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 : 2007**

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) Define essential amino acids.
(b) List any five essential amino acids.
(c) Explain two effects of essential amino acid deficiency in the body.

(a) Essential amino acids are amino acids that the human body cannot synthesize in sufficient quantities on its own. They must therefore be obtained directly from the diet through consumption of protein-rich foods. These amino acids play a key role in growth, repair, and maintenance of body tissues.

(b) Examples of essential amino acids include lysine, leucine, isoleucine, methionine, and tryptophan. These are only five out of the nine essential amino acids required by humans.

(c) One effect of essential amino acid deficiency is stunted growth, especially in children. This is because these amino acids are needed to build new proteins that form muscles, tissues, and organs. Without them, growth and development become impaired.

Another effect is muscle wasting in adults. Since the body cannot synthesize proteins adequately without essential amino acids, it starts breaking down muscle tissue to meet its needs, leading to weakness and reduced productivity.

2. (a) Differentiate between saturated fatty acids and polyunsaturated fatty acids.
(b) State two health risks associated with excess intake of saturated fatty acids.
(c) Mention three dietary sources of polyunsaturated fatty acids.
(d) Explain the importance of omega-3 fatty acids in human nutrition.

(a) Saturated fatty acids are fatty acids that have no double bonds between their carbon atoms. They are usually solid at room temperature and are commonly found in animal fats like butter, lard, and fatty meats. Polyunsaturated fatty acids, on the other hand, contain two or more double bonds in their structure. They are usually liquid at room temperature and are found in plant oils such as sunflower oil and fish oils.

(b) Excess intake of saturated fatty acids increases the risk of developing cardiovascular diseases such as hypertension and heart attack. This happens because they raise the levels of low-density lipoprotein (LDL) cholesterol in the blood, which clogs arteries.

Another health risk is obesity, since saturated fats are energy-dense and when consumed in large amounts without sufficient physical activity, they lead to weight gain and related complications.

(c) Dietary sources of polyunsaturated fatty acids include sunflower oil, soybean oil, and oily fish such as sardines and mackerel. These foods provide healthy fats that contribute to heart health.

(d) Omega-3 fatty acids are important because they reduce inflammation in the body, which lowers the risk of chronic diseases such as arthritis. They also help reduce triglyceride levels in the blood, thereby protecting the cardiovascular system. Additionally, they play a role in brain development and function, particularly in infants and young children.

3. (a) Define basal metabolic rate (BMR).
(b) Mention three factors that influence BMR.
(c) State three reasons why BMR is higher in men than in women.

(a) Basal metabolic rate is the minimum amount of energy that the body needs to perform essential life-sustaining processes at rest, such as breathing, circulation, and maintaining body temperature.

(b) Age influences BMR because younger individuals have higher metabolic activity due to growth and greater lean muscle mass, while older individuals experience a decline in metabolism.

Another factor is body composition, where people with higher lean muscle mass have higher BMR compared to those with more fat tissue, since muscles are metabolically active.

Hormonal activity also influences BMR. For example, higher secretion of thyroid hormones increases metabolism, while reduced secretion lowers BMR.

(c) Men generally have more lean muscle mass compared to women, which increases their BMR since muscle tissue burns more energy at rest than fat.

Men often have larger body sizes and higher total body surface area, which requires more energy to maintain, leading to a higher BMR.

Testosterone, a male hormone, promotes muscle growth and higher metabolism, while estrogen in females does not have the same effect, contributing to lower BMR in women.

4. (a) What is anemia?

(b) Give three nutritional causes of anemia.

(c) Mention three groups of people who are more vulnerable to anemia.

(d) State three measures to prevent anemia in the community.

(a) Anemia is a condition in which the number of red blood cells or the hemoglobin concentration in the blood is lower than normal. This reduces the ability of blood to transport oxygen effectively, leading to fatigue, weakness, and pale skin.

(b) One nutritional cause of anemia is iron deficiency, since iron is a major component of hemoglobin responsible for oxygen transport.

Another cause is vitamin B12 deficiency, which affects red blood cell formation and leads to megaloblastic anemia.

Folate deficiency is also a cause, as folate is essential for DNA synthesis and cell division, particularly in the production of red blood cells.

(c) Pregnant women are more vulnerable to anemia because of increased iron requirements for both mother and fetus.

Infants and young children are at risk due to rapid growth and high demand for iron to support development.

Adolescent girls are vulnerable because of menstrual blood loss and often inadequate dietary intake.

