

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 2 Examinations 2015/2016

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, Dr. Annmarie Burns

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

Duration: 2hr

Sitting: Summer 2016

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) For centrifugal separation, define each of the following terms:

(i) RPM (2 marks)

(ii) RCF (2 marks)

(b) How would you convert RPM to RCF? (3 marks)

(c) List the main types of cell disruption techniques (5 marks)

(d) Propose one method used to isolate a specific type of cell from a tissue (3 marks)

(e) Outline briefly the principle of separation and application for each of the following centrifugation techniques:

(i) Differential centrifugation (5 marks)

(ii) Isopycnic Density Gradient centrifugation (5 marks)

Use diagrams where relevant to illustrate your answer.

Q2. (a) Describe with the aid of a labelled diagram the principle of Gel Filtration chromatography (10 marks)

(b) Define each of the following and detail how you would determine their value in a typical gel filtration experiment:

(i) Void volume (V_o) (2 marks)

(ii) Total volume (V_t) (2 marks)

(iii) Elution volume (V_e) (2 marks)

(iv) Partition Coefficient (K_{av}) (4 marks)

(c) Outline the principle of dialysis for biological separation and include a simple diagram to illustrate your answer. (5 marks)

Q3. (a) Outline the principle of separation in a HPLC system under the following headings:

(i) Reverse Phase chromatography (6 marks)

(ii) Stationary and Liquid phases (4 marks)

(iii) HPLC detectors (4 marks)

(b) What is the principle of analysis in Infra-Red Spectroscopy? (6 marks)

(c) Write a short overview of the main components of a UV-Vis spectrophotometer. (5 marks)

- Q4. (a) Outline the principle of separation in gas chromatography. (8 marks)
- (b) What types of stationary phases can be used in gas chromatography columns. (6 marks)
- (c) List the main types of detectors used in gas chromatography. (5 marks)
- (d) What are the key instrument components of a gas chromatography system? (6 marks)

- Q5. (a) Describe with aid of a diagram the principle of ion exchange chromatography. (10 marks)
- (b) What is a cation and an anion exchanger? Give an example of each. (5 marks)
- (c) Describe how you would equilibrate a cation or anion exchange column before separation. (5 marks)
- (d) Give an example of an experiment you have performed which uses ion exchange chromatography for the purification of a protein. (5 marks)

- Q6. (a) Explain the main differences between Agarose Gel and SDS PAG Electrophoresis (5 marks)
- (b) List the important experimental conditions required to perform a PAGE separation. (5 marks)
- (c) What is the principle of separation in an agarose gel for the separation of plasma proteins? (5 marks)
- (d) Draw a diagram illustrating and explaining the principle of isoelectric focusing. (10 marks)