

Cork Institute of Technology

Bachelor of Science in Food Science & Technology - Award

(NFQ – Level 7)

December 2006

Food Chemistry

(Time: 3 Hours)

Answer **five** questions.

Answer four questions from Section A

Answer one question from Section B

Please use separate answer books for each section.

All questions carry equal marks.

Examiners:

Mr. E. Fitzgerald

Dr. A. Furey

Prof. R. Fitzgerald

Section A

- Q1. Describe a laboratory technique to determine the complete composition of butter. Use appropriate diagrams and show a sample set of calculations. (20 marks)
- Q2. Write short notes on three of the following:
- a. Diabetes and the role of nutrition in its management
 - b. Nutrition of the elderly
 - c. Irritable Bowel Syndrome
 - d. The role of nutrition in the management of Attention Deficit Hyperactive Disorder.
 - e. Nutrition for sprint swimmers (20 marks)
- Q3. “There is no such thing as an unhealthy food, only unhealthy diets” Discuss. (20 marks)
- Q4. Describe the importance of proteins in the structure, functionality and spoilage of foods. (20 marks)

- Q5. (a) What mass of sodium ethanoate (purity 87%) and what volume of ethanoic acid (M.W. 60, purity: 97%, specific gravity: 1.27, $K_a: 1.8 \times 10^{-5}$) should be taken to make 2.45 l of 0.66 M buffer of pH 4.88? (10 marks)
- (b) What will be the pH and molarity of 2000 ml of buffer made up using 28ml of the acid and 42g of the sodium ethanoate in (a) above? (10 marks)
- Q6. Discuss the significance of plastic flow in the formulation and manufacture of foods, cosmetic products and topically applied healthcare products. (20 marks)
- Q7. Write short notes on three of the following:
- a. Handling chemical spillages
 - b. Safety when handling enzymes
 - c. Safety with corrosive chemicals
 - d. Safety with mutagens
 - e. Personal Protective Equipment. (20 marks)
- Q8. “Modern food processing depends of the use of additives and, once properly used, they pose no danger to health” Discuss. (20 marks)

Section B

- Q9. (a) Briefly discuss the techniques of atomic absorption and atomic emission spectrometry taking into account (i) their differences and similarities, (ii) instrumentation used, and (iii) their applications. (6 marks)
- (b) Discuss the technique of Inductively Coupled Plasma Atomic Emission and the application of this technique to the analysis of heavy metals in food samples. Include in your answer the advantages / disadvantages of ICP compared with flame excitation sources. (8 marks)
- (c) 20.0 cm³ aliquots of a raw-water sample were pipetted into five 50.0 cm³ volumetric flasks. A 100 cm³ solution of 20 ppm copper was prepared from a 100 ppm Cu solution. Then 0.00, 2.00, 4.00, 6.00, and 8.00 cm³ respectively of the 20 ppm copper solution were added to one of these five volumetric flask. All of these standard solutions were diluted to volume with distilled water and analysis was performed using an atomic absorption spectrophotometer. The results are given below.

Volume of Cu standard added (cm ³) to 20 ml water sample	Absorbance (A)
0.00	0.063
2.00	0.102
4.00	0.139
6.00	0.179
8.00	0.212

Calculate the concentration in ppm of Cu in the raw water sample, using standard addition quantitation. (6 marks)

- Q10. (a) What are the advantages and disadvantages of packed and open tubular columns in gas chromatography (GC)? Describe the types of stationary liquid phases that may be employed in GC columns.

Briefly what factors influence the efficiency of GC analysis using packed columns? (10 marks)

- (b) Write a brief note on one of the following gas chromatography topics:
- (i) Temperature Programming
 - (iii) Internal Standardisation in GC

(4 marks)

- (c) To each of a series of six 100.0 cm³ volumetric flasks were added 3.00 cm³ of propan-1-ol. To five of the flasks were then added respectively 1.00, 2.00, 3.00, 4.00 and 5.00 cm³ of pure ethanol; the resultant solutions were then diluted to volume with distilled water. A whiskey samples (10 ml) contained the propan-1-ol (3 ml) was diluted to volume with distilled water. All six solutions were then analysed by GC-FID, the areas underneath the ethanol and the propan-1-ol peaks were recorded. The results obtained are as follows:

% Ethanol (v/v)	Area of ethanol peak (mm ²)	Area of propan-1-ol peak (mm ²)
1.00	1500	4685
2.00	2817	4410
3.00	4715	4900
4.00	6020	4700
5.00	7000	4350
Whiskey sample	5516	4500

Calculate the percentage by volume of ethanol in the whiskey sample. (6 marks)