerable households during food shortages.

Finally, encouraging regional trade in food products ensures that surplus from one area can meet shortages in another, enhancing overall national food security.