



Coláiste na Tríonóide, Baile Átha Cliath
Trinity College Dublin
Ollscoil Átha Cliath | The University of Dublin

Faculty of Science, Technology, Engineering and Mathematics

School of Biochemistry and Immunology

Molecular Medicine

Semester 2 2023

Junior Sophister

Module BIU33390: Nucleic Acids (Molecular Medicine)

03 MAY 2023

RDS Simmonscourt

09:30 – 11:30

Examiner: Dr K.H. Mok

Instructions to Candidates:

Part A: Answer THREE questions – ONE from each section, all questions equally weighted.

Part B: Answer THREE short questions

ANSWER EACH QUESTION IN A SEPARATE BOOKLET

Materials permitted for this examination:

Student ID card, pen(s), pencil(s), eraser, calculator, ruler.

Instructions to Invigilators:

SIX answer booklets to be given to each student.

Part A: 85.7% of paper

Answer THREE questions – ONE from each section, all questions equally weighted.

The Genome

1. Compare and contrast prokaryotic and eukaryotic DNA replication.
2. Discuss the structure and function of histone proteins.

Gene Expression

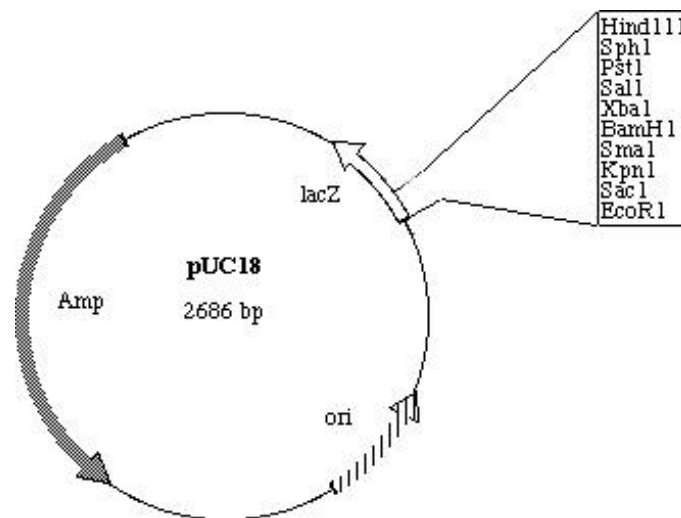
3. Discuss the role of G proteins in eukaryotic translation.
4. Compare and contrast the structure and functions of eukaryotic RNA polymerases I, II and III.

Molecular Genetic Mechanisms

5. Discuss the mechanism of tRNA aminoacylation and tRNA utilisation in protein translation.
6. Write an essay about bacterial restriction endonucleases with emphasis on their utility for molecular cloning.

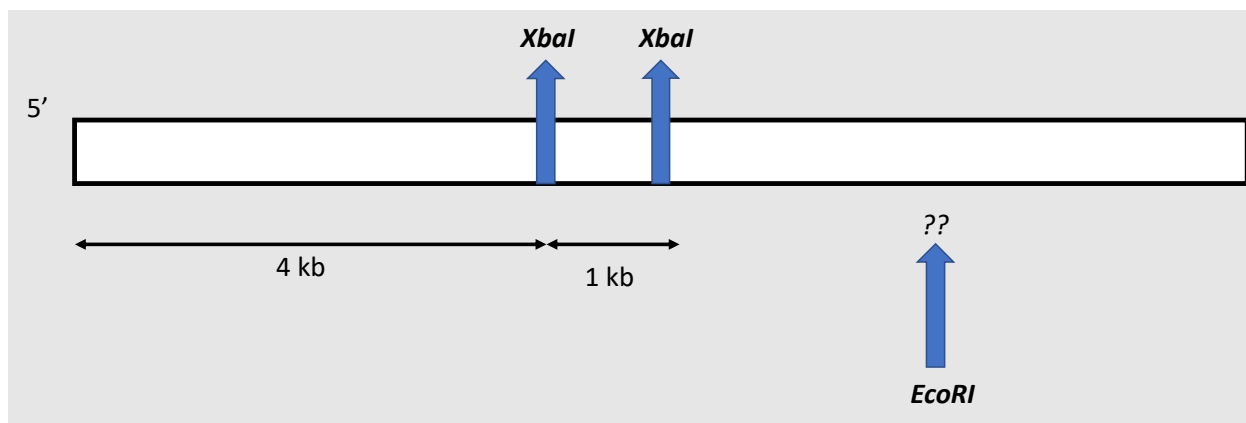
Part B: 14.3% of paper**Write briefly on THREE of the following**

1. Explain what is meant by 'in-frame' cloning.
2. Describe why the melting-temperature is critical for successful PCR.
3. I wish to clone gene X into the pUC18 vector illustrated below. If I use the enzymes KpnI and HindIII to insert gene X and use *E.coli* cells as a host, describe how I can use a combination of antibiotics and blue/white screening to select for novel transformants.



4. Cyclins.
5. DNA methylation.

6. A linear piece of DNA containing 2 restriction sites for *Xba*I is shown below. This sequence also contains a restriction site for *Eco*R1 somewhere after the second *Xba*I site and the 3' end. From the information provided below about the size of the fragments observed on agarose gel electrophoresis after the indicated restriction digests, deduce the exact position of the *Eco*R1 site in the DNA molecule.



A single digest with *Xba*I alone yields 3 fragments, 1 at 1kb, a second at 4kb and a third fragment of 5kb.

A double digest with *Xba*I and *Eco*R1 yields 4 fragments, 1 at 1kb, 1 at 2kb, 1 at 3kb and a final at 4kb.

A single digest with *Eco*R1 alone yields 2 fragments, 1 at 2kb and 1 at 8kb.

[oOo]