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 : 2002**

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 baking soda and baking powder.
(b) Mention four weak acids used with baking soda to neutralize its effect.
(c) Explain the role of a filler material in baking powder.

(a) Baking soda is sodium bicarbonate, a single chemical compound that releases carbon dioxide when combined with an acid and moisture. It requires an acidic ingredient such as lemon juice or vinegar to activate. Baking powder, on the other hand, contains sodium bicarbonate already mixed with an acid, usually cream of tartar, and a filler such as starch. It releases carbon dioxide on its own when moistened and heated, making it more convenient in baking.

(b) Cream of tartar is one weak acid used with baking soda. It reacts with sodium bicarbonate to produce carbon dioxide for leavening.

Lactic acid, which can be present in sour milk or yogurt, is another weak acid that activates baking soda.

Acetic acid, found in vinegar, also combines with baking soda to release carbon dioxide and aid in dough rising.

Citric acid, naturally found in citrus fruits such as lemon or lime, is another weak acid used with baking soda to produce a leavening effect.

(c) A filler material such as starch in baking powder dilutes the active ingredients, making it easier to measure and distribute evenly throughout the flour mixture.

It also absorbs moisture to prevent premature reactions between the acid and the base, ensuring the baking powder remains stable during storage.

By stabilizing and balancing the mixture, filler materials ensure consistent leavening results in baked products.

2. (a) State four properties of vitamin A.
(b) Explain three factors that influence the absorption of vitamin A.

(a) Vitamin A is fat-soluble, meaning it dissolves in fats and oils and is stored in the liver and fatty tissues.

It is sensitive to heat and light, which can destroy its activity during cooking or storage.

Vitamin A is unstable in the presence of oxygen and can be oxidized, reducing its potency.

It occurs in two main forms: preformed vitamin A (retinol) from animal sources and provitamin A carotenoids from plant sources.

(b) Dietary fat enhances the absorption of vitamin A since it is fat-soluble and requires fat for transportation across the intestinal lining.

The health of the digestive system influences absorption because conditions such as diarrhea or intestinal infections reduce vitamin absorption.

The presence of other nutrients such as zinc also affects absorption, as zinc is necessary for the metabolism of vitamin A.

3. (a) Briefly describe three temporary grain storage methods used in Tanzania.
(b) State four disadvantages of underground grain storage.
(c) Suggest three modern alternatives to improve grain storage.

(a) One method is the use of clay pots, where grains are stored in sealed earthen pots to keep out insects and moisture.

Another method is using woven baskets, which are plastered with mud or cow dung to provide a barrier against pests.

Gunny bags are also used, where grains are dried and stored in sacks, allowing for easy handling and transport.

(b) Underground storage exposes grains to moisture, leading to mold growth and spoilage.

It encourages pest infestation from rodents and insects, which are difficult to control in underground pits.

The method reduces nutritional quality, as moisture and microorganisms damage the stored grain.

It requires heavy labor to dig and maintain storage pits, making it inconvenient for households.

(c) One modern alternative is the use of metallic silos, which provide airtight conditions that protect against insects and moisture.

Another alternative is hermetic storage bags, which create a sealed environment where pests cannot survive.

Improved warehouses with proper ventilation and fumigation systems are also effective in reducing storage losses.

4. (a) Define the term leavening agent.
(b) Describe how a physical raising agent works in dough.
(c) State two determinants for selecting a raising agent and give examples.

(a) A leavening agent is any substance that causes the expansion of doughs and batters by releasing gases, making baked products light and porous.

(b) A physical raising agent works by introducing air into the dough during mixing, sieving, or creaming. When the dough is heated, the trapped air expands, increasing the volume and creating a soft texture. For example, whisking egg whites incorporates air, which acts as a leavening agent.

(c) The type of product is one determinant. For example, yeast is chosen for bread to achieve a chewy texture, while baking powder is used for cakes to produce a soft crumb.

The desired texture is another determinant. For example, baking soda is used in cookies to give a coarse texture, while steam is used in choux pastry to create hollow centers.

5. (a) Differentiate chronic food insecurity from transitory food insecurity.
(b) Analyse the effects of environmental degradation on food production.
(c) Briefly explain two ways to reduce the impact of civil conflicts on food security.

(a) Chronic food insecurity is a persistent inability to access adequate food, often caused by poverty, poor infrastructure, and limited resources. Transitory food insecurity is temporary and occurs due to sudden shocks such as drought, floods, or economic crises.

(b) Environmental degradation reduces soil fertility through erosion and deforestation, leading to lower crop yields.

