NAMIBIA UNIVERSITY
OF SCIENCE AND TECHNOLOGY

Faculty of Health, Natural Resources and Applied Sciences

School of Health Sciences

Department of Preventative Health Sciences

13 Jackson Kaujeua Street
Private Bag 13388
Windhoek
NAMIBIA

T: +264 61 207 2970
F: +264 61 207 9970
E: dphs@nust.na
W: www.nust.na

QUALIFICATION : **BACHELOR OF HUMAN NUTRITION**	
QUALIFICATION CODE: **08BOHN**	LEVEL: **6**
COURSE: **FOOD CHEMISTRY**	COURSE CODE: **FCH621S**
DATE: **NOVEMBER 2024**	SESSION: **1**
DURATION: **3 HOURS**	MARKS: **100**

FIRST OPPORTUNITY EXAMINATION: QUESTION PAPER

EXAMINER: **MR. ERICK NATANGWE UUKULE**

MODERATOR: **MS. FIINA K. NAMUKWAMBI**

INSTRUCTIONS:

1. Answer all questions on the separate answer sheet.
2. Please write neatly and legibly.
3. Do not use the left side margin of the exam paper. This must be allowed for the examiner.
4. No books, notes and other additional aids are allowed.
5. Mark all answers clearly with their respective question numbers.

PERMISSIBLE MATERIALS:

1. None

ATTACHMENTS

1. None

This question paper consists of 5 pages including this front page

SECTION A: MULTIPLE CHOICE AND TRUE / FALSE [20 MARKS]

QUESTION 1: MULTIPLE CHOICE QUESTIONS [10 MARKS]

Evaluate the statements in each numbered section and select the most appropriate answer or phrase from the given possibilities. Fill in the appropriate letter next to the number of the correct statement/phrase on your ANSWER SHEET. [10]

1.1 Which of the following proteins is not a structural protein:

A. Keratin.
B. Collagen.
C. Actin.
D. Elastin.

1.2 Water activity is known to influence the rate of chemical reactions such as:

A. Lipid oxidation.
B. Non-enzymatic browning.
C. Enzyme activity.
D. All of the above.

1.3 Which of the following is not a type of non-polar lipids:

A. Phospholipids.
B. Waxes.
C. Triacylglycerols.
D. Cholesterols.

1.4 The disaccharide *"maltose"* is made up of the following sugar monomers:

A. Glucose and Galactose.
B. Glucose and Glucose.
C. Glucose and Fructose.
D. Glucose and Lactose.

1.5 Which of the following thermal processing technologies is not an example of moist heating:

A. Frying.
B. Steaming.
C. Pasteurisation.
D. Autoclaving.

1.6 From the list below, identify the pigment that serves as a precursor for Vitamin A:

A. Carotenoids.
B. Chlorophylls.
C. Anthocyanins.
D. Betalains.

1.7 Natural antioxidants include vitamins such as:

A. Vitamins C and E
B. Vitamins A and C
C. Vitamins A and K
D. Vitamins C and D

1.8 Hypervitaminosis is likely to be caused by:

A. Vitamin A.
B. Vitamin B_3.
C. Vitamin B_9.
D. Vitamin C.

1.9 Globular proteins are known to be:

A. Insoluble in water.
B. Long and narrow.
C. More sensitive to changes in temperature and pH.
D. Structural proteins.

1.10 Which of the following fatty acids is likely to have the lowest melting point in °C:

A. C 4:0
B. C 10:0
C. C 16:1
D. C 18:1

QUESTION 2: TRUE/FALSE QUESTIONS **[10 MARKS]**

Evaluate the statements and select whether the statement is true or false. Write the word 'True' or 'False' next to the corresponding number on your ANSWER SHEET. [10]

2.1 The degradation of pectin is known to positively modify the texture of fruits.

2.2 Iron, iodine and Vitamin A deficiencies are the most common around the world.

2.3 Hygroscopic foods are able to easily lose moisture to their immediate environment, especially under humid conditions.

2.4 Physically entrapped water may result in a food product that has a high water activity.

2.5 Peptide, Ester and Glyosidic bonds are all formed through condensation reactions.

2.6 Enzymes speed up reactions by increasing a reaction's activation energy.

2.7 Minerals remain as ash after the combustion of plant and animal tissues.

2.8 A high moisture content is always indicative of high water activity.

2.9 Most bacterial species start thriving from a water activity of 0.91.

2.10 Stereoisomers have the same molecular formula but different structures.

SECTION B: SHORT/LONG ANSWER QUESTIONS [80 MARKS]

Please answer ALL of the questions in this section.

QUESTION 3 (30 MARKS)

3.1 Define the following terms:

a) Water activity. (3)

b) Interesterification. (3)

c) Essential mineral. (2)

d) Food additives (3)

e) Gelatinisation (3)

3.2 As nutritionists, which aspects of food chemistry are we required to understand for effective dietary interventions. (3)

3.3 State any four (4) major forces that stabilise protein structures. (4)

3.4 Discuss the different mechanisms that contribute to the allergenic properties of proteins. (6)

3.5 Explain the impact of rapid denaturation on protein structure and function. (3)

QUESTION 4 (25 MARKS)

4.1 Draw the aliphatic structures of the following fatty acids:

a) C18:2$\Delta^{9,12}$ (3)

b) C16:0 (2)

c) C18:3 ω-3 (3)

4.2 Hydrogenation makes lipids more solid at room temperature and improves their oxidative stability. However, there are potential drawbacks. What health concerns should we keep in mind when practicing hydrogenation and how can these concerns be mitigated? (4)

4.3 After a good harvest, Mr Erick is left with a lot of spinach that he could not sell at the market. As such, he gets the idea to can the leftover spinach. However, after his first three canning attempts, Mr Erick realises that his canned spinach was no longer green but had a pale yellow colour. Answer the following questions:

a) Why is colour an important quality attribute of foods? (3)

b) What is the name of the pigment responsible for the colour of spinach? (1)

c) Describe the role of thermal processing in the loss of the spinach's green colour. (3)

d) Suggest three (3) ways by which Mr. Erick can retain the green colour of his canned spinach. (3)

4.4 Outline the conditions that must be met before a Maillard reaction can take place. (3)

QUESTION 5 (25 MARKS)

5.1 The Ministry of Health intends to initiate a food fortification campaign, however they are unsure on the type of food to include in this campaign. How would you advice the Ministry of Health in this regard? (3)

5.2 The presence of inhibitors may affect the rate at which enzymes work. Differentiate between *"competitive inhibitors"* and *"non-competitive inhibitors"*. (4)

5.3 Highlight the four (4) main approaches to the study of food chemistry. (4)

5.4 Name and describe the three categories used to classify starch based on its digestibility. (6)

5.5 Discuss the impact of sugar on starch gelatinisation. (4)

5.6 Outline any four (4) strategies used to minimise the formation of acrylamide in food. (4)

- END OF QUESTION PAPER

-