

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn 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
 Prof. Olivia Corcoran

Internal Examiner(s): **Anne Ward**

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

Duration: 2 Hours

Sitting: Autumn 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) Explain the principle of separation of photosynthetic pigments by paper chromatography (5 marks)

(b) What is the significance of calculation of R_f values in this experiment. (6 marks)

(c) For a gel filtration separation experiment, calculate the K_{av} value for Cytochrome C from the following data:

Ve1 Blue Dextran = 6ml

Ve2 Cytochrome C = 10ml

Ve3 Phenol Red = 18ml (5 marks)

(d) Define each of the following:

(i) Void volume (V_o)

(ii) Partition Coefficient (K_{av})

(iii) Total bed volume (V_t) (9 marks)

Q2. (a) Outline the principle of separation in each of the following centrifugation techniques:

(i) Differential Centrifugation (7 marks)

(ii) Isopycnic Density Gradient centrifugation (7 marks)

(b) Write a brief note on each of the following:

(i) Cell isolation techniques (6 marks)

(ii) Cell disruption techniques (5 marks)

Q3. Ion exchange chromatography is a separation technique in which components of a mixture are separated on the basis of net charge.

(a) Briefly describe the principle of separation (7 marks)

(b) Draw a diagram to illustrate this separation (6 marks)

(c) Outline briefly what occurs during each of these stages of separation

(i) Equilibration (4 marks)

(ii) Adsorption (4 marks)

(iii) Elution (4 marks)

- Q4. (a) Outline the principle of separation in reverse phase HPLC chromatography (5 marks)
- (b) What type of stationary phase can be used in HPLC (5 marks)
- (c) List two detectors commonly used in HPLC (5 marks)
- (d) Explain the principle of analysis in IR Spectroscopy (10 marks)

- Q5. (a) Explain the principle of separation in Polyacrylamide gel electrophoresis (PAGE) (5 marks)
- (b) What are the main experimental conditions in the design of a PAGE system. (10 marks)
- (c) List two methods of protein analysis post electrophoresis (5 marks)
- (d) From your own laboratory experience list the five main groups of plasma proteins separated by agarose gel electrophoresis. (5 marks)

Q6. Write a brief overview of the principle of TWO of the following:

- (i) Gas chromatography
- (ii) Affinity chromatography
- (iii) Gel Filtration chromatography

Use diagrams to illustrate your answer for each method described. (25 marks)