

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2013/2014

Module Title: Immunoanalysis
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Module Code: **BIOT6002**

School: Science & Informatics

Programme Title: Bachelor of Science in Applied Biosciences & Biotechnology – Year 2
Bachelor of Science (Honours) in Pharmaceutical Biotechnology – Year 2
Bachelor of Science (Honours) in Nutrition & Health Science – Year 2
Bachelor of Science (Honours) in Herbal Science – Year 2

Programme Code: **SBIOS_7_Y2**
 SPHBI_8_Y2
 SNHSC_8_Y2
 SHERB_8_Y2

External Examiner(s): **Dr Gillian Gardiner**
Internal Examiner(s): **Ms Anne Ward**

Instructions: **Answer Question 1 (compulsory) and three other questions only. All questions carry equal marks**

Duration: 2 Hours

Sitting: Autumn 2014

Requirements for this examination: Calculator

<p>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.</p>
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Q1. (Compulsory)

- (a) Explain briefly the principle of purification of IgG using saturated ammonium sulphate. (5 marks)
- (b) From the set of data below generated from an experiment for the purification of IgG using ammonium sulphate calculate the following:
- (i) Dilution factor for treated and untreated serum (8 marks)
- (ii) The total protein concentration in the treated and untreated serum using the Beer-Lambert Law ($\epsilon = 0.8 \text{ (mg/ml)}^{-1} \text{ cm}^{-1}$) (7 marks)

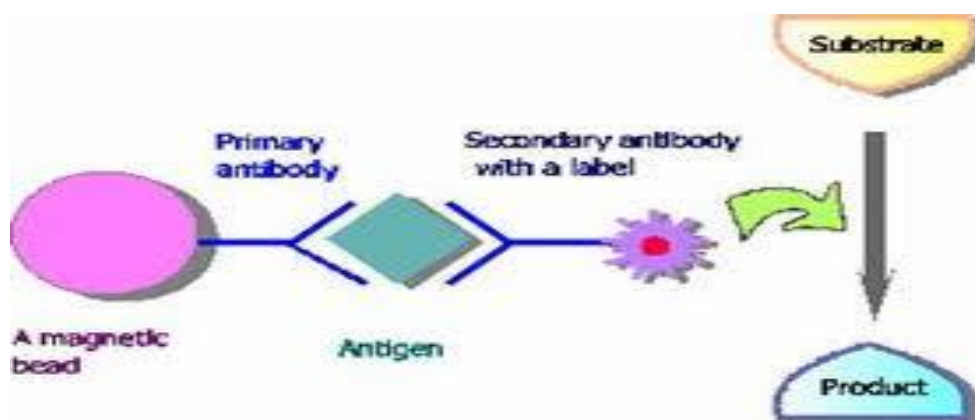
Sample	Volume PBS (ml)	Volume sample (ml)	Abs 280nm
Untreated serum	1.980	0.02	0.12
Ammonium sulphate treated serum	1.334	0.668	0.5

Write a short comment on the results obtained in this experiment. (5 marks)

- Q2. (a) List the five classes of immunoglobulin. (5 marks)
- (b) Illustrate & describe the structure of IgG. (6 marks)
- (c) Define each of the following:
- (i) Antigen (2 marks)
- (ii) Paratope (2 marks)
- (iii) Hapten (2 marks)
- (iv) Epitope (2 marks)
- (d) List three advantages of the use of antibodies in immunoassays over other proteins. (6 marks)

- Q3.(a) What is a monoclonal antibody? (6 marks)
- (b) Illustrate the principle of each of the following immunoprecipitation assays:
- (i) Ouchterlony Immunodiffusion (5 marks)
 - (ii) Rocket Immunoelectrophoresis (5 marks)
 - (iii) Crossed immunoelectrophoresis (5 marks)
- (c) For Single Radial Immunodiffusion (SRID), outline why this is classified as a quantitative assay. (4 marks)

- Q4. (a) Explain the principle of the immunoassay illustrated below (10 marks)



- (b) Draw an example of the calibration curve typical of this type of immunoassay. (8 marks)
- (c) Outline what parameters you would need to study to optimise this type of assay. (7 marks)
- Q5. (a) Outline how you would assess the reliability of an assay. (6 marks)
- (b) Explain how to assess the accuracy of an analytical method. (6 marks)
- (c) Write a brief overview of the use of control charts in Internal Quality Control under the following headings:
- (i) Statistics (5 marks)
 - (ii) Control limits (5 marks)
 - iii) Non-random patterns (3 marks)

- Q6. (a) Define how you would validate a typical immunoassay. (5 marks)
- (b) Write a brief overview of each of the following validation parameters:
- (i) Precision (4 marks)
 - (ii) Accuracy (4 marks)
 - (iii) Specificity (4 marks)
 - (iv) Method Comparison (4 marks)
- (c) Write a brief note on the use of enzyme labels in immunoassay systems (4 marks)