

**CORK INSTITUTE OF TECHNOLOGY  
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

**Autumn Examination 2013**

**Microbes, Enzymes & Energy - Continuous Assessment**

**Module Code:** BIOM 6001

**School:** Science

**Programme Title:** BSc in Applied Biosciences& Biotechnology  
BSc Hons Pharmaceutical Biotechnology  
BSc Hons in Nutrition and Health science  
BSc Analytical & Pharmaceutical Chemistry  
BSc Hons in Analytical Chemistry

**Programme Code:** SCHQA\_8\_Y1  
SCHEM\_7\_Y1  
SBIOS\_7\_Y1  
SPHBI\_8\_Y1  
SHNSC\_8\_Y1

**External Examiner(s):** Dr Gillian Gardiner

**Internal Examiner(s):** Ms Margaret Lane  
Dr Fiona O Halloran

**Instructions:** Answer 4 Questions.

**Question 1 is compulsory.**

**Duration:** 2 hours

**Sitting:** Autumn 2013

**Requirements for this examination:** 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.

## Q1 (Compulsory)

### Q1. Answer all parts

(Total 25 marks)

- (i) In an experiment the effect of pH on Amylase activity was assessed by measuring the time taken for amylase activity at specific pH values. The results obtained are presented in Table 1.

Table 1

pH	Time (min)
4.0	6
5.0	4
6.0	2
7.0	1
8.0	4
9.0	No activity

- Plot a graph of these data.
- What is the optimum pH for the action of amylase? Explain your chosen answer.
- What is the critical pH for the activity of this enzyme?

(5 Marks)

(ii) In an experiment using a potatoe as a source of the enzyme catalase a macerated cube of potatoe was found to have more enzyme activity than a similar size cube of unmacerated potatoe.

- Explain these findings.
- Write a chemical reaction to show the activity of catalase on hydrogen peroxide
- Why is the reaction, described above, important in human cells?

(5 Marks)

(iii) Diphenol oxidase is present in the tissue of potatoes and apples.

- Explain the reaction catalyzed by this enzyme.
- Describe a simple experiment that demonstrates the activity of this enzyme
- What is the economic significance of this enzyme activity?

(5 Marks)

(iv) In microbiological experiments

- a. Describe how you would aseptically prepare agar plates
- b. Why are agar plates inverted during incubation?
- c. A liquid culture of bacteria was streaked onto an agar plate (i) before filtration and (ii) after filtration. Describe the expected results.
- d. How would you generate a pure bacterial culture from a mixed growth bacterial culture?

(5 Marks)

(v) a. What is a dilution series?

b. What is a decimal dilution series?

c. What are CFU?

d. What is a viable plate count?

(5 Marks)

Q2.

(a) In relation to enzyme structure define the following terms: apoenzyme, co-factor, co-enzyme, holoenzyme, active site.

(10 Marks)

(b) Explain what is meant by:

(i) Activation energy

(ii) Induced fit theory of enzyme-substrate complex

(iii) Optimal reaction conditions for enzymes

(15 Marks)

Q3

(a) Describe five ways that micro-organisms positively impact on human welfare  
(15 Marks)

(b) In relation to bacteria describe 5 structural features and list their function in these organisms.  
(10 Marks)

Q4. Write an essay on food-borne illnesses. In your answer include information on the most common bacterial causes of microbial food-borne illness, clinical symptoms, incubation period, treatment, mechanisms to protect against this type of illness and the definition of an outbreak.  
(25 Marks)

Q5.

(a) In catabolic metabolism describe, the difference between oxidation and reduction  
(4 Marks)

(b) List the three essential pathways of cellular aerobic respiration  
(6 Marks)

(c) Describe, using a diagram, the process of substrate level phosphorylation. Give an example of a reaction in glycolysis where SLP occurs, naming the substrate, enzyme and product.  
(15 Marks)

Q6.

(a) Draw a simple summary diagram of the citric acid cycle  
(10 Marks)

(b) Describe what each turn of the cycle generates and indicate in the diagram the stages where these products are formed.  
(10 Marks)

(c) Write a chemical reaction that shows how pyruvate is converted into acetyl CoA  
(5 Marks)