

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 2 Examinations 2013/2014

Module Title: Bioanalytical Techniques

Module Code: BIOT7002

School: Science & Informatics

Programme Title: BSc Applied Biosciences
 BSc (Hons) Pharmaceutical Biotechnology
 BSc (Hons) Nutrition & Health Science
 BSc (Hons) Herbal Science

Programme Code: **SBIOS_7_Y2**
 SPHBI_8_Y2
 SNHSC_8_Y2
 SHERB_8_Y2

External Examiner(s): **Dr. Tom O' Connor**
 Dr. Cormac Gahan
 Prof. Torres Sweeney
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Internal Examiner(s): Anne Ward

Instructions: **Answer any FOUR questions.**
 All questions carry equal marks

Duration: 2 Hours

Sitting: Summer 2014

Requirements for this examination: Calculator

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination paper.
If in doubt please contact an Invigilator.

Q1. (a) Define each of the following terms:

(i) Relative Centrifugal Force (RCF) (3 marks)

(ii) Revolutions per minute (RPM) (3 marks)

For an RCF value of 15,000g and a rotor radius of 10cm, calculate the corresponding rpm value in a centrifugation separation experiment.

(6 marks)

(b) Describe using a diagram for illustration the principle of Differential Centrifugation. (5 marks)

(c) What is the principle of separation in isopycnic density gradient centrifugation (5 marks)

(d) List three types of cell disruption technique used in purification (3 marks)

Q2. For ion exchange chromatography:

(a) Explain the principle of separation. (4 marks)

(b) Draw a simple diagram to illustrate this principle. (4 marks)

(c) Write a brief note on ion exchange media used for this type of separation (4 marks)

(d) Outline briefly the experimental procedure under the following headings:

(i) Equilibration (3 marks)

(ii) Adsorption (3 marks)

(iii) Elution (3 marks)

(e) Give one example of the application of ion exchange chromatography that you are familiar with. (4 marks)

Q3.

(a) Outline the principle of separation in gas chromatography. (5 marks)

(b) List the main types of stationary phase used in gas chromatography. (5 marks)

(c) Name any detection system used in gas chromatography (5 marks)

(d) Write a brief overview of Infra-Red Spectroscopy under the following headings:

(i) Principle of analysis (5 marks)

(ii) IRS Instrumentation (5 marks)

Q4.

(a) Gel filtration chromatography is a method used to separate molecules based on their size and relative molecular weight. Give an overview of the principle of separation for this method. Illustrate your answer with a diagram. (15 marks)

(b) Define each of the following in relation to gel filtration chromatography:

- (i) Void Volume
- (ii) Elution Volume
- (iii) Total Bed Volume
- (iv) Partition Coefficient (K_{av})

How would you calculate each of these values from a size exclusion experiment? (10 marks)

Q5.

(a) Describe the principle of separation in HPLC under the following headings:

- (i) Principle of Reverse Phase chromatography (5 marks)
- (ii) Stationary and Liquid phases (5 marks)
- (iii) HPLC detection systems. (5 marks)

(b) Outline the main experimental considerations in the design of a Polyacrylamide Gel Electrophoresis system (10 marks)

Q6. For Affinity Chromatography:

- (a) Explain the principle of separation (8 marks)
- (b) Draw a diagram to illustrate the principle (6 marks)
- (c) What type of matrix can be used for this type of chromatography (5 marks)
- (d) Outline TWO applications with examples of this method of separation (6 marks)