

**CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

Autumn Examinations 2011/12

Module Title: Bioanalytical Science V

Module Code: BIOT7002

School: Science & Informatics

Programme Title: BSc in Applied Biosciences and Biotechnology - Award
BSc (Hons) in Pharmaceutical Biotechnology – Year 3

Programme Code: SBIBI_7_Y3
SPHBI_8_Y3

External Examiner(s): Dr Anne Nelson

Internal Examiner(s): Dr L. Goold, Ms A. Ward

Instructions: Attempt 2 questions from Section A
and 2 questions from Section B.

Duration: 2 hours

Sitting: Autumn 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.

SECTION A

Q1. Discuss (a) ion-exchange chromatography and (b) size exclusion chromatography under the following headings:- (i) nature and physical state(s) of the stationary phase (ii) interaction of components with the stationary phase and (iii) basis for separation of components.

(20 marks)

Q2. (a) Construct a labelled block diagram of a gas chromatographic instrument and use the diagram to give a brief description of how a sample solution containing a mixture of volatile compounds is separated and analysed by this instrument.

(8 marks)

(b) An alcoholic beverage sample was analysed by gas chromatography for its ethanol content using the internal standard method of quantitation. Isopropanol was chosen as the internal standard and was added to the sample and standards of ethanol so that all solutions had a constant concentration of isopropanol. The following data were obtained for all solutions analysed:-

| %(v/v) Ethanol | Area of Ethanol Peak (integration counts) | Area of Isopropanol Peak (integration counts) |
|-----------------------|--|--|
| 2 | 660947 | 1812442 |
| 4 | 1269649 | 1800540 |
| 6 | 1861078 | 1799212 |
| 8 | 1709135 | 1262320 |
| 10 | 3081370 | 1803780 |
| sample | 1185944 | 1701250 |

PTO

- (i) Use a graphical method to accurately determine the %(v/v) of ethanol in the sample.

(10 marks)

- (ii) Comment on the usefulness of the internal method of quantitation in gas chromatographic analysis.

(2marks)

- Q3. (a) Draw a labelled block diagram of a HPLC instrument and briefly describe the function of each component labelled.

(8 marks)

- (b) Describe the following HPLC processes:- (i) reverse phase chromatography (ii) gradient elution (iii) uv absorbance detection

(12 marks)

SECTION B

- Q4. (a) Validation is the process of proving that an analytical method is fit for its purpose. Discuss this statement outlining the key parameters required to perform validation experiments for a newly developed immunoassay system. (10 marks)
- (b) Write short notes on each of the following:
- (i) Internal Quality Control (5 marks)
 - (ii) External Quality Assessment Schemes (5 marks)
- Q5. (a) Describe with the aid of a diagram the principle of an immunoassay typical of each of the following:
- (i) Reagent excess assays (7 marks)
 - (ii) Reagent limited assays (7 marks)
- (b) Outline the main optimisation parameters to be considered for immunoassay development. (6 marks)
- Q6. (a) Write a short overview of labels commonly used in immunoassay systems. (5 marks)
- (b) Outline the main experimental considerations in the design Polyacrylamide Gel Electrophoresis (10 marks)
- (c) Briefly, describe the principle and application of SDS-PAGE (5 marks)