CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2015

Module Title: Metabolic Biochemistry (CA)

Module Code: BIOL6017

School: Science & Informatics

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 and Health Science

Programme Code: SBIOS_7_Y2
SHERB_8_Y2
SPHBI_8_Y2
SNHSC_8_Y2

External Examiner(s): Dr Gillian Gardiner
Internal Examiner(s): Dr Fiona O Halloran

Instructions: Answer Section A (compulsory) and THREE 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 (40 marks)

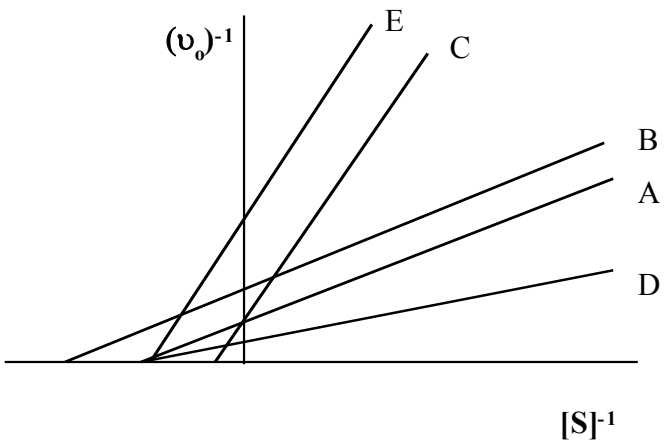
Q1. *(compulsory)* Answer <u>all</u> parts.

(a) Using the following enzyme data construct a Michaelis-Menten plot and a Lineweaver-Burke plot and clearly show how you would determine the K_m and V_{max} from each plot.

[Substrate] (mM)	v_0 **(µmol/ml/min)**
1.0	0.04
2.5	0.075
5.2	0.10
9.4	0.13
13.0	0.16
15.8	0.17
18.0	0.18

(20 marks)

(b) In the following graph of an enzyme-catalysed reaction, Line A represents the Lineweaver-Burk plot for the reaction of a normal substrate in the absence of any inhibitor.



(i) Explaining your answer in each case, which line would be expected in the presence of

- an uncompetitive inhibitor?
- a noncompetitive inhibitor?
- a competitive inhibitor?

(12 marks)

(ii) Which line would be expected if the concentration of enzyme is doubled? Explain your answer.

(4 marks)

(iii)Which line has the same K_M as Line A but a smaller V_{max}? Explain your answer.

(4 marks)

Section B (60 marks)

Answer any <u>three</u> questions.

Q2. Using diagrams explain the effect of the following on the rate of an enzyme catalysed reaction

(i) substrate concentration

(ii) enzyme concentration

(iii) increasing temperature

(iv) pH change

(5 marks each / 20 marks)

Q3.

(a) Differentiate between reversible and irreversible enzyme inhibitors

(5 marks)

(b) Give an example of an irreversible enzyme inhibitor you have studied and name the enzyme it inhibits.

(5 marks)

(c) Using a Lineweaver-Burke plot explain the effect of a competitive inhibitor on the enzyme reaction rate.

(10 marks)

Q4.

(a) Briefly describe the process of how pyruvate is converted to acetyl CoA in eukaryotic cells.

(8 marks)

(b) Describe three reactions that serve as metabolic control points in the Citric Acid Cycle, naming the substrate, enzyme and product in each case.

(12 marks)

Q5.

(a) List four potential non-carbohydrate precursors that can be used to generate glucose in the gluconeogenic pathway

(8 marks)

(b) Describe the three metabolically-irreversible enzyme catalyzed reactions that differentiate the glycolytic and gluconeogenic pathways and serve as the control points for these pathways.

(12 marks)