

**CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

Autumn Examinations 2014/15

Module Title: Molecular Biology (CA)

Module Code: GENE7002

School: Science & Informatics

**Programme Title(s): Bachelor of Science in Applied Bioscience & Biotechnology
Bachelor of Science in Pharmaceutical Biotechnology – Stage 3
Bachelor of Science in Nutrition and Health Science –Stage 3**

**Programmes Code(s): SBIBI_7_Y3
SPHBI_8_Y3
SNHSC_8_Y3**

External Examiner(s): Dr Gillian Gardiner

**Internal Examiner(s): Dr Brigid Lucey
Dr Lesley Cotter**

Instructions: Answer FOUR of the six questions provided. Each question carries equal marks.

Duration: 2 Hours

Sitting: Autumn 2015

Requirements for this examination: Calculator

Note to Candidates: Please check the Programme Title and the Module Title to ensure that you have received the correct examination. If in doubt please contact an Invigilator.

- Q1. Give an account of how DNA may be quantified in the laboratory using**
(a) Spectrophotometric means (13 Marks)
(b) Fluorescent dyes (12 Marks)

- Q2. (a) Explain what is meant by the process of gene transfer in bacteria via transformation**
(10 Marks)
(b) Explain how Griffith's early experiments proved that transformation occurred
(15 Marks)

- Q3.(a) What are plasmids?** (4 Marks)
(b) Give an account of the principle of the alkaline lysis method used to isolate plasmids from bacterial cells. Include in your answer an account of the means by which the plasmid DNA may be recovered from solution. (13 Marks)
(c) You are required to make up the following TE solution: 10mM Tris, 2mM EDTA. Calculate the quantity of TRIS and EDTA that will be required to make up a 1 litre volume of this TE solution.

Mole weights of ingredients: Tris (121.1 g/l = 1M); EDTA (mw: 372.24g/l = 1M).
(8 Marks)

- Q4. (a) When making up a PCR reaction mix to a total volume of 25µL, what volume of each of the following stock reagents would you add:**

25 mM MgCl₂ to give a final concentration of 3.0mM
10x buffer to give a final concentration of 1X
5U/µL *Taq* DNA polymerase to give a 1 Unit final concentration
12.5pmol/µL of a primer to give 25 pmoles per reaction
200µMolar dNTPs from a stock concentration of 1.25mMolar solution
(15 Marks)

- (b) Explain the function of each of the above components in the PCR reaction
(10 Marks)

- Q5. (a) Describe the structure of the lac operon.** (8 Marks)
(b) Explain how the operon is regulated in the presence and absence of lactose. (10 marks)
(c) Describe the effect of glucose on the gene expression of the lac operon. (7 Marks)

- Q6. There are three types of RNA produced in all organisms, namely messenger RNA, transfer RNA and ribosomal RNA. Give an account of each of these types of RNA.**
(25 Marks)