

**CORK INSTITUTE OF TECHNOLOGY  
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

**Autumn Examinations 2016**

**Introduction to Biotechnology: Continuous Assessment (Semester 2)**

**Module Code: BIOT6001**

**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  
BSc Hons Biological Sciences (Common Entry)

**Programme Code:** SBIOS\_7\_Y1  
SPBHI\_8\_Y1  
SNHSC\_8\_Y1  
SCHQA\_8\_Y1  
SCHEM\_7\_Y1  
SCEBS\_8\_Y1

**External Examiner(s):** Dr Brendan O'Donnell  
**Internal Examiner(s):** Dr Helen O' Shea  
Dr Karen Finn  
Ms Margaret Lane

**Instructions:** Answer 4 Questions, question 1 and 3 other questions  
Question 1 is compulsory. All questions carry 25 marks.

**Duration:** 2 hours

**Sitting:** Autumn 2016

**Requirements for this examination:**

**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.

### Question 1 is compulsory

Answer all parts.

Q1. (a) Explain how a lactic acid fermentation can be monitored in the laboratory using an acid /base titration. (2 marks)

Explain how lactic acid is produced in a flask of milk inoculated with *lactococcus* and give a practical example of the use of this fermentation. (4 marks)

(b) The table below indicates the final absorbance reading for *E coli* growing in three different media. Which of these media provided the optimum nutrients for *E coli*. (2 marks)

Explain how absorbance is used to measure bacterial growth. (2 marks)

Briefly discuss why the growth of *E coli* differed in these media (2 marks)

Suggest the possible differences in the composition of each of the media. (2 marks)

Abs 600nm Flask A	1.0
Abs 600nm Flask B	0.6
Abs 600nm Flask C	0.03

(c) Using a diagram show the position of the following fragments of DNA in an agarose gel following electrophoresis. (2 marks)

1. 138bp
2. 24bp
3. 87bp
4. 38bp
5. 62bp

Explain why your fragments are in these positions. (4 marks)

(d) What is a cryoprotectant?

Give one example of a cryoprotectant used for bacteria. (2 marks)

(e) State the type of microscope and magnification required when viewing

(i) Prokaryotic cells

(ii) Tissue culture (mammalian cells) (3 marks)

Q2. Write a brief description of the applications of biotechnology in each of the following areas. Give specific examples where possible.

- (a) Medical therapeutics (2 marks)
- (b) Vaccines (3 marks)
- (c) Plant agriculture (8 marks)
- (d) Animal agriculture (8 marks)
- (e) Bioremediation (4 marks)

Q3. Proteins are a major component of cells.

- (a) List and briefly describe 5 roles for proteins in the body. (5 marks)
- (b) Describe the structure of an antibody. (6 marks)
- (c) Explain using a diagram how a monoclonal antibody is made. (6 marks)
- (d) Give 4 examples of monoclonal antibody applications. (8 marks)

Q4.

- (a) List three advantages associated with the use of commercial kits for the isolation of high purity genomic DNA. (6 marks)

(b) Write descriptive notes to explain the role of DNA in each of the following:

- (i) Biotechnology (5 marks)
- (ii) Food safety (4 marks)
- (iii) Medicine (5 marks)
- (iv) Forensic analysis (5 marks)

Q5.

- (a) List 5 reasons why bacterial cells are used to produce biotechnology products (5 marks)

(b) Name two bacteria that are used in biotechnology, and for each state a product that they produce. (2 marks)

(c) Define the following terms: (10 marks)

- (i) Microaerophilic organisms
- (ii) Strict aerobe
- (iii) Neutrophile
- (iv) Hypertrophy
- (v) Hyperplasia

(d) Draw a diagram of a typical fermenter and clearly label the components. (8 marks)

Q6.

- (a) List three requirements for recombinant DNA technology. (3 marks)
- (b) Describe two methods that can be used to separate DNA from crude lysate (cellular debris and proteins). (6 marks)
- (c) Briefly explain the difference between genetic engineering and protein engineering. (4 marks)
- (d) Describe with the aid of a well-labelled diagram the steps involved in genetically engineering a bacterium to produce human insulin. (12 marks)