

UNIVERSITY OF KWAZULU-NATAL
SCHOOL OF AGRICULTURAL, EARTH & ENVIRONMENTAL SCIENCES
DISCIPLINE OF DIETETICS & HUMAN NUTRITION
EXAMINATIONS: NOVEMBER 2013
SUBJECT, COURSE & CODE: FOOD SCIENCE 120, INTRODUCTION TO FOOD
SCIENCE, P2

DURATION: 3 HOURS

TOTAL MARKS: 120

External Examiner: Prof F. J. Veldman
Internal Examiner: Dr M. Siwela

NOTE: This paper consists of 5 pages, Please see that you have them all.

INSTRUCTIONS

1. Section A is **compulsory**. This section carries 20 marks.
2. There are six (6) questions in Section B; each question carries 25 marks. Answer any **four (4)** questions in Section B.
3. Use clearly labeled diagrams where necessary.

SECTION A is COMPULSORY

QUESTION 1

- 1.1 Name two (2) compounds produced by the hydrolysis of fats and oils? (2)
- 1.2 State one (1) factor that promotes the reaction named in 1.1. (1)
- 1.3 What is the effect of:
- 1.3.1 sugar on the boiling point of water;.....(1)
- 1.3.2 sugar on water activity; (1)
- 1.3.3 water activity on the growth of micro-organisms. (1)
- 1.4.1 State two (2) problems with the sensory quality of a muffin leavened with sodium hydrogen carbonate. (2)
- 1.4.2 What is the difference in chemical composition between slow acting baking powder and a double acting baking powder? (2)
- 1.5 Give one (1) example of each: a protein-based and a fat-based fat replacement. (2)

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1.6 Why is it necessary to reduce the amount of leavening in a cake recipe when baking at a very high altitude (height above sea level)? (2)

1.7 Name one (1) low energy sweetener and its two (2) applications/uses. (3)

1.8 Give two (2) functional properties of hydrocolloids **besides** gelling and thickening properties. (2)

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SECTION B

ANSWER FOUR (4) QUESTIONS FROM THIS SECTION

QUESTION 2

2.1 Draw the basic chemical structure of a fatty acid. (2)

2.2 List three plant sources of commercial fats and oils. (3)

2.3 Give an outline of reaction steps of the deterioration of oil that does not require enzyme catalysis and its end products are chemically stable. (15)

2.4 explain to a Food Processor who uses oil to produce French Fries (fresh fried potato chips) why he/she should do the following

2.4.1 Filter oil every day; (2)

2.4.2 Drain water from potatoes and the fryer before frying; (2)

2.4.3 Skim the oil surface. (2)

2.5.1 State two (2) positive effects of a shortening on the quality of a baked product. (2)

2.5.2 Name one (1) animal-fat shortening and state its fat composition. (2)

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QUESTION 3

- 3.1 Define a foam as a food system, and give two (2) examples of food foams, excluding milk foams. (4)
- 3.2 Explain how you would **experimentally** demonstrate that there are two types of emulsions: oil-in-water (O/W) emulsion or water-in-oil emulsion (W/O). (6)
- 3.3 State four (4) ways by which you would increase the stability of milk foams. (4)
- 3.4 The batter of a shortening cake batter is a complex food system. Justify the statement by identifying four (4) food systems present in the batter. (4)
- 3.5 What type of food system is a starch paste and jam, respectively? (2)
- 3.6 List three (3) materials that stabilize mayonnaise. (3)
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QUESTION 4

- 4.1.1 Draw the basic chemical structure of an amino acid in its ionic form. (4)
- 4.1.2 Name and draw the chemical structure of an amino acid whose R group (side group) is H (3)
- 4.1.2 Name two (2) sulphur containing amino acids. (2)
- 4.1.3 Name the electrostatic force that is most broken and reformed during protein denaturation. (1)
- 4.3.1 With regard to changes that happen in nutritive proteins and non-nutritive proteins, respectively, state two (2) natural benefits of cooking meat by boiling at atmospheric pressure. (2)

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4.3.2 With regard to changes that happen in proteins, state one (1) advantage and two (2) disadvantages of grilling meat. (3)

4.4.1 List four (4) functions of water in food processing. (4)

4.4.2 List four (4) negative effects of water on food quality. (4)

4.4. Without reducing the water content of food and without heating the food, explain how you would reduce the spoilage of freshly cut cabbages and fresh meat due to the activity of enzymes found in these foods when they are stored at room temperature (about 25°C). (2)

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QUESTION 5

5.1.1 Give an outline of the biochemical reactions that lead to the browning of fresh potatoes when they cut into slices. (8)

5.1.2 State two (2) cases whereby the browning of plant food due to biochemical reactions is desirable. (2)

5.3.1 You are provided with a large piece of a tough, fresh meat and a meat tenderizing enzyme, which is in powder form. Give an outline of an experiment you would perform in a Food Preparation laboratory to show that the meat tenderizing enzyme is negatively affected by heat. State the expected results. (6)

5.3.2 State two (2) environmental conditions that would promote the activity of the meat tenderizing enzyme. (2)

5.4 State two (2) reasons why it would be better to obtain an enzyme for processing cheese from microorganisms than from the stomach wall of a pig. (2)

5.5 State at three (3) functional properties of food proteins. (3)

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5.6 Give one (1) example of the application of protein hydrolases enzymes in food processing, **excluding** the tenderization of meat. (2)

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QUESTION 6

6.1.1 Give two (2) types of micronutrients found in the germ/embryo. (2)

6.1.2 What is the nutritional advantage of brown rice compared to white rice? (1)

6.1.3 State any two (2) advantages of marketing maize in the form of maize snacks compared to fresh maize on the cobs. (2)

6.2 With reference to the chemical/nutritional composition of cereal grains, justify the statement "Cereal grains are a very important food source". (20)

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QUESTION 7

7.1 List and state the chemical nature of five (5) types/classes of non-starch polysaccharides found in plant foods. (15)

7.2 Name the reaction and outline the reaction steps (chemical structures are not necessary) which will occur when sucrose is heated at temperatures above 100°C in acidic or alkaline conditions, in the absence of nitrogen-containing substances (i.e. no proteins, amino acids, peptide, ammonia, etc.) (10)

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