

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Semester 1 Examinations 2016/17

Module Title: Applied Enzymology

Module Code: BIOL7001

School: Science

Programme Title: Bachelor of Science in Applied Biosciences and Biotechnology
Bachelor of Science (Honours) in Pharmaceutical Biotechnology
Bachelor of Science (Honours) in Herbal Science

Programme Code: SBIBI_7_Y3
SHERB_8_Y3
SPHBI_8_Y3

External Examiner(s): Dr Brendan O Donnell
Internal Examiner(s): Dr Fiona O Halloran
Dr Karen Finn

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

Duration: 2 Hours

Sitting: Winter 2016

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 – compulsory

Answer **eight** of the following (each question carries five marks)

Q1.

- (i) List two characteristics that differentiate enzymes from chemical catalysts.
- (ii) Using a graph differentiate between instantaneous reaction rate and average reaction rate.
- (iii) In enzyme kinetics what is meant by the terms K_m and K_{cat} ?
- (iv) In an enzyme catalyzed reaction 1.5 μ g of enzyme (M_r 30,000) gives a V_{max} of 3 μ mol product produced per minute. What is the turnover number for the enzyme?
- (v) Write a note on the mechanism of action of the antimicrobial agent, clavulanic acid.
- (vi) An enzyme with a K_m of 1.5 mM yields 9 mmol of product per minute in the presence of saturating substrate concentration. A non-competitive inhibitor, at 1 mM, lowers the activity to 5 mmol/min. Calculate the K_i for the inhibitor.
- (vii) What is the principle of enzyme immobilization?
- (viii) Describe two advantages of covalent enzyme immobilization.
- (ix) Differentiate between the terms '*enzyme activity*' and '*specific enzyme activity*'.
- (x) What reaction does *glucose oxidase* catalyse? Describe one way to monitor the progress of this reaction.

(40 Marks)

Section B. Answer two questions

Q2.

- (a) List three types of enzyme catalytic mechanisms.
(6 marks)
- (b) Describe in detail the catalytic mechanism used by the proteolytic enzyme, chymotrypsin.
(20 marks)
- (c) Draw the Cleland plot that best represents the multi-substrate reaction for chymotrypsin.
(4 marks)

Q3.

- (a) List two criteria that can be used to assess successful enzyme extraction.
(5 marks)
- (b) Describe in detail three ways to disrupt cells for the purpose of extracting cellular enzymes.
(15 marks)
- (c) Explain four precautions that can be taken to protect enzymes during extraction procedures.
(10 marks)

Q4.

- (a) Describe three mechanisms that biological systems use to regulate enzyme activity.
(12 marks)
- (b) Distinguish between reversible and irreversible enzyme inhibitors.
(6 marks)
- (c) Using a Lineweaver Burk plot explain the effects of a non-competitive inhibitor on the kinetics of an enzyme.
(12 marks)