It causes loss of biodiversity, which reduces the variety of crops that can be cultivated, limiting resilience against pests and diseases.

Degradation contributes to climate change, leading to unpredictable rainfall and frequent droughts that harm food production.

(c) Promoting peace and dialogue is one way to reduce conflicts and ensure that farming communities are not displaced from their land.

Providing secure access to farmland and markets during conflict periods can help sustain food production and prevent hunger.

6. Explain the primary causes of food losses in tropical storage systems and propose solutions.

Poor storage facilities in tropical regions cause food losses due to high humidity and temperature, which encourage mold growth and pest infestations.

Rodent attacks are another cause, as rodents consume and contaminate large amounts of stored grain.

Inadequate drying before storage leads to spoilage because moisture supports microbial activity.

Solutions include using improved storage structures such as metallic silos and hermetic bags, which prevent moisture and pest invasion.

Proper drying of grains before storage is essential to reduce microbial spoilage.

Community education on post-harvest management practices ensures that farmers adopt effective methods to reduce losses.

7. Describe nine chemical preservatives used in the food and beverage processing industry to control microbial growth.

Sodium benzoate is used in acidic foods and beverages to inhibit the growth of yeast, bacteria, and molds.

Sorbic acid prevents the growth of molds and yeasts in foods such as cheese and baked goods.

Sulfur dioxide is applied in dried fruits and wines to control microbial activity and prevent browning.

Nitrates and nitrites are used in processed meats to prevent bacterial growth and preserve color.

Propionic acid is added to baked products to inhibit mold growth.

Calcium propionate serves a similar purpose and is widely used in bread.

Potassium sorbate is another preservative used in dairy products and fruit-based drinks to inhibit fungi.

Acetic acid is used in pickles and sauces to control bacteria and extend shelf life.

BHA (Butylated hydroxyanisole) and BHT (Butylated hydroxytoluene) act as antioxidants that prevent rancidity in fatty foods, indirectly controlling microbial spoilage.

8. Discuss the nutritional requirements of the elderly and suggest features of an appropriate diet to meet their needs.

Elderly people require fewer calories than younger adults due to lower physical activity and reduced metabolism. However, their need for nutrients like vitamins and minerals remains high.

They need higher amounts of calcium and vitamin D to maintain bone health and prevent osteoporosis.

Proteins are essential in the elderly to maintain muscle mass and repair body tissues. Lean meats, legumes, and dairy products are good sources.

Dietary fiber is important to improve digestion and prevent constipation, which is common in older age.

An appropriate diet should be low in saturated fats and cholesterol to reduce the risk of cardiovascular diseases.

It should include fruits, vegetables, and whole grains to supply vitamins, minerals, and antioxidants that boost immunity.

Adequate hydration is necessary since the elderly often experience reduced thirst sensation.

Meals should be soft and easy to chew, especially for those with dental problems.

Small, frequent meals may be more suitable than large meals to ensure adequate nutrient intake.

9. Evaluate the effects of pesticide misuse on food safety and suggest measures to prevent poisoning.

Pesticide misuse leaves harmful chemical residues in food, which can cause poisoning and long-term health effects such as cancer and reproductive problems.

Excessive use of pesticides reduces food quality by contaminating crops and making them unsafe for consumption.

Improper application can kill beneficial organisms, upsetting the ecological balance and making crops more vulnerable to pests.

To prevent poisoning, farmers should be trained in proper pesticide use, including correct dosage and application methods.

Use of protective gear when spraying pesticides reduces direct exposure to harmful chemicals.

Observing recommended pre-harvest intervals ensures that residues decline to safe levels before food reaches consumers.

Governments should enforce strict regulations on pesticide use and promote integrated pest management as a safer alternative.

10. “Fish are highly perishable foods that require immediate preservation.” Discuss with reasons and traditional preservation methods.

Fish spoil quickly because they contain high moisture content, which encourages rapid microbial growth.

They have enzymes that break down tissues soon after death, accelerating spoilage.

Fish also have soft tissues that are easily attacked by bacteria, making them highly perishable compared to other animal foods.

One traditional method of preservation is drying, where fish are sun-dried to reduce moisture and extend shelf life.

Salting is another method, in which fish are coated with salt to draw out water and inhibit microbial growth.

Smoking is widely used to both preserve and add flavor to fish, though it may alter taste depending on the type of wood used.

Fermentation is also practiced in some regions, where fish are preserved by microbial activity that produces acids to slow spoilage.