

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

**Autumn Examinations 2015**

**Module Title: Structural Biochemistry (CA)**

**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

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

**External Examiner(s):** Dr Tom O'Connor  
**Internal Examiner(s):** Dr Fiona O Halloran

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

**Duration:** 2 hours

**Sitting:** Autumn 2015

**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) You are provided with stock solutions of 0.1 M Acetic Acid and 0.1 M Sodium Acetate. Calculate the volumes of acid and base required to prepare 2 litres of a 0.02 M Acetate buffer, pH 4.5, using these stock solutions. Mention any precautions you would take to ensure your buffer has the correct pH. ( $pK_a$  of Acetic Acid = 4.75)

(10 Marks)

- (b) In an experiment to assess the pipetting performance of a new P1000 automatic pipette the following weight measurements relating to the pipetting of water were recorded;

Table 1: Data measurements for ten deliveries of water at the required volume of 1000  $\mu$ l.

Measurement No.	Required Volume ( $\mu$ l)	Cumulative Weight (g)	Individual Weight (g)	Actual Volume (ml)
1	1000	0.998		
2	1000	1.996		
3	1000	2.992		
4	1000	3.988		
5	1000	4.986		
6	1000	5.984		
7	1000	6.982		
8	1000	7.978		
9	1000	8.976		
10	1000	9.972		

- (i) Complete the table to calculate the actual volumes delivered.
- (ii) Comment on the accuracy and precision of the pipetting, showing all formulas and calculations used to support your comments.

*Note: specific gravity of water: 1g/ml*

(10 marks)

- (c)
- (i) Regarding the technique of spectrophotometry define the following terms: absorption spectrum, molar extinction coefficient (5 marks)
- (ii) A solution of ADP shows an absorbance of 0.22 at 258 nm. What is the concentration of the solution? Assume light path of 1cm and the molar Absorption Coefficient ( $\epsilon$ ) =  $1.54 \times 10^4 \text{ M}^{-1}\text{cm}^{-1}$  (5 marks)
- (d)
- (i) For a simple colorimetric assay to estimate the amount of reducing sugars in an unknown sample describe how you would prepare the following series of standards from a stock solution of 10mM glucose: 0, 1, 2, 4 and 6  $\mu\text{mol}$  of sugar, in a final volume of 1.5 ml (8 marks)
- (ii) Name a reagent that can be used to detect the presence of reducing sugars (2 marks)

## Section B (60 marks)

Answer any three questions.

### Q2.

- (a) Describe four ways that proteins support the biological activities of living organisms. Give a specific example in each case. (12 marks)
- (b) Give the structure of two stereoisomers of amino acids (4 marks)
- (c) List four types of noncovalent interactions that stabilise the native 3D conformation of a protein. (4 marks)

**Q3.**

- (a) Using examples you have studied differentiate between the structures of aldose and ketose monosaccharides. Give an example of each type of monosaccharide and list a role for this monosaccharide in biological systems.

(10 marks)

- (b) Write a note on two polysaccharides you have studied using the headings of structure and function.

(10 marks)

**Q.4**

- (a) In double stranded DNA structure explain what is meant by 'complimentary base pairing'.

(8 marks)

- (b) Using a diagram describe the effect of increasing temperature on DNA structure.

(6 marks)

- (c) Name three types of RNA found in cells and briefly explain the function of each type.

(6 marks)

**Q5.**

- (a) Draw the general structure of a phosphoglyceride.

(4 marks)

- (b) Name and draw the structure of the parent molecule that is the building block of all steroid hormones

(8 marks)

- (c) Name two types of non-glyceride lipids and draw the basic structure of one of these lipids.

(8 marks)