



MACHAKOS UNIVERSITY

University Examinations for 2024/2025 Academic Year

SCHOOL OF AGRICULTURE, ENVIRONMENT AND HEALTH SCIENCES

DEPARTMENT OF HEALTH SCIENCES

THIRD AND FOURTH YEAR FIRST SEMESTER EXAMINATION FOR
BACHELOR OF SCIENCE IN FOOD, NUTRITION AND DIETETICS

HFN 443: FOOD CHEMISTRY

TIME:

DATE:

INSTRUCTIONS: Answer question ONE (COMPULSORY) and any other TWO

QUESTION ONE (COMPULSORY - 30 MARKS)

- a) Explain four effects of protein denaturation at the different levels of the protein structure (4 marks)
- b) Explain three roles played by conjugated polysaccharides in animals and/or plants tissues (3 marks)
- c) Assume that an experiment was conducted to determine the acid value in palm oil. A sample of 15 g of the oil was used for titration with 0.1N KOH and a titre of 2.4 ml was recorded. Given that the average acid value of palm oil is 0.5, answer the following questions:
 - i) Explain three reasons for regular determination of acid value in fats and oils (3 marks)
 - ii) Calculate the acid value of the palm oil (3 marks)
 - iii) Explain the interpretation of the acid value obtained in (ii) above in relation to the palm oil used in the experiment (2 marks)
- d) Amino acids are the building blocks of proteins:
 - i) Explain the two categories of amino acids (4 marks)

- ii) Define each of the two classes of amino acids from a nutrition and health perspective (2 marks)
- e) Explain four nutritional and health benefits that may be achieved through food fermentation (6 marks)
- f) Foods are known to contain nutrients as well as antinutrients or antinutritional factors:
 - i) Define the term antinutrient (1 mark)
 - ii) State four ways in which plant antinutritional factors reduce digestive efficiency (2 marks)

QUESTION TWO (20 MARKS)

- a) With reference to enzyme inhibition in Food Chemistry answer the following questions:
 - i) Describe the mode of action of an enzyme inhibitor (2 marks)
 - ii) Explain the mode of action of irreversible enzyme inhibitors (3 marks)
 - iii) Discuss the four groups of reversible enzyme inhibitors and their modes of action (8 marks)
- b) Discuss the effects of fermentation on each of the following:
 - i) Proteins (2 marks)
 - ii) Minerals (3 marks)
 - iii) Glycaemic index (2 marks)

QUESTION THREE (20 MARKS)

- a) Explain the effects of germination/malting on each of the following food components:
 - i) Carbohydrates (2 marks)
 - ii) Minerals (2 marks)
- b) Describe the four main types of food fortification (6 marks)
- c) Discuss the chemistry behind the synthesis of vitamin A using plant tissue as the starting food material (5 marks)
- d) Mr. Anguka Nayo received a protein intake of 102 g over a 24 hour period. Within the same period, he excreted 14.3 g of nitrogen in the urine, 3.0 g of nitrogen through faeces and 1.0 g of nitrogen in sweat. Using this information, calculate the nitrogen balance of Mr. Anguka Nayo and indicate its implication (5 marks)

QUESTION FOUR (20 MARKS)

- a) Describe lipid autooxidation under each of the following headings:
- i) The steps involved in lipid autooxidation (4 marks)
 - ii) Four importance of lipid autooxidation in Food Science (4 marks)
 - iii) Three factors that affect lipid autooxidation (3 marks)
- b) Describe the non-enzymatic reactions in foods clearly highlighting their quality and nutritional importance (9 marks)

QUESTION FIVE (20 MARKS)

- a) Describe how each of the following compound functions as an antinutrient/antinutritional factor.
- i) Tannins (3 marks)
 - ii) Phytic acid (2 marks)
- b) Food fortification has been used as a strategy to combat micronutrients malnutrition (MNM) in many countries, Kenya included:
- i) Explain five technical considerations in planning a food fortification program (5 marks)
 - ii) Explain five advantages of food fortification over other interventions aimed at preventing and controlling MNM (5 marks)
 - iii) Explain five limitations of relying on food fortification as a strategy for MNM control (5 marks)