

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: Summer 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 Gel Filtration Chromatography. (10 marks)
- (b) Define each of the following:
- (i) Void Volume (V_o) (2 marks)
 - (ii) Partition Coefficient (K_{av}) (2 marks)
 - (iii) Total Bed Volume (V_t) (2 marks)
- (c) Outline how you would measure or calculate each of the parameters listed above. (6 marks)
- (d) What type of media can be used to perform gel filtration chromatography? (3 marks)
- Total 25 marks**

- Q2. (a) Define each of the following terms;
- (i) Centrifugal Force (3 marks)
 - (ii) Relative Centrifugal Force (RCF) (3 marks)
 - (iii) Revolutions per minute (RPM) (3 marks)
- (b) Outline each of the following types of centrifugal separation technique:
- (i) Differential Centrifugation (5 marks)
 - (ii) Density Gradient Centrifugation (5 marks)
- (c) List the main types of cell disruption techniques used in purification. (3 marks)
- (d) Briefly list the three categories into which centrifugation rotors can be classified. (3 marks)
- Total 25 marks**

Q3. (a) Describe & illustrate the principle of ion-exchange chromatography. (8 marks)

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

(i) Ion-exchange media (3 marks)

(ii) Experimental preparatory stages (3 marks)

(c) Outline the importance of Infra-Red Spectroscopy (IRS) as an analytical technique under the following headings:

(i) Physical basis of IRS (6 marks)

(ii) IRS instrumentation (5 marks)

Total 25 marks

Q4. (a) Outline the important parameters to be considered in the design of a Polyacrylamide Gel Electrophoresis system. (8 marks)

(b) Write a brief overview of analysis methods for proteins after electrophoresis. (5 marks)

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

(d) What type of detectors can be typically used in this type of chromatographic separation? (7 marks)

Total 25 marks

Q5. In relation to Affinity Chromatography:

(a) Briefly, describe the principle of the separation technique. Use a diagram to illustrate your answer. (10 marks)

(b) Outline TWO important applications of affinity chromatography. (5 marks)

(c) Outline the experimental procedure in terms of column preparation, adsorption & elution. (6 marks)

(d) What type of matrix can typically be used for this type of chromatography? (4 marks)

Total 25 marks

Q6. Outline the method of HPLC under the following headings:

- (a) Principle of Reverse Phase chromatography (5 marks)
- (b) Stationary & liquid phases in HPLC (5 marks)
- (c) Instrumentation (5 marks)
- (d) HPLC detectors (10 marks)

Total 25 marks