Cork Institute of Technology

Bachelor of Science in Cell and Molecular Biology - Award

(NFQ Level 7)

Autumn 2006

Cell & Molecular Biology

(Time: 3 hours)

Answer FIVE Questions.
Question 1 is compulsory.
Answer FOUR others, availing
of the internal choices provided.

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

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

(i) 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 40. The conversion factor for your counting chamber is 10^4. The total volume of cell suspension is 30 mls.

Calculate:

(a) The number of cells per ml.

(b) The total number of cells in the cell suspension.

(c) The volume of cell suspension required to set up 2 flasks, each containing 1.5×10^8 cells.

(d) How many cells remain in the total suspension after this manipulation ?

(ii) Write notes on the structure and function of mitochondria.

(iii) Write notes on the use and formulation of chemically defined cell culture media.

(iv) Outline, with the aid of a diagram, the principles involved in the production and selection of a monoclonal antibody-secreting hybridoma cell line.

(v) Describe how retroviruses transform cells.

(vi) During plasmid isolation from *E. coli,* explain what are the two purposes of the alkaline SDS solution?

(vii) 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.

(viii) A plasmid is isolated from a bacterial culture and electrophoresed on an agarose gel. Explain what the different bands viewed on the agarose gel represent.

(ix) Briefly describe how you would obtain DNA from blood.

(x) Outline the typical temperatures used in a PCR cycle and explain what happens at each temperature.

Section A - Answer 2 questions.

Each question carries 20 marks.

Q2. Discuss how viruses change cell metabolism and structure. (20 marks)

Q3. Discuss, with the aid of diagrams, the structure and function of antibodies. Comment on clonal selection. (20 marks)

Q4. Comment on the macroscopic and microscopic appearance of malignant neoplasms. Discuss metastasis. (20 marks)

Section B -Answer 2 questions.

Each question carries 20 marks.

Q5. Write an essay on the different enzymes involved in DNA replication in bacteria (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. (a) Give a description of RNA from the point view of bases found, different types of RNA in cells, structure and conformation, and occurrence of helical structures (10 marks)

(b) Write an account of the effects of acid, alkali and heat on DNA (10 marks)