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: 2021**

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) Briefly explain the principles involved in:

   (i) Vacuum packing.

   Vacuum packing is a food preservation method based on removing air, especially oxygen, from a package before sealing it. Since oxygen supports the growth of aerobic microorganisms and causes oxidative spoilage, its removal slows down microbial activity and oxidation processes, thus prolonging the shelf life of food products. The absence of air also helps prevent changes in texture, color, and flavor of the stored food.

   (ii) Freezing methods of food preservation.

   Freezing preserves food by lowering its temperature to levels where microbial growth, enzymatic activity, and chemical reactions are either significantly slowed or stopped. At temperatures below zero degrees Celsius, the water content in food turns into ice, making it unavailable for microbial and enzymatic activity. This maintains the freshness, texture, and nutrient content of food for extended periods.

   (b) Briefly explain the effects of dehydration on food nutrients.

   Dehydration leads to the concentration of nutrients by removing water from food, making it lighter and less perishable. However, it can cause the loss of heat-sensitive vitamins such as vitamin C and some B-complex vitamins due to exposure to high temperatures. It also alters the texture and flavor of food and may reduce the bioavailability of certain nutrients because of structural changes during the drying process.

2. (a) Explain briefly the problems associated with the use of pesticides.

   The use of pesticides can lead to environmental pollution by contaminating water sources, soil, and air, affecting both human and animal health. Pesticides may leave toxic residues in food products, posing health risks to consumers. Frequent use also contributes to the development of pest resistance, making it harder to control pests in the future. Additionally, pesticides may harm non-target organisms like bees and beneficial insects, disturbing ecological balance.

   (b) Give the practices that should be used to avoid the problems associated with the use of pesticides.

   Pesticides should be used in recommended amounts and according to the manufacturer's instructions to prevent overuse and environmental contamination. Farmers should adopt integrated pest management practices by combining chemical, biological, and cultural control methods. Protective clothing and equipment must be worn during application to avoid direct exposure. Pesticides should be stored safely, away from children, food, and water sources, and obsolete pesticides must be disposed of properly.

3. (a) Identify the potential users of Tanzania Food Composition Tables.

   The potential users include nutritionists and dietitians for meal planning and assessing nutritional status. Health workers use them for nutritional counseling and public health interventions. Researchers rely on them for dietary surveys and food consumption studies. Food industries use them for product formulation and labeling, while policymakers apply them in food security and nutrition programs.

   (b) Give the procedure of calculating the nutritive value of a meal recipe by using a food composition table.

   First, list all the ingredients in the recipe and record their respective weights. Then, for each ingredient, find the nutrient content per 100 grams from the food composition table. Multiply the nutrient value by the actual weight of the ingredient divided by 100 to obtain the nutrient contribution of each item. Sum up the nutrient values of all ingredients to determine the total nutritive value of the meal.

4. (a) Identify the factors that determine the quantity of protein an individual requires for structural and regulatory functions and for energy.

   Age is a key factor as growing children and adolescents need more protein for tissue development. Body weight and physical activity level influence protein needs because more active or heavier individuals require more for muscle repair and energy. Health status affects protein demand, especially during illness, injury, or surgery for tissue repair. Pregnancy and lactation increase protein needs to support fetal and infant growth. Dietary quality also matters, as protein requirements rise when low-quality proteins are consumed.

   (b) Argue against the statement "excessive intake of protein is beneficial to health".

   Excessive protein intake can burden the kidneys, increasing the risk of kidney damage over time. It may also lead to dehydration since the body requires extra water to eliminate nitrogen waste from protein metabolism. High protein diets often displace other essential nutrients like carbohydrates, vitamins, and fiber, causing imbalanced nutrition. Additionally, long-term high-protein diets rich in animal proteins can raise cholesterol levels, increasing the risk of heart disease.

5. (a) Give the reason as to why spinach is not considered as a good source of calcium and sodium in spite of containing a reasonable amount of those minerals.

   Spinach contains high levels of oxalates, which bind with calcium and sodium to form insoluble compounds. These compounds are not readily absorbed in the digestive tract, making the minerals biologically unavailable for the body's use.

   (b) Give the biological effects of:

   (i) Glucosinolates.

   Glucosinolates found in cruciferous vegetables can have both beneficial and harmful effects. In small amounts, they contribute to cancer prevention, but in large quantities, they can interfere with thyroid function by inhibiting iodine uptake, leading to goiter.

   (ii) Saponins natural toxicants.

   Saponins have antimicrobial and antifungal properties and may help lower cholesterol. However, excessive intake can cause digestive irritation and hemolysis of red blood cells in high concentrations.

