

THE UNIVERSITY OF MELBOURNE
DEPARTMENT OF BIOCHEMISTRY AND MOLECULAR BIOLOGY
SEMESTER 2 ASSESSMENT, 2003

521-302 FUNCTIONAL GENOMICS

EXAM DURATION: TWO (2) Hours and THIRTY (30) minutes

READING TIME: Fifteen (15) Minutes

THIS PAPER HAS 3 PAGES

Instructions to Students:

Use a **SEPARATE** script book for EACH QUESTION.

Attempt **FIVE** (5) of the six (6) questions.

Total marks for the paper: 100

Authorized Materials:

No specific materials are authorized.

Instructions to Invigilators:

Students need **FIVE** (5) 6-page script books.

This paper is worth 80% of the total mark for the subject

This paper may be reproduced and lodged with the Baillieu Library

Please use a new script book for each Question
Attempt five (5) of the following 6 questions
Suggested time for each question – 36 minutes

Question 1 (Please use a new script book)

The ability to make mouse models of human genetic diseases has revolutionized studies of genetic disorders. Describe the basic technology of gene targeting in mice and discuss how it has been used to investigate the molecular basis and treatment of cystic fibrosis.

(20 marks)

Question 2 (Please use a new script book)

Describe the mechanisms used by eukaryotic gene activator proteins to promote gene transcription.

(20 marks)

Question 3 (Please use a new script book)

Efficient replication of eukaryotic chromosomes requires replication origins, centromeres and telomeres. Describe an experiment to demonstrate the requirement for these elements. The experiment can be one that you have come across in the 302 course, or you can design your own approach.

(20 marks)

Please use a new script book for each Question
Attempt five (5) of the 6 questions
Suggested time for each question – 36 minutes

Question 4 (Please use a new script book)

Answer TWO (2) of the following three (3) questions:

- A. Proteomic analysis indicates that organisms produce a greater variety of proteins than would be expected from the number of predicted genes. List types of post-transcriptional and post-translational modifications that may contribute to this observation of a greater variety of proteins.
- B. One type of post-transcriptional modification of RNA has been called RNA editing. Describe the general process of RNA editing and give one biological example.
- C. Discuss the importance of the Ran-GTP/GDP protein in the transport of proteins between the nucleus and cytoplasm.

(20 marks)

Question 5 (Please use a new script book)

Answer ONE (1) of the following two (2) parts

- A. "The process of tumour development requires multiple independent genetic changes." Discuss the evidence from cancer development in humans and experimental evidence from animal models that supports this statement.
- B. How are proto-oncogenes converted into oncogenes? Give one example of how an oncogene was identified and how this oncogene contributes towards the development of cancer.

(20 marks)

Question 6 (Please use a new script book)

Discuss two examples of how alterations in the machinery associated with the G1, S or M phase of the cell cycle can influence the development of tumours.

(20 marks)

END OF EXAM