

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

**Autumn Examinations 2009/10**

**Module Title: Structural Biochemistry**

**Module Code:** BIOL6024

**School:** Science

**Programme Title:** B.Sc. in Applied Biosciences – Stage 2  
B.Sc. in Analytical and Pharmaceutical Chemistry – Stage 2  
B.Sc. (Honours) in Herbal Science – Stage 2

**Programme Code:** SBIOS\_7\_Y2  
SCHEM\_7\_Y2  
SHERB\_8\_Y2

**External Examiner(s):** Prof. Gary Walsh  
**Internal Examiner(s):** Dr Brendan O’Connell, Dr. Heloise Tarrant

**Instructions:** Answer Section A (compulsory) AND 2 questions from Section B

**Duration:** 2 hours

**Sitting:** Autumn 2010

**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 (50 marks)

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

- (a) What are the four major classes of macromolecule present in living cells?
- (b) Name and draw five different functional groups that can be found on biomolecules.
- (c) Define **protein denaturation**. List five ways in which proteins may be denatured. Are any of these reversible?
- (d) What are stereoisomers? Name and draw a simple example.
- (e) Draw a diagram of the peptide bond that illustrates its polar nature. What significance does this have for protein structure?
- (f) Define the terms **pH**, **pKa**, and **pI**.
- (g) Draw the structure of ATP.
- (h) List the nitrogen-containing bases found in DNA and in RNA. In each case state whether the base is a purine or a pyrimidine.
- (i) Name the four levels of protein architecture, and write brief notes on each.
- (j) Name and draw the structure of one amino acid in each of the following groups:
  - a. neutral and hydrophobic
  - b. aromatic
  - c. sulphur-containing.

## Section B (50 marks)

Answer any two questions.

- Q2.** (a) Outline the functions of carbohydrates in living organisms [5 marks]
- (b) Using glucose as an example, describe how monosaccharides can exist as different stereoisomers (i.e. D and L stereoisomers,  $\alpha$  and  $\beta$  stereoisomers). [10 marks]
- (c) Explain the structural difference that allows humans to use starch and glycogen as energy sources, but makes cellulose indigestible to us. [10 marks]
- Q.3** (a) Explain how the Meselson-Stahl experiment proved that DNA undergoes semi-conservative replication in *E. coli*. [10 marks]
- (b) Write a short essay describing the process of replication. Use diagrams wherever possible to illustrate your answer. [15 marks]
- Q.4** (a) List the main biological roles of lipids. [5 marks]
- (b) Describe the structure and properties of fatty acids. [10 marks]
- (c) Write brief notes on each of the different classes of lipids, using diagrams to illustrate your points. [10 marks]