

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

**Autumn Examinations 2013**

**Module Title: Structural Biochemistry – Continuous assessment**

**Module Code:** BIOL6024

**School:** Science

**Programme Title:** BSc in Applied Biosciences  
BSc (Honours) in Herbal Science  
BSc (Honours) in Pharmaceutical Biotechnology  
BSc (Honours) in Nutrition and Health Science  
BSc (Honours) in Analytical Chemistry  
Bsc Analytical & Pharmaceutical Chemistry

**Programme Code:** SBIOS\_7\_Y2  
SHERB\_8\_Y2  
SPHBI\_8\_Y2  
SNHSC\_8\_Y2  
SCHQA\_8\_Y2  
SCHEM\_7\_Y2

**External Examiner(s):** Dr. Anne Nelson

**Internal Examiner(s):** Ms. Anne Ward  
Dr. Fiona O Halloran

**Instructions:** Answer Section A (compulsory) and THREE questions from Section B.

**Duration:** 2 hours

**Sitting:** Autumn 2013

**Requirements for this examination:** Scientific Calculator, Graph Paper

**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 (40 marks)

**Q1. (Compulsory)** Answer all parts.

- (a) Outline how you would assess the accuracy and precision of a pipetting procedure and comment on the statistical parameters you would use.

(10 Marks)

- (b) State the Beer Lambert Law. For a compound that obeys the Beer Lambert Law, which of the following describes the relationship between absorbance and concentration of the light-absorbing compound?

- (i) Directly proportional
- (ii) Inversely proportional

(5 Marks)

- (c) The following table of results was generated for a Biuret Assay to estimate protein concentration:

Tube Number	Protein (mg/ml)	Absorbance @ 540 nm
Standard 1	0	0
Standard 2	1	0.09
Standard 3	2	0.18
Standard 4	4	0.36
Standard 5	6	0.54
Standard 6	10	0.88
Unknown solution A		0.25
Unknown solution B		0.64

From these data plot a standard curve of absorbance versus protein concentration (mg/ml). Use this curve to estimate the concentration of protein in each of the unknown solutions A and B.

(10 Marks)

- (d) Using the Henderson-Hasselbach equation, describe the preparation of 100ml of a 0.02M phosphate buffer pH 6.5 from solid disodium hydrogen phosphate (MW=268g/mol) and sodium dihydrogen phosphate (MW=156g/mol). The pKa value is 7.2.

(10 Marks)

- (e) Distinguish between the absorbance spectrum and the absorbance maximum of a compound.  
Draw a graph to illustrate your answer.

(5 Marks)

## Section B (60 marks)

Answer any three questions.

### Q.2

- (a) Using a monosaccharide structure you have studied, explain the term *stereoisomer*.

(4 Marks)

- (b) Give three examples of monosaccharide derivatives, explaining their structural differences and identify where these derivatives can be found in nature and/or the environment.

(6 Marks)

- (c) Describe the structural differences between homopolysaccharides and heteropolysaccharides.

(10 Marks)

(Total 20 Marks)

### Q.3

- (a) Describe five major functions of proteins in living organisms.

(5 Marks)

- (b) Describe the four structural levels of organisation in proteins and discuss how each level contributes to the final biologically active structure of a protein.

(15 Marks)

(Total 20 Marks)

**Q.4**

(a) Using diagrams, describe the structural differences between a saturated and an unsaturated fatty acid. Give one example of each type. (8 Marks)

(b) In relation to membrane transport mechanisms distinguish between passive diffusion, facilitated diffusion and active transport

(12 Marks)

(Total 20 Marks)

**Q5.**

(a) Differentiate between a DNA nucleotide and an RNA nucleotide. (6 Marks)

(b) Outline the process of DNA replication in procaryotes. (14 Marks)

(Total 20 Marks)