

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, α and β 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]