

# Cork Institute of Technology

## Bachelor of Science Applied Biosciences & Biotechnology - Award

(NFQ Level 7)

Autumn 2007

### Cell Biology

(Time: 3 hours)

Answer FIVE Questions.  
Question 1 is compulsory.  
Answer TWO questions from  
Section A and TWO questions from  
Section B.

Examiners: Dr. A. Coffey  
Dr. H. O'Shea  
Dr. T. Beresford

Q1. **Compulsory.** Answer all Questions (each question = 2 marks)

- (a) You have counted cells using a haemocytometer and have a total of 150 cells in 16 squares. In order to obtain this count, you diluted the cells by a factor of 50. The conversion factor for your counting chamber is  $10^4$ . The total volume of cell suspension is 30 mls.
- Calculate:
- (i) The number of cells per ml.
  - (ii) The total number of cells in the cell suspension.
  - (iii) The volume of cell suspension required to set up 2 flasks, each containing  $2.5 \times 10^7$  cells.
  - (iv) How many cells remain in the total suspension after this manipulation?
- (b) Write notes on the nucleus. Illustrate an experiment to demonstrate that the nucleus is the control centre of the cell.
- (c) Discuss, with the aid of a diagram, animal cell growth in culture.
- (d) Outline, with the aid of a diagram, the principles involved in the production and selection of a monoclonal antibody-secreting hybridoma cell line.
- (e) Discuss specific immunity with reference to measles virus infection.
- (f) Briefly explain the principle behind adsorption columns for isolation of nucleic acids.

- (g) If an electrophoresis buffer contains Tris at a final concentration of 30 mM, EDTA at a final concentration of 3 mM, Acetic acid at a final concentration of 60 mM. How much of each ingredient (in grams) would you weigh out to make up 1 litre of the buffer?  
*Mole weights of ingredients: Tris (121.1 g/l = 1M); EDTA (mw: 372.24g/l = 1M); Acetic acid (60 g(ml)/l = 1M)*
- (h) Why do many buffers in molecular biology contain Tris (tris-hydroxymethyl-aminomethane) and EDTA (Ethylene Diamine Tetra-acetic Acid)?
- (i) If a DNA sample does not get properly digested by a restriction endonuclease, can you give three possible reasons why this might be?
- (j) Explain in detail how would you make up an agarose gel for electrophoresis of DNA?

## Section A

**Answer 2 questions. Each question carries 20 marks.**

- Q2. Discuss, using examples, how different viruses replicate and release new viral progeny.
- Q3. Discuss, with the aid of diagrams, the structure and function of antibodies.  
Compare the different immunoglobulin classes found in humans.
- Q4. Comment on the macroscopic and microscopic appearance of malignant neoplasms.  
Outline how they cause disease and death.

## Section B

**Answer 2 questions. Each question carries 20 marks.**

- Q5. (a) Give a description of chromosome structure in *E. coli* with specific reference to size, conformation, domains, DNA binding proteins. (10 marks)
- (b) Give a description of prokaryotic gene structure. (10 marks)
- Q6. (a) Give a general account of the different types of non-coding DNA in eukaryotes. (10 marks)
- (b) Detail the steps involved in mRNA processing in eukaryotic cells. (10 marks)
- Q7. Write an essay on bacterial plasmids from the point of view of structure, typical properties encoded, and modes of replication. (20 marks)