

Cork Institute of Technology

Bachelor of Science in Cell and Molecular Biology - Award

(NFQ - Level 7)

March 2006

CELL & Molecular Biology

(Time: 3 hours)

Answer **FIVE** Questions.

Question 1 is compulsory.

Answer **FOUR** other questions,
two from section B
and two from section C.

Use separate answer books for each section.

Examiners: Dr. T. Beresford

Dr. A. Coffey

Dr. H. O'Shea

Section A

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

- (i) You have counted cells using a haemocytometer and have a total of 250 cells in 16 squares. In order to obtain this count, you diluted the cells by a factor of 30. The conversion factor for your counting chamber is 10^4 . The total volume of cell suspension is 20 ml.

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 nucleus. Illustrate an experiment to demonstrate that the nucleus is the control centre of the cell.
- (iii) Discuss, with the aid of a diagram, animal cell growth in culture.

- (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 SV40 transforms cells.
- (vi) Briefly explain the principle behind adsorption columns for isolation of nucleic acids.
- (vii) 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)
- (viii) Why do many buffers in molecular biology contain Tris (tris-hydroxymethyl-aminomethane) and EDTA (Ethylene Diamine Tetra-acetic Acid)?
- (ix) If a DNA sample does not get properly digested by a restriction endonuclease, can you give three possible reasons why this might be?
- (x) Explain in detail how would you make up an agarose gel for electrophoresis of DNA?

Section B

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. Comment on clonal selection.
- Q4. Comment on the macroscopic and microscopic appearance of malignant neoplasms. Outline how they cause disease and death.

Section C

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 and DNA binding proteins. (10 marks)
- (b) Give a description of prokaryotic gene structure. (10 marks)
- Q6. Write an essay on bacterial plasmids from the point of view of structure, typical properties encoded, and modes of replication.
- Q7. With the aid of diagrams, give a detailed account of the different orders of coiling/folding in the eukaryotic chromosome.