

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2014/2015

Module Title: Bioanalytical Techniques

Module Code: BIOT7002

School: Science

Programme Title: Bachelor of Science Applied Biosciences – Year 2
 Bachelor of Science (Honours) Pharmaceutical Biotechnology – Year 2
 Bachelor of Science (Honours) Nutrition & Health Science – Year 2
 Bachelor of Science (Honours) Herbal Science - Year 2

Programme Code: **SBIOS_7_Y2**
 SPHBI_8_Y2
 SNHSC_8_Y2
 SHERB_8_Y2

External Examiner(s): Dr. Tom O Connor

Internal Examiner(s): Anne Ward

Instructions: Answer FOUR questions only. All questions carry equal marks

Duration: 2 Hours

Sitting: Autumn 2015

Requirements for this examination:

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) Describe with the aid of a diagram the principle of Gel Filtration chromatography. (14 marks)

(b) The following set of readings were generated in a gel filtration experiment for the separation of Blue Dextran, Cytochrome C and Phenol Red using a Sephadex G50 column:

Elution volume (V_{e1}) Blue Dextran = 6ml

Elution volume (V_{e2}) Cytochrome C = 10ml

Elution volume (V_{e3}) Phenol Red = 22ml

- (i) What is the Void volume (V_o) for this experiment? (3 marks)
- (ii) What is the Total volume (V_t) for this experiment? (3 marks)
- (iii) Calculate the K_{av} value for Cytochrome C (5 marks)

Q2. (a) Describe with the aid of a diagram the principle of ion-exchange chromatography (10 marks)

(b) Outline the experimental procedure for ion-exchange separation under the following headings:

- (i) Equilibration (3 marks)
- (ii) Adsorption (3 marks)
- (iii) Elution (3 marks)

(c) Give an example of an experiment which you have performed which uses ion-exchange chromatography for purification of a protein. (6 marks)

Q3. (a) Outline the principle of separation in each of the following centrifugation techniques:

- (i) Differential Centrifugation (7 marks)
- (ii) Rate zonal 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)

- Q4. (a) Explain the principle of separation in SDS-Polyacrylamide Gel Electrophoresis (10 marks)
- (b) List two methods of protein analysis post-electrophoresis (5 marks)
- (c) From your own laboratory experience list the five main groups of plasma proteins separated by agarose electrophoresis (5 marks)
- (d) What is isoelectric focusing? (5 marks)

- Q5. (a) Outline the method of Infra-Red Spectroscopy under the following headings:
- (i) Principle of analysis (5 marks)
- (ii) Instrumentation (5 marks)
- (b) What type of detectors are commonly used in HPLC separation? (9 marks)
- (c) What are the three types of stationary phases typically used in HPLC? (6 marks)

- Q6. (a) Describe and illustrate the principle of separation in Affinity chromatography (10 marks)
- (b) Outline the principle of separation in gas chromatography (5 marks)
- (c) List the main types of stationary phase used in gas chromatography (5 marks)
- (d) What type of detection system is commonly used in gas chromatography? (5 marks)