



2ND SEM. 2015/16

PAGE 1 OF 5

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) Explain the following terms:-
- i. Sampling (2 Marks)
 - ii. Finite population (2 Marks)
 - iii. Heterogeneous population (2 Marks)
- (b) Discuss **four (4)** changes that could occur to the food sample and how these changes can be slowed down or stopped. (20 Marks)
- (c) What is the function of sulphuric acid and amyl alcohol in the Geber method for fat content determination in milk? (2 Marks)
- (d) The equation $y = 0.1933x + 0.0134$ was obtained for the standard calibration curve (x-axis = concentration and y-axis = absorbance) for vitamin A.
- i. Using the equation, calculate the concentration of each of the following samples. (4 Marks)
- | Sample | Abs |
|--------|------|
| A | 0.35 |
| B | 0.38 |
| C | 0.37 |
| D | 0.34 |
- ii. Calculate the mean of the samples. (2 Marks)
 - iii. Calculate the standard deviation of the samples. (4 Marks)
 - iv. Calculate the coefficient of variation. (2 Marks)
- [TOTAL MARKS = 40]

QUESTION 2

- (a) Discuss the **three (3)** forms of water in food and indicate which form of water is not determined by the oven drying method. (9 Marks)
- (b) Explain the principles behind the following methods for moisture content determination in food:-
- i. Microwave drying method (2 Marks)
 - ii. Distillation method (5 Marks)
 - iii. Gas production method (4 Marks)
- (c) Explain the digestion, distillation and titration steps in the Kjeldahl protein determination method. (10 Marks)

[TOTAL MARKS = 30]

QUESTION 3

- (a) Describe the following types of errors in nutrient analysis and explain how these errors will affect the results:-
- i. Determinate error (3 Marks)
 - ii. Indeterminate error (3 Marks)
 - iii. Gross error (3 Marks)
- (b) Explain the following functions of HPLC:-
- i. Chemical separation (3 Marks)
 - ii. Purification (3 Marks)
 - iii. Identification (3 Marks)
 - iv. Quantification (4 Marks)
- (d) Describe the Soxhlet extraction method for crude fat determination. (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, 6.69. Should 4.85 be rejected or retained at the following confidence levels:-
- i. 95% (10 marks)
 - ii. 90%
- (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 causes fluorescence in some compounds such as aflatoxins under UV light? (2 Marks)
- (e) 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)

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

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

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

Outlier

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

Where x_1 = Questionable value

x_2 = Closest value to X_1

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 $Q_{critical}$