

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 2 Examinations 2011/2012

Module Title: Bioanalytical Science IV

Module Code: BIOT6002

School: Science

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

Programme Code: SBIOS_7_Y2
 SPHBI_8_Y2
 SNHSC_8_Y2

External Examiner(s): Dr A. Nelson, Dr J. Bird, Dr A. Gallagher
Internal Examiner(s): Anne Ward

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

Duration: 2 hours

Sitting: Summer 2012

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) 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)

Q2. (a) Describe the principle of each of the following immuno-precipitation techniques:

- (i) Single Radial Immunodiffusion (SRID) (7 marks)
- (ii) Immunodiffusion (Ouchterlony Assay) (6 marks)
- (iii) Immunoelectrophoresis (6 marks)

Illustrate each assay with a diagram.

(b) Define each of the following:

- (i) Primary Immune Response (3 marks)
- (ii) Secondary Immune Response (3 marks)

Q3. (a) Define each of the following:

- (i) Heterogeneous immunoassay (3 marks)
- (ii) Polyclonal antibody (3 marks)
- (iii) Monoclonal antibody (3 marks)

(b) Using a diagram illustrate the principle of a heterogeneous competitive immunoassay. (10 marks)

(c) Briefly describe the principle of immunoaffinity chromatography. (6 marks)

- Q4. (a) Describe & illustrate, using an appropriate diagram, the principle of ion exchange chromatography under the following headings:
- (i) Ion exchangers & media (5 marks)
 - (ii) Experimental preparatory stages (5 marks)
 - (iii) Choice of operation conditions for elution (5 marks)
- (b) Briefly describe the principle of **ONE** of the following electrophoretic techniques:
- (i) SDS – PAGE, or
 - (ii) iso-electric focusing (10 marks)
- Q5. (a) Describe the four main performance characteristics required to achieve a reliable assay in bioanalytical testing. (12 marks)
- (b) Discuss the use of the control chart as a method of Internal Quality Control under the following headings:
- (i) Definition (3 marks)
 - (ii) Statistics used & control limits (5 marks)
 - (iii) Non-random patterns (5 marks)
- Q6. (a) Write brief notes on **TWO** of the following:
- (i) Principle of Gel filtration chromatography (8 marks)
 - (ii) Applications of Affinity Chromatography (8 marks)
 - (iii) Detection & quantitation methods post electrophoresis for proteins (8 marks)
- (b) In Good Laboratory Practice sources of error must be identified & eliminated to achieve a reliable assay. Outline the main sources of error associated with analytical methods. (9 marks)