CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Atumun Examinations 2014/15

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. Gillian Gardiner
Internal Examiner(s):	Dr. Fiona O Halloran
Instructions:	Answer Section A (compulsory) and TWO 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 – compulsory (40 Marks)

Q1.

(a) Define each of the following terms: V_{max}, K_m, *Vo*, and Ki

(10 Marks)

(b) An enzyme that follows Michaelis-Menten kinetics has a K_m of 7mM and yields 10µmol product per minute at saturating substrate concentration. A non-competitive inhibitor lowers the activity to 5 µmol/min. Given that the concentration of the inhibitor is 810µM, calculate the Ki for the inhibitor.

(10 Marks)

(c) In an enzyme catalyzed reaction investigating the effect of temperature on initial velocity rates the following data was generated:

Table 1

Reaction tube	**Temp (◦C)**	*Vo* **(µmol/min)**
1	25	0.105
2	30	0.155
3	37	0.159
4	48	0.139

(i) Using the data in Table 1 draw a graph of the natural log of initial velocity (ln *Vo*) versus 1/temperature (Kelvin units).

(ii) Determine the slope of the line through the linear portion of the curve

(iii) From the slope calculate the Arrhenius activation energy (Ea) for the enzyme catalyzed reaction

Information provided: 0◦C = 273.16K; R (gas constant) = 8.3Joules /mol.K

(20 Marks)

Section B. Answer two questions

Q2.

(a) Explain, using appropriate graphs, the difference between the effects of a non-competitive inhibitor and an uncompetitive inhibitor on the kinetics of an enzyme.

(20 marks)

(a) List four additional strategies that are available to a cell to regulate enzyme activity

(10 marks)

Q3.

'Allosteric enzymes frequently do not show Michaelis-Menten kinetics due to cooperative binding of substrate molecules'.

Discuss this statement, using graphs to support your answer and explaining the underlined terms.

(30 Marks)

Q4.

(a) Discuss the techniques available to extract enzymes from cells

(20 Marks)

(b) List five ways to protect enzymatic activity during enzyme extraction procedures.

(10 Marks)