UNIVERSITY OF SWAZILAND

FINAL EXAMINATION PAPER

PROGRAMME : FOOD SCIENCE, NUTRITION AND TECHNOLOGY YEAR III

COURSE CODE : FSNT 307

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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QUESTION 1 (COMPULSORY)

(a) Give **two (2)** reasons for conducting nutrient analysis and the steps involved.
(5 Marks)

(b) Distinguish between accuracy and precision.
(4 Marks)

(c) Explain the principles of the Geber method for fat content determination in milk.
(6 Marks)

(d) The following data were obtained in the analysis of vitamin A:-

Table1. Standard calibration curve data

Concentration (mg/L)	Absorbance @ 760 nm
0	0
1	0.3
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:
(Formula are provided on page 6 of this question paper)

i. Find the equation of the straight line. (5)
ii. Calculate the correlation coefficient of the straight line (4)
iii. Calculate the concentration of each of the samples in Table 2 (4)
iv. Calculate the mean of the samples (4)
v. Calculate the standard deviation of the samples (4)
vi. Calculate the coefficient of variation (4)

(25 marks)

[TOTAL MARKS = 40]

QUESTION 2

(a) Explain how you would conduct the following procedures:-

i. Composite sampling
ii. Stratified sampling
iii. Random sampling
iv. Systematic sampling

(8 Marks)

(b) Explain **three (3)** constituents of food that may interfere with moisture content determination, stating how they will affect the results.

(6 Marks)

(c) Discuss the following steps in the Kjeldahl protein determination method:-

i. Digestion
ii. Distillation

(16 Marks)

[TOTAL MARKS = 30]

QUESTION 3

(a) Explain the type of error you would encounter if the following happens during nutrient analysis and how this error will affect the results:

i. A pH meter was used without first calibrating it with buffer solutions.
ii. Your fellow group member weighed 25 g of reagent instead of 0.25 g.

(4 Marks)

(b) Describe the equipment in high performance liquid chromatography (HPLC) system and its function.

(8 Marks)

(c) Explain the principle behind the direct method for ash determination.

(2 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.

(8 Marks)

[TOTAL MARKS = 30]

QUESTION 4

(a) The following data were obtained for the sugar concentration of a sugar solution: 4.85, 6.18, 6.28, 6.49 and 6.69. Should 4.85 be rejected or retained at:

i. 95% confidence level
ii. 99% confidence level

(Critical values for Dixon's Q-test are provided on page 6 of this question paper)

(10 marks)

(b) Explain the principles in crude fibre determination method.

(8 Marks)

(c) Briefly explain the use and principle of atomic absorption spectroscopy.

(4 Marks)

(d) What type of sample is gas chromatography suitable for?

(2 Marks)

(e) Describe the equipment in gas chromatography (GC).

(6 Marks)

[TOTAL MARKS = 30]

Formula

Mean

$$\bar{X} = \frac{\Sigma x}{n}$$

Standard deviation

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

Coefficient of variation (CoV)

$$CoV = \frac{S}{\bar{X}} x\ 100$$

Equation of a straight line

$$y = mx + c$$

Slope

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

y-Intercept

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

Correlation coefficient

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

Outlier

$$Q\ value = \frac{x_2 - x_1}{W}$$

Where x_1 = Questionable value
x_2 = Closest value to X1
W = Range (Highest value – 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