

**CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

Autumn Examination 2015

Module Title: Microbes, Enzymes & Energy (CA)

Module Code: BIOM6001

School: Science

Programme Title: BSc in Applied Biosciences
BSc Hons Pharmaceutical Biotechnology
BSc Hons in Nutrition and Health Science
BSc Hons in Analytical Chemistry with Quality Assurance
BSc Analytical & Pharmaceutical Chemistry
Higher Certificate in Science in GMP and Technology

Programme Code: SBIOS_7_Y1
SPHBI_8_Y1
SHNSC_8_Y1
SCHQA_8_Y1
SCHEM_7_Y1
SGMPR_6_Y1

External Examiner (s): Dr Gillian Gardiner

Internal Examiner (s): Ms Margaret Lane, Dr Fiona O Halloran, Ms Richenda Kiernan,
Ms Shauna Keane

Instructions: Answer 4 Questions. Question 1 is compulsory.

Duration: 2 hours

Sitting: Autumn 2015

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 question. Answer all parts

- (i) In a laboratory exam you are provided with the following materials and asked to determine the activity of a specific enzyme in each of the food sources provided

- H_2O_2
- buffer pH 7.0
- Food sources: Potatoes, apples, bananas, kiwi, lambs liver
- Test tubes
- Pipettes.

(a) Which enzyme is being tested for? (1 marks)

(b) Describe how you would set up this experiment. (5 marks)

(c) Why is buffer at pH 7.0 included as a reagent? (2 marks)

(d) Explain how you would identify which food source had the greatest enzyme activity. (2 marks)

- (ii) You have been asked to determine if microorganisms are present in the air and on the surface of a laboratory bench.

(a) List the materials required to carry out this experiment. (1 marks)

(b) Briefly describe how to perform the experiments. (4 marks)

(c) If bacteria were cultured from the bench surface briefly describe a staining method you could use to identify the bacteria. (5 marks)

- (iii) You are provided with a 10 ml solution of a heat sensitive liquid that must be sterilized in the laboratory. Describe how you would sterilize the liquid and how you would determine the liquid was sterile following the sterilization procedure.

(5 marks)

Q2.

(a) What is an enzyme? (2 marks)

(b) Write a brief description of the following enzyme components:

- Apoenzyme

- Cofactor

- Coenzyme

- Holoenzyme (12 marks)

(c) List four principles that apply to all catalysts (8 marks)

(d) List two factors that distinguish enzymes from other catalysts. (3 marks)

Q3.

(a) Using a diagram explain how activation energy affects a chemical reaction? (7 marks)

(b) Explain how enzymes affect activation energy? (6 marks)

(c) Describe the 'lock and key' mode of action of an enzyme. (6 marks)

(d) Describe the 'induced fit' mode of action of an enzyme. (6 marks)

Q4. Using diagrams describe how each of the following affect enzyme activity.

- (a) pH
- (b) Temperature
- (c) Substrate concentration
- (d) Enzyme concentration
- (e) Irreversible inhibitors

(25 marks/ 5 marks each)

Q5. Aerobic respiration requires three pathways to occur in eukaryotic cells including Glycolysis, Krebs cycle and the Electron transport chain.

(a) Write a summary reaction for Glycolysis (5 marks)

(b) Draw a simple schematic of the Krebs cycle and indicate where NADH is produced in this cyclic pathway

(8 marks)

(c) Give a brief description of the sequence of events that occur in the Electron Transport Chain

(12 marks)

Q6. Write descriptive notes on five of the following:

- Algae
- Viruses
- Fungi
- Gram stain
- Methods of sterilization in microbiology labs
- Microbial food borne infections
- Isolation of pure cultures

(25 marks/ 5 marks each)