

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2012

Module Title: Structural Biochemistry

Module Code: BIOL6024

School: Science

Programme Title: Bachelor of Science in Applied Biosciences
Bachelor of Science (Honours) in Herbal Science
Bachelor of Science (Honours) in Pharmaceutical Biotechnology
Bachelor of Science (Honours) in Nutrition & Health Science
Bachelor of Science (Honours) in Analytical Chemistry with Quality Assurance
Bachelor of Science 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, Dr. Jerry Bird, Dr. Alison Gallagher
Internal Examiner(s): Dr. Heloise Tarrant, Ms. Susan Bullman, Dr. Brendan O'Connell,
Dr. Fiona O'Halloran.

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

Duration: 2 hours

Sitting: Autumn 2012

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) Draw a diagram illustrating the condensation reaction of two amino acids to form a dipeptide.
- (b) Outline how you would assess the accuracy and precision of a pipetting procedure, and comment on the statistical parameters you would use.
- (c) Define protein denaturation. List five ways in which proteins may be denatured. Are any of these reversible?
- (d) Distinguish between the absorbance spectrum and the absorbance maximum of a compound. Draw a graph to illustrate your answer.
- (e) Draw the structure of ribose and deoxyribose.
- (f) What is the T_m of a piece of DNA? How would you determine this in the lab? Why is it useful?
- (g) Write a short note on structure of phospholipids.
- (h) Define the terms **pH**, **pKa**, and **pI**.
- (i) Why are DNA and RNA called “nucleic acids”?
- (j) Draw the structure of ATP.

Section B (50 marks)

Answer any two questions.

- Q2.**
- (a) Amino acids are classified on the basis of the properties of their side-chains. List the different groups of amino acids, and draw and name an example in each case. (8 marks)
 - (b) Discuss the acid-base properties of amino acids. (8 marks)
 - (c) Use the Henderson-Hasselbach equation to prepare 100ml of a 0.05 M phosphate buffer, pH 6.65. (Given $pK_a = 7.2$, $MW Na_2HPO_4 \cdot 7H_2O = 268g/mol$, $MW NaH_2PO_4 \cdot 2H_2O = 156g/mol$) (9 marks)

- Q3.** (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) Distinguish between homopolysaccharides and heteropolysaccharides. To which class does the polymer starch belong? (5 marks)
- (d) Explain the structural difference that allows humans to use starch and glycogen as energy sources, but makes cellulose indigestible to us. (5 marks)
- Q4.** Discuss DNA replication in Bacteria under the following headings:
- (a) DNA polymerase
 - (b) Replication forks
 - (c) Okazaki fragments
 - (d) DNA primer
 - (e) Accessory proteins (25 marks)