

Cork Institute of Technology

Bachelor of Science in Applied Biology-Stage I

(SBIOS_7_Y1)

Summer 2008

Bioanalytical Science 1(Old Syllabus)

(Time: 3 Hours)

Answer **FIVE** questions as follows:

Question 1 is compulsory

Answer **two** questions from section B

Answer **any other two** questions

Examiners: Ms. R. Kiernan

Ms. E. Flannery

Dr. M. Sheahan

Prof. Gary Walsh

Use separate answer books for each section

Section A

Q1. Answer ALL of the following: *each part carries 2 marks*

- (a) List two safety precautions that should be taken when working with chemicals in the laboratory.
- (b) Convert 0.05ml to microlitres (μL) and state which of the following pipettes would be used to deliver this volume: P100, P1000 or P5000?
- (c) Comment on the precision of the following set of data (units are in g): 4.0, 4.01, 3.99, 4.0, 4.01, 5.02, 3.99, 4.0, 4.01, 4.0.
- (d) What is meant by the pH of a solution? List two ways the pH of a solution can be measured in the laboratory.
- (e) Give labelled diagrams to illustrate the appearance of a suspension of bacteria **before** and **after** centrifugation at 4000rpm for 15 minutes.
- (f) What is meant by the R_f value as used in thin layer chromatography?
- (g) Indicate the quantities of glucose and water required to make up a 2% w/v glucose solution. Describe the correct procedure for the preparation of this solution.
- (h) List three buffers commonly used in biological systems.
- (i) What solution can be added to an amino acid to give its pK_1 value?
- (j) List two safety precautions that should be taken when dealing with a minor fire outbreak in the laboratory.

- Q2.(a) Describe in detail how you would treat a person suffering from shock. (6 marks)
- (b) Comment on the causes, signs and symptoms of shock (6 marks)
- (c) List the contents of a first aid box. (4 marks)
- (d) What is meant by the levels of responsiveness? (4 marks)

Q3. Write notes on ALL of the following: *each part carries 5 marks*

- (a) Laboratory safety
- (b) The spectrophotometer
- (c) Biological cabinet safety
- (d) Preparation of standard solutions

Section B

- Q4.(a) Discuss carcinogens using the following guidelines:
- (ii) Methods for their identification (6 marks)
- (iii) Primary, secondary and cocarcinogens (6 marks)
- (iv) Measures to prevent exposure (3 marks)
- (b) Briefly explain how exposure to radiation can lead to a variety of different cancers. In your answer identify the type(s) of radiation that are most likely to lead to cancer. (5 marks)

- Q5.(a) What is a *homogeneous solution*? (2 marks)
- (b) An aqueous stock solution of silver nitrate (AgNO_3) which was prepared by dissolving 0.05g of AgNO_3 in water and diluting to a final volume of 100cm^3 .
- (i) Calculate the molarity of the solution (2 marks)
- (ii) What is the % (w/v) composition of the solution? (2 marks)
- (iii) What volume of the stock solution needs to be diluted to prepare 50cm^3 of a 100ppm AgNO_3 solution? (4 marks)
- (c) Diethyl ether ($\text{C}_2\text{H}_5\text{OC}_2\text{H}_5$) and water are produced by treating ethanol ($\text{C}_2\text{H}_5\text{OH}$) with acid. All species in the reaction are present in the liquid phase.
- (i) Write a balanced equation for this reaction (2 marks)
- (ii) Calculate the theoretical yield (in grams) of diethyl ether if 138g of ethanol are used. (3 marks)
- (iii) How many grams of diethyl ether would be obtained from 40.0g of Ethanol if the percent yield of the reaction is 87%? (3 marks)
- (iv) Give the empirical formulae for both diethyl ether and ethanol. (2 marks)

- Q6.(a) Differentiate between the terms *acute toxicity* and *chronic toxicity*. (4 marks)
- (b) In terms of their toxic effects, differentiate between mutagens, teratogens and carcinogens. (6 marks)
- (c) In the case of each of the underwritten categories, identify specific criteria that have to be considered for their safe storage:
- (i) Flammable materials (3 marks)
 - (ii) Corrosive substances (3 marks)
 - (iii) Water sensitive and air sensitive chemicals (4 marks)