   (c) Give the reasons for a very small amount of natural toxicants found in most foods not necessarily creating a hazard in the body.

   Most natural toxicants occur in such low quantities that the body's detoxification systems, like the liver and kidneys, can safely neutralize and eliminate them. Furthermore, cooking and food processing often reduce the levels of these toxicants to harmless amounts.

6. (a) Account for the factors that influence meal planning in a commercial catering institution.

   The budget available determines the type and quality of ingredients that can be purchased, influencing the menu's nutritional quality and variety. The nutritional needs of customers, such as age, occupation, health status, and preferences, must be considered to meet diverse dietary requirements. The availability and seasonality of ingredients affect meal planning, as seasonal foods are fresher and cheaper. The kitchen staff's skills and equipment capacity also influence the complexity and range of dishes that can be prepared.

(b) Give the measures of improving the nutritive value of foods served so as to meet the nutritional needs of the customers.

Menus should be diversified to include a variety of fruits, vegetables, legumes, whole grains, and lean protein sources. Cooking methods that preserve nutrients, such as steaming and boiling instead of deep frying, should be adopted. Fortified foods and nutrient-dense ingredients should be included in meals to enhance their nutritional quality. Portion sizes should be appropriate to avoid underfeeding or overfeeding customers. Nutrition education programs for catering staff can also improve meal planning and preparation practices.

7. Suggest the methods of preventing food grain deterioration by insect pests.

Grains should be properly dried to the recommended moisture content before storage because dry grains are less susceptible to insect infestation and mold growth.

Grains must be stored in clean, dry, and well-ventilated storage facilities to prevent pest breeding and the accumulation of dampness that favors insect survival.

The use of natural repellents such as neem leaves, pepper, and dried chili can deter insects when mixed with stored grains.

Regular inspection and cleaning of storage facilities should be done to detect early signs of infestation and remove any insect eggs, larvae, or adult pests.

Hermetic or airtight storage methods, like using sealed containers or bags, prevent oxygen entry and suffocate insects, thus controlling pest development.

Applying safe, approved chemical pesticides or fumigants to grains and storage areas can control insect populations if used according to safety guidelines.

Rotating stored stock (first in, first out) helps to avoid prolonged storage periods that encourage insect infestations.

8. (a) Describe the roles of yeast fermentation in bread making process.

Yeast fermentation produces carbon dioxide gas when yeast metabolizes sugars present in the flour. This gas becomes trapped in the dough's gluten network, causing the dough to rise and develop a light, airy texture.

Fermentation enhances the flavor of bread through the production of organic acids, alcohol, and other aromatic compounds, improving the overall taste and aroma.

The activity of yeast contributes to the development of the dough's texture and crumb structure, giving bread its characteristic softness and chewiness.

Yeast fermentation improves the nutritional value of bread by partially breaking down complex carbohydrates and making some nutrients more bioavailable.

(b) Give the factors which affect the rate of yeast fermentation during bread making.

Temperature greatly affects yeast activity, with optimal fermentation occurring between 27°C and 35°C. Higher temperatures may kill yeast, while lower ones slow down the process.

The amount and type of sugar in the dough influence fermentation, as sugar serves as food for the yeast, promoting gas production.

The presence of salt in the dough slows fermentation because salt inhibits yeast growth when added in high amounts.

Moisture content affects yeast activity, with adequate hydration needed for effective fermentation. A dry dough limits yeast action, while overly wet dough may collapse.

The type and freshness of yeast used also determine the fermentation rate, with fresh, active yeast fermenting more efficiently than old or improperly stored yeast.

9. (a) Describe the major groups of factors which cause low food crop production.

Natural factors such as drought, floods, pests, and diseases reduce crop yields by damaging plants and limiting growth conditions.

Socio-economic factors including poverty, lack of farming equipment, inadequate storage, and limited market access discourage farmers from producing large quantities.

Technical factors like poor farming methods, insufficient knowledge about modern agricultural practices, and lack of agricultural extension services lead to inefficient production.

Policy-related factors such as poor government support, inadequate investment in agriculture, and unstable agricultural policies discourage sustainable food crop production.

(b) Suggest the ways of improving food crop production.

Introducing irrigation systems and water harvesting techniques can help overcome the problem of unreliable rainfall and drought.

Providing farmers with affordable access to improved seeds, fertilizers, and farm implements will enhance productivity.

Training farmers in modern agricultural practices, pest control, and soil conservation through extension services will increase crop yields.

Establishing reliable markets, storage facilities, and transportation systems will encourage farmers to produce more and reduce post-harvest losses.

Government investment in agricultural research, policy reforms, and financial support programs such as subsidies and loans will promote sustainable food crop production.