

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

**Autumn 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:                Autumn 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) Explain the basis of the separation of photosynthetic pigments in paper chromatography. (10 marks)

(b) How would you calculate the  $R_f$  value for this type of separation? (5 marks)

(c) In a gel filtration experiment the following set of data was generated. Calculate the  $K_{av}$  value for cytochrome C from this data:

$V_{e1}$  = Blue Dextran = 7ml

$V_{e2}$  = Cytochrome C = 9ml

$V_{e3}$  = Phenol Red = 20ml (10 marks)

Q2. (a) Draw a diagram illustrating the principle of gel filtration chromatography. (12 marks)

(b) Define each of the following terms and state how you would estimate them in a gel filtration experiment:

(i) Void volume ( $V_o$ ) (3 marks)

(ii) Elution volume ( $V_e$ ) (3 marks)

(iii) Total volume ( $V_t$ ) (3 marks)

(iv) Partition coefficient ( $K_{av}$ ) (4 marks)

Q3. (a) Use a diagram to illustrate the basis of separation in differential centrifugation. (10 marks)

(b) List two applications of isopycnic density gradient centrifugation. (6 marks)

(c) What are the three categories of rotors commonly used in centrifugation experiments? (9 marks)

Q4. Write a brief review of the principle of TWO of the following techniques:

(i) Gas chromatography (10 marks)

(ii) Infra-red spectroscopy (10 marks)

(iii) Affinity chromatography (10 marks)

Include diagrams to illustrate your answer. (5 marks)

- Q5. (a) Explain the principle of separation in SDS-Polyacrylamide Gel Electrophoresis. (10 marks)
- (b) List three methods of analysis of proteins or nucleic acids after electrophoresis. (9 marks)
- (c) From your own laboratory experience list the five main groups of plasma proteins separated by agarose gel electrophoresis. (6 marks)

Q6. Ion-exchange chromatography is a separation technique in which components of a mixture are separated based on the relative charge.

- (a) Draw a diagram illustrating the principle for both anion and cation exchangers. (10 marks)
- (b) Ion exchange can be used to separate lysozyme from egg white. Briefly give an overview as to how this experiment is performed. (10 marks)
- (c) How is lysozyme eluted from the column? (5 marks)