(d) Prevention of anemia can be achieved by promoting the consumption of iron-rich foods such as meat, beans, and leafy vegetables.

Fortification of staple foods with iron and other essential micronutrients helps reduce widespread anemia in communities.

Nutrition education is another measure, teaching households about balanced diets and the importance of combining iron sources with vitamin C for better absorption.

5. (a) Define food poisoning.

(b) State three bacterial causes of food poisoning.

(c) Mention two symptoms of food poisoning.

(d) Outline three ways of preventing food poisoning at household level.

(a) Food poisoning is an illness caused by consuming food or drinks contaminated with harmful microorganisms or their toxins. It often results in gastrointestinal problems such as vomiting, diarrhea, and stomach cramps.

(b) Bacterial causes of food poisoning include Salmonella species, which are commonly found in undercooked poultry and eggs. Another is Escherichia coli (E. coli), often associated with contaminated water and beef. A third example is Staphylococcus aureus, which produces toxins that contaminate improperly stored food.

(c) One symptom of food poisoning is diarrhea, which may range from mild to severe and sometimes accompanied by blood.

Another symptom is persistent vomiting, which leads to dehydration and weakness in the affected person.

(d) Preventing food poisoning at household level includes washing hands thoroughly with soap before preparing and eating food to prevent contamination.

Proper cooking of foods, especially meat, eggs, and fish, ensures harmful bacteria are destroyed.

Refrigerating perishable foods promptly and keeping cooked foods covered prevents bacterial growth and contamination.

6. Analyse the relationship between poor sanitation and malnutrition in developing countries.

Poor sanitation leads to contamination of water and food with disease-causing microorganisms. When people consume such contaminated food or water, they suffer from diarrhea and intestinal infections, which reduce nutrient absorption and lead to malnutrition.

Children living in areas with poor sanitation often suffer repeated infections, which deplete the body's nutrient reserves and weaken immunity. This contributes to chronic undernutrition and stunted growth.

In many developing countries, poor sanitation also increases the spread of parasites such as hookworms, which cause blood loss and iron deficiency anemia, further contributing to malnutrition.

Households that spend time and resources managing sanitation-related illnesses often have limited capacity to invest in nutritious food, worsening the cycle of malnutrition.

7. Discuss the contribution of biotechnology in improving food and nutrition security.

Biotechnology contributes to food security by developing high-yield crop varieties that produce more food per acre, ensuring stable food supplies for growing populations.

It enables the development of crops resistant to pests, diseases, and drought, reducing crop losses and making food production more reliable in harsh environments.

Biotechnology improves the nutritional quality of crops through biofortification. An example is golden rice, which is genetically engineered to contain vitamin A, addressing widespread deficiencies.

It also enhances food preservation by producing enzymes and additives that extend shelf life, reducing post-harvest losses and ensuring food availability.

8. Explain the effects of overnutrition on health and productivity in Tanzania.

Overnutrition leads to overweight and obesity, which increase the risk of non-communicable diseases such as hypertension, diabetes, and cardiovascular disorders. These diseases reduce life expectancy and quality of life.

It reduces productivity because individuals suffering from obesity-related illnesses experience fatigue and frequent absenteeism from work, lowering economic performance.

Overnutrition also places a heavy financial burden on the healthcare system, as more resources are required to treat diet-related chronic diseases.

Children affected by overnutrition often experience poor concentration and performance in school, which affects future productivity and development.

9. Assess the role of school feeding programs in promoting learning and nutrition among pupils.

School feeding programs improve children's nutritional status by providing regular meals rich in essential nutrients. This helps prevent malnutrition and promotes healthy growth and development.

They enhance learning outcomes, as well-fed children have better concentration, memory, and energy levels, which improve academic performance.

School feeding programs reduce absenteeism and dropout rates, especially among children from poor households, since parents are encouraged to keep their children in school.

These programs also promote equity by ensuring children from disadvantaged families receive the same nutritional benefits as their peers.

10. Discuss the effects of HIV/AIDS on food production and nutrition at household level.

HIV/AIDS reduces household labor because infected individuals often fall sick and cannot participate in farming activities. This leads to reduced agricultural output and lower food availability.

Households affected by HIV/AIDS spend more income on healthcare, leaving less money available for purchasing food and farm inputs.

The disease increases the nutritional requirements of infected individuals, making it difficult for households to meet both medical and dietary needs.

HIV/AIDS also leads to loss of agricultural knowledge and skills when productive family members die, weakening household resilience to food insecurity.