

**CORK INSTITUTE OF TECHNOLOGY
INSTITIÚID TEICNEOLAÍOCHTA CHORCAÍ**

Autumn Examinations 2014

Module Title: Molecular Biology CA

Module Code: GENE 7002

School: Science

Programme Title: Bachelor of Science in Applied Bioscience & Biotechnology
Bachelor of Science (Honours) in Pharmaceutical Biotechnology

Programme Code: **SBIBI_7_Y3**
SPHBI_8_Y3

External Examiner(s): Dr. Cormac Gahan
Internal Examiner(s): Dr Brigid Lucey

Instructions: Answer FOUR of the six questions provided.

Each question carries equal marks.

Duration: 2 Hours

Sitting: **Autumn 2014**

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 paper.
If in doubt please contact an Invigilator.

Q1

(a) If an electrophoresis buffer contains Tris at a final concentration of 40 mM, EDTA at a final concentration of 5 mM, Acetic acid at a final concentration of 60 mM. How much of each ingredient (in grams) would you weigh out to make up 500mL 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) (9 Marks)

(b) When making up a PCR reaction mix to a total volume of 25 μ L, what volume of each of the following stock reagents would you add:

25 mM MgCl₂ to give a final concentration of 2.5mM

10x buffer to give a final concentration of 1X

5U/ μ L *Taq* DNA polymerase to give a 0.5Unit final concentration

10pmol/ μ L of a primer to give 20 pmoles per reaction

(12 Marks)

(c) Why may Ethidium Bromide be used to visualise DNA?

(4 Marks)

Q2 The lac operon is a good example of transcription control in bacteria.

(a) Explain this statement in the context of THREE structural genes that allow *E. coli* to utilise lactose, by listing these genes along with their individual functions.

(15 Marks)

(b) Discuss the result of the following being available to the lac operon (i) high levels of lactose and no glucose; (ii) high levels of glucose and no lactose; (iii) high levels of glucose and lactose; (iv) no lactose and no glucose.

(10 Marks)

Q3 (a) Bacteriophages have differing morphologies. Discuss.

(9 Marks)

(b) Phage typing is a traditional epidemiological typing method. Discuss how this method may be (i) conducted and (ii) interpreted.

(10 Marks)

(c) The prototype phage is the lambda phage. Describe one common use for the lambda phage in molecular biology.

(6 Marks)

Q4 (a) Give an account of the methods used in the molecular biology laboratory to prevent contamination.

(15 Marks)

(b) Discuss how you would estimate the (i) quality and (ii) quantity of your DNA preparation.

(10 Marks)

Q5 What are the functions of each of the following enzymes that are involved in DNA synthesis?

- (a) DNA helicase
- (b) DNA gyrase
- (c) DNA polymerase I
- (d) DNA polymerase III
- (e) DNA ligase

(25 Marks)

Q6

(a) Why are plasmids useful in molecular biology?

(7 Marks)

(b) Give an account of the properties of plasmids

(8 Marks)

(c) Plasmids are often classified under five headings. Explain.

(10 Marks)