

2ND SEM. 2016/17



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UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

- PROGRAMME** : **FOOD SCIENCE, NUTRITION AND TECHNOLOGY
YEAR II**
- COURSE CODE** : **FNS 204**
- TITLE OF PAPER** : **FOOD NUTRIENT ANALYSIS**
- TIME ALLOWED** : **TWO (2) HOURS**
- INSTRUCTIONS** : **ANSWER QUESTION ONE (1) AND ANY OTHER
TWO (2) QUESTIONS. STATISTICAL TABLES
AND FORMULA ARE PROVIDED AT THE END OF
THE QUESTION PAPER**

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GRANTED BY THE CHIEF INVIGILATOR**

QUESTION 1 (COMPULSORY)

- (a) What is sampling and what is a good sample?
(3 Marks)
- (b) Explain the following terms giving an example in each case:
i. Infinite population
ii. Homogeneous population
(6 Marks)
- (c) Explain **three (3)** types of ovens that can be used in moisture content determination of food.
(6 Marks)
- (d) The following data was obtained in the analysis of vitamin A:-

Table 1. Standard calibration curve data

Concentration (mg/L)	Absorbance @ 760 nm
0	0
1	0.1
2	0.4
3	0.5
4	0.8

Table 2. Sample absorbance values

Sample	Absorbance @ 760 nm
A	0.35
B	0.38
C	0.37
D	0.34

Answer the following questions and show all calculations

- i. Find the equation of the straight line. (5)
- ii. Calculate the correlation coefficient of the straight line (3)
- iii. Calculate the coefficient of determination and explain this value (4)
- iv. Calculate the concentration of each of the samples in Table 2 (4)
- v. Calculate the mean of the samples (3)
- vi. Calculate the standard deviation of the samples (4)
- vii. Calculate the coefficient of variation (2)
- (25 marks)

[TOTAL MARKS = 40]

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QUESTION 2

- (a) Explain how you would conduct the following procedures:-
i. Composite sampling
ii. Stratified sampling

(6 Marks)

- (b) Describe the principles behind the distillation method for moisture content determination.

(8 Marks)

- (c) Discuss the following steps in the Kjeldahl protein determination method:-
i. Digestion
ii. Distillation

(16 Marks)

[TOTAL MARKS = 30]

QUESTION 3

- (a) Calculate how many millilitres of 36% HCl you would add to a 1000 ml volumetric flask to make a 0.1 M solution, given that the molecular weight of HCl is 36.5 g/mole and density (ρ) is 1.1789 g/ml.

(10 Marks)

- (b) Explain the ash determination method.

(8 Marks)

- (d) Describe the Soxhlet extraction method for crude fat determination.

(8 Marks)

- (e) Give **Four (4)** other substances that are extracted together with true fats in the Soxhlet extraction method.

(4 Marks)

[TOTAL MARKS = 30]

QUESTION 4

- (a) The following data were obtained in the analysis of food: 3.456, 3.451, 3.475 and 3.452. Should 3.475 be rejected or retained at?
- i. 99% confidence level
 - ii. 95% confidence level
- (10 marks)**
- (b) Define the terms accuracy and precision.
- (6 Marks)**
- (c) Explain the principles in crude fibre determination method. What are the main components in crude fibre?
- (8 Marks)**
- (d) Describe the equipment in gas chromatography (GC).
- (6 Marks)**

[TOTAL MARKS = 30]

Formula
Mean

$$\bar{X} = \frac{\sum X}{n}$$

Standard deviation

$$s = \sqrt{\frac{\sum (x - \bar{x})^2}{n - 1}}$$

Coefficient of variation (CoV)

$$\text{CoV} = \frac{s}{\bar{x}} \times 100$$

Equation of a straight line

$$y = mx + c$$

Slope

$$m = \frac{\sum xy}{\sum x^2}$$

y-Intercept

$$c = \bar{y} - m\bar{x}$$

Correlation coefficient

$$r = \frac{\sum xy}{\sqrt{(\sum x^2)(\sum y^2)}}$$

Coefficient of determination

$$r^2 = \frac{(\sum xy)^2}{(\sum x^2)(\sum y^2)}$$

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Outlier

$$Q_{\text{exp}} = \frac{X_2 - X_1}{X_N - X_J}$$

- X_1 = Questionable value
- X_2 = Closest value to X_1
- X_N = Highest value
- X_J = Lowest value

Critical values for Dixon's Q-test

n	Q_{crit} CL at 90%	Q_{crit} CL at 95%	Q_{crit} CL at 99%
3	0.941	0.970	0.994
4	0.765	0.829	0.926
5	0.642	0.710	0.821
6	0.560	0.625	0.740
7	0.507	0.568	0.680
8	0.468	0.526	0.634
9	0.437	0.493	0.598
10	0.412	0.466	0.568

The data is discarded if the calculated Q-value is higher than the tabulated value Q_{critical}