

CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ

Autumn Examinations 2011

Module Title: Enzymes and Metabolism

Module Code: BIOL6017

School: Science

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

Programme Code: SBIOS_7_Y2
SHERB_8_Y2
SPHBI_8_Y2

External Examiner(s): Dr. Don Faller
Internal Examiner(s): Dr. Heloise Tarrant

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

Duration: 2 hours

Sitting: Autumn 2011

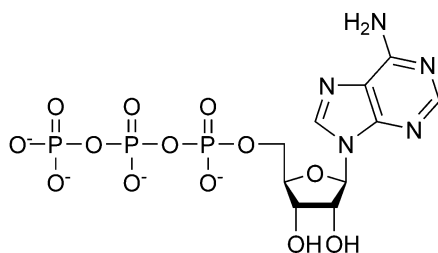
Requirements for this examination: Scientific Calculator, Graph Paper

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)

Q.1 (COMPULSORY) Answer all parts

- (a) Write a note on the general features of enzyme active sites.
- (b) What is the pH optimum of an enzyme?
- (c) What is a **coenzyme**?
- (d) Define the terms v_0 , V_{\max} , and K_m .
- (e) Write a note on **irreversible** and **reversible** enzyme inhibitors.
- (f) Name the following molecule. Use an arrow to show the location(s) of the high energy phosphoanhydride bond(s) in the structure.



- (g) Give an example of (i) an anabolic pathway and (ii) a catabolic pathway.
- (h) What are the three possible fates of pyruvate in living cells?
- (i) Enzymes are highly **efficient**, highly **specific** catalysts that are almost always **protein** in nature. Write brief notes elaborating on each of these characteristics.
- (j) Explain the term energy of activation (E_a).

Section B (50 marks)

Answer any two questions.

- Q.2** The conversion of fumarate to L-malate is one of the reactions of the Citric Acid Cycle. It is catalysed by the enzyme fumarase. Use the following experimental data to construct a Lineweaver-Burk plot (v_o vs $[S]$) and determine the K_m and V_{max} for this reaction.

[Fumarate] (mM)	v_o (mmol/l/min)
2.0	2.5
3.3	3.1
5.0	3.6
10.0	4.2

(25 marks)

- Q.3** Write an essay on glycolysis, indicating clearly the energy-consuming reactions and the energy-yielding reactions. (25 marks)

- Q.4** (i) The citric acid cycle is often described as **amphibolic**. What does this mean?

(5 marks)

- (ii) Draw a summary of the citric acid cycle. Name the different intermediates and the number of carbon atoms in each compound. Show where in the cycle CO_2 and reducing power are produced, and which steps control the rate of the cycle. (20 marks)