

**CORK INSTITUTE OF TECHNOLOGY**  
**INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

**Semester 2 Examinations 2012/2013**

**Module Title:     Bioanalytical Techniques**

**Module Code:             BIOT7002**

**School:                     Science & Informatics**

**Programme Title:**     BSc in Applied Biosciences Year 2  
                                 BSc (Hons) Nutrition & Health Sciences Year 2  
                                 BSc (Hons) Pharmaceutical Biotechnology Year 2  
                                 BSc (Hons) in Herbal Science Year 2

**Programme Code:**    SBIOS\_7\_Y2  
                                 SPHBI\_8\_Y2  
                                 SNHSC\_8\_Y2  
                                 SHERB\_8\_Y2

**External Examiner(s):     Dr A. Nelson, Dr J. Bird, Prof T. Sweeney, Dr J. Green**  
**Internal Examiner(s):     Anne Ward**

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

**Duration:             2hr**

**Sitting:                 Autumn 2013**

**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 ion-exchange chromatography. (8 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) Write a brief outline of the principle of ONE of the following;
- (i) Isoelectric focusing
  - (ii) Differential centrifugation (8 marks)
- Total 25 marks**

- Q2. Describe and illustrate the principle of separation in affinity chromatography under the following headings:
- (a) Preparation of affinity matrix (8 marks)
  - (b) Adsorption & Elution of biomolecules (9 marks)
  - (c) Applications of affinity chromatography (8 marks)
- Total 25 marks**

- Q3. (a) Outline the principle of separation in gas chromatography. (7 marks)
- (b) List the main types of stationary phase used in gas chromatography. (3 marks)
- (c) Outline the basic design of GC instrumentation. (5 marks)
- (d) What type of detection systems are commonly used in gas chromatography? (10 marks)
- Total 25 marks**

- Q4. (a) Outline the method of Infra-Red Spectroscopy under the following headings:
- (i) Principle of analysis (5 marks)
  - (ii) Instrumentation used (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)
- Total 25 marks**

- Q5. (a) Describe with the aid of a diagram the principle of gel filtration chromatography. (12 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 (Ve1) Blue Dextran = 5ml  
Elution volume (Ve2) Cytochrome c = 12ml  
Elution volume (Ve3) Phenol Red = 22ml
- Calculate the Kav value for Cytochrome c. (7 marks)
- (c) Define each of the following in relation to gel filtration separation:
- (i) Void volume (2 marks)
  - (ii) Inner volume (2 marks)
  - (iii) Total bed volume (2 marks)
- Total 25 marks**

- Q6. (a) What is the principle of separation in gel electrophoresis? (6 marks)
- (b) Explain the difference in preparation of agarose versus polyacrylamide gels. (3 marks)
- (c) Outline the main experimental considerations in the design of a Polyacrylamide Gel system. (12 marks)
- (d) List TWO methods of protein analysis post-electrophoresis. (4 marks)
- Total 25 marks**