

BME495F

UNIVERSITY OF TORONTO

FACULTY OF APPLIED SCIENCE AND ENGINEERING  
FINAL EXAMINATION, DECEMBER 2001

Fourth Year - Programme 5bm

Exam Type: A

Examiner - P. Y. Wang

(ANSWER ANY 10 QUESTIONS: Each Question=10%)

- (1) Draw and label the essential components of an eucaryote cell. Enlarge to show the details of a chromatin. Sketch and label various regions of its chromosome at mitosis. Explain clearly the reasons for the presence of the centromere at anaphase and its disappearance at telophase.
- (2) Show, with formulas and equations, how D-glucose can be labeled at C<sub>1</sub> with <sup>14</sup>C, and then converted to pyruvates, which are used as precursors in the biosynthesis of cholesterol. What happens to the <sup>14</sup>C label?
- (3) Describe, with sketches, the replication process in E. coli. Explain clearly, how and why the termination of replication in eucaryote cell are quite different.
- (4) With sketches, describe how a constitutive gene in E. coli is transcribed. Explain clearly its difference as compared to the transcription of a regulated gene.
- (5) Explain with sketches, the various steps in the translation of a mRNA into a protein. How can the participation and departure of IF3 be demonstrated?
- (6) Describe and explain with sketches -
  - (a) the principle of using gene-machined polynucleotides to deduce the sequence of a structural gene,
  - (b) the approaches used in decoding the codons,
  - (c) why DNA sequence cannot be used to deduce the amino acid sequence in a protein.
- (7) With sketches, describe and explain in detail -
  - (a) the physical and molecular characteristics required in the bacteria for gene mapping,
  - (b) the principle of mapping the entire chromosome of E. coli.
- (8) In the rDNA biosynthesis of luciferase, describe and explain in detail -
  - (a) the isolation and confirmation of its mRNA,
  - (b) how the mRNA is transcribed and inserted into a stable vector,
  - (c) how the transcription of the new gene is induced.

- (9) Explain and describe in detail -
- (a) the structure of a typical antibody molecule, and label its various regions,
  - (b) humoral-mediated immune response
  - (c) complement.
- (10) Describe and explain in detail -
- (a) procedures to obtain samples of pure B-lymphocytes and T-lymphocytes in HIGH yield,
  - (b) demonstrate convincingly that the antibodies are secreted by only 1 kind of lymphocyte in (a) above.
- (11) With sketches, explain clearly and in detail -
- (a) basis for the antibody diversity,
  - (b) principle of clonal selection and the production of mAB.