

# Cork Institute of Technology

## Higher Certificate in Science in Applied Biology – Stage 1

(NFQ Level 6)

Autumn 2006

### Bioanalytical Science

(Time: 3 Hour)

Answer **five** questions  
Answer **two** from each Section  
Answer the **5th question** from either A or B  
Use **separate answer books** for each Section

Examiners: Ms. R. Kiernan  
Dr. M. Sheahan  
Prof. R. Fitzgerald

### Section A

- Q1. Many chemical reactions and analytical methods are carried out in solution. In the case of analytical procedures, it is critical that homogenous solutions are used. Many analyses require the preparation of a standard reference solution; this reference solution may be prepared from a primary standard reagent or a secondary standard reagent depending on the type of analysis and the reagents available.

Answer the following questions on the above passage:

- (i) Explain each of the underlined terms. (8 marks)
- (ii) A 0.50M solution of silver nitrate ( $\text{AgNO}_3$ ) is required to standardize a solution of sodium chloride. Determine the weight of  $\text{AgNO}_3$  required to prepare  $100\text{cm}^3$  of a 0.5M solution. Describe how the solution may be prepared and indicate all the precautions that have to be taken to ensure the concentration is accurate. (8 marks)
- (iii) Perform the appropriate calculations to determine if a 10% w/v solution of  $\text{AgNO}_3$  is more or less concentrated than the 0.5M  $\text{AgNO}_3$  solution. (4 marks)

Atomic masses: Ag (107.86), O (16), N (14)

- Q2. Write a note on each of the following: *Each part carries 4 marks*
- (a) Threshold limit values and LD<sub>50</sub> values
  - (b) Upper and Lower Explosive Limits
  - (c) Electrical hazards in a laboratory environment
  - (d) Actions to be taken in the event of a laboratory fire
  - (e) Fire extinguishers; types and suitability to the different fire types
- Q3. (a) Draw a fully labelled diagram for a simple distillation apparatus set-up and briefly explain the distillation process i.e. how a pure sample may be obtained from an impure liquid mixture. (8 marks)
- (b) Identify the occasions when a fractional distillation is a more appropriate method of purification / separation than a simple distillation. (4 marks)
- (c) Explain with the aid of a sketch of the appropriate apparatus, why it may be necessary to perform a distillation under reduced pressure. (6 marks)
- (d) What is an azeotrope? (2 marks)

## Section B

- Q4. (a) Describe in detail how you would treat a person suffering from shock. (8 marks)
- (b) Comment on the causes, signs and symptoms of shock. (8 marks)
- (c) Outline the first aid treatment you would administer for a corrosive chemical splash on the skin. (4 marks)

- Q5. (a) Explain your understanding of the following: (i) Normality; (ii) % w/v; (iii) % w/w; (iv) % v/v and (v) g/L (5 marks)
- (b) Calculate the weight required to prepare 200cm<sup>3</sup> of a 0.1M Tris HCl (121.1g/mole) buffer of pH 7.0. (4 marks)
- (c) Outline the steps involved in the preparation of this buffer. (6 marks)
- (d) Comment on possible sources of error. (5 marks)

Q6. Write notes on all of the following: *Each part carries 5 marks*

- (a) Preparation of standard solutions
- (b) The pH meter
- (c) Sterilization, Disinfectants and antiseptics
- (d) Accuracy and precision

(20 marks)