

Cork Institute of Technology

Bachelor of Science Applied Biosciences & Biotechnology - Award

(NFQ Level 7)

Spring 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 20. The conversion factor for your counting chamber is 10^4 . The total volume of cell suspension is 40 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 1.5×10^8 cells.
 - (iv) How many cells remain in the total suspension after this manipulation?
- (b) Write notes on the structure and function of mitochondria.
- (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) Describe, using a diagram, the routes taken by different viruses to synthesize mRNA in the host cell.

- (f) If an electrophoresis buffer contains: Tris at a final concentration of 40 mM, EDTA at a final concentration of 2 mM, Acetic acid at a final concentration of 40 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)*
- (g) Explain step-by-step how would you make up an agarose gel for electrophoresis of DNA.
- (h) Briefly explain the principle behind adsorption columns for isolation of nucleic acids.
- (i) Explain how you would set up and perform a restriction digest of DNA.
- (j) If you had a 10 mg/ml stock of Ethidium Bromide and you added 2 µl of it to 100 ml of agarose, what is the final concentration of Ethidium Bromide in the agarose? Use the correct units.

Section A

Answer 2 questions. Each question carries 20 marks.

- Q2. Discuss how viruses change cell metabolism and structure.
- Q3. Discuss the cells and tissues of the Acquired Immune System.
- Q4. Describe using a diagram(s), the stages in the development of invasive carcinoma of the cervix.

Section B

Answer 2 questions. Each question carries 20 marks.

- Q5. Write an essay on bacterial plasmids from the point of view of structure, typical properties encoded, and modes of replication. (20 marks)
- Q6. Write an essay on restriction endonucleases from the point of view of
(a) their function in nature,
(b) their classification into different types,
(c) their recognition sequences on DNA,
(d) their mode of action, and
(e) their applications in molecular biology. (20 marks)
- Q7. With the aid of diagrams, give a detailed account of the different orders of coiling/folding in the eukaryotic chromosome. (20 marks)