BIO 1140 - INTRODUCTION TO CELL BIOLOGY

SECTION A

FINAL EXAMINATION - APRIL 2007

3 HOURS **Prof. J. Fenwick**

NO BOOKS, NOTES OR CALCULATORS PERMITTED

PLEASE DO NOT ASK QUESTIONS DURING THE EXAM AS THEY WILL NOT BE ANSWERED

GENERAL INSTRUCTIONS: All writing must be in black or blue INK. Figures may be drawn in pencil.

There are **THREE SECTIONS** to this exam.

SECTION A: twenty-five multiple choice questions that must be answered using the multiple choice answer sheet provided. Be certain to write in your name and student number and fill in the appropriate boxes on this sheet.

You may take the multiple choice question sheet home.

SECTION B PART ONE: Ten short-answer questions, worth a total of fifty marks, which which must be answered in the spaces provided.

SECTION B PART TWO: three questions, two worth ten marks and one worth five marks. Your answers must be confined to the spaces provided.

NOTE! For some unknown reason many students write answers that do not contain all of the information that they know and that is relevant to the question. Don't over do it, and do budget your time, but don't quit writing when you still have time and still have important information unwritten. For example, if you have time at the end, go back over your major answers and see if you have included a concluding statement about the significance of whatever you have been writing about.

DO NOT OPEN THE EXAM UNTIL INSTRUCTED TO DO SO

YOU MAY TAKE THESE SHEETS HOME

SECTION A: 25 MARKS

1. Which is not true concerning adherens belts?

a. cell-cell adhesion
b. are associated with integrins
c. are adhesive junctions
d. bind to actin via linker proteins
e. are anchoring junctions

2. The movement of something between two cells, from one side of an epithelial sheet to the other side of the epithelial sheet, is most accurately described as

a. transmembrane.
b. paracellular.
c. intracellular
d. transepithelial.
e. none of the above are very accurate.

3. If the critical concentration of G-actin is greater than that of the plus end of the filament but less than that of the minus end of the filament, which of the following will occur?

a. Polymerization will occur at the plus end of the actin filament.
b. Depolymerization will occur at the minus end of the filament.
c. Subunits will be added at the plus end and removed at the minus end.
d. Treadmilling.
e. All of the above will occur.

4. The ground substance in animal tissues will not contain:

a. N-acetylglucosamine
b. proteoglycans
c. N-acetylmuramic acid
d. GAGs
e. SO_3^-

5. Which of the following do not break Chargaff's rules of bases?

a. C + T = A + G
b. A = T
c. [purines] = [pyrimidines]
d. G = C
e. all of a, b, c, & d

6. Which of the following factors could increase membrane fluidity?

a. a greater proportion of unsaturated phospholipids
b. a lower temperature
c. a greater proportion of saturated phospholipids
d. an increase in the length of the hydrophobic fatty acid chains
e. all of the above

7. What would be the nucleotide sequence on the template strand of a DNA molecule coding for an amino acid attached to a tRNA carrying the anticodon 3'-GAA-5'?

a. 3'-GAA-5'
b. 5'-CUU-3'
c. 3'-GTT-5'
d. 5'-CAA-3'
e. 3'-GAA-5'

8. Which of the following is **NOT** associated with post-transcriptional modification of mRNA in eukaryotes?

a. removal of 5`cap
b. 3' polyadenylation
c. removal of introns
d. removal of exons

9. Which of the following pairs are not the same thing?

a. capsule & slime layer
b. murein & peptidoglycan
c. unit membrane & bilipid layer
d. cell envelope & cell wall
e. polypeptide & protein

10. In eukaryotes, which of the following lays down most of the DNA in both the leading and lagging strand?

a. DNA polymerase α
b. DNA polymerase δ
c. DNA polymerase I
d. DNA polymerase II
e. DNA polymerase III

11. A mutation that activates cdc2 kinase will result in a cell that

a. divides too soon.
b. divides too many times.
c. elongates without dividing.
d. is in G_0 arrest.
e. has too many chromosomes.

12. Approximately how thick is the cell membrane?

a. 1 μm b. 5 μm c. 1 nm d. 4-6 nm e. 7-10 nm

13. The multiple sites of DNA replication along eukaryotic chromosomes are known as

a. multi-replication forks
b. helicase loaders
c. replicons
d. ARS elements
e. spliceosomes

14. A plant cell placed in a hypotonic solution will

a. undergo osmotic lysis.
b. shrink.
c. plasmolyze.
d. become turgid.
e. none of the above.

15. During which phase of the cell cycle does replication occur?

a. Go b. G1 c. G2 d. S e. M

16. Transport vesicles involved in retrograde transport from the Golgi back to the ER are most likely:

a. uncoated vesicles.
b. clathrin coated vesicles.
c. COPI coated vesicles.
d. COPII coated vesicles.
e. caveolin coated vesicles.

17. Mystery question.

18. Which of the following **is incorrect**?

a. There is a specific aminoacyl-tRNA synthetase for each tRNA.
b. There is a specific aminoacyl-tRNA synthetase for each amino acid.
c. mRNA is specific for a given protein or proteins.
d. In eukaryotes $tRNA^{MET}_{i}$ binds to the small ribosomal subunit before the ribosome attaches to the mRNA.
e. All proteins in the cytoplasm have a methionine at one end

19. Release factors of translation recognize the codon

a. AUG b. GUA c. UUU d. UGA e. GGA

20. eIFs are required for initiation in

a. prokaryoric translation
b. chaperonin activity
c. eukaryotic translation
d. prokaryotic transcription
e. DNA replication

21. A protein is destined to be secreted from a cell. In which of the following organelles would you first expect to find the protein after it is produced in the rER?

a. endosome
b. lysosome
c. secretory vesicle
d. Golgi apparatus
e. nucleus

22. Which of the following is a v-SNARE?

a. clathrin
b. coatomer
c. syntaxin
d. synaptobrevin
e. a Rab protein

23. Without regard for the actual start of the cell cycle, which of the following is in the correct sequence?

a. Go →G1→G2→M→S
b. G1 →G2→Go→M→S
c. G2→M→G1→Go→S
d. M→G1→S→G2→S
e. S→G1→G2→S→Go

24. Which of the following will not be found on an mRNA molecule that is close to half way through the process of transciption?

a. a 5' cap
b. a poly (A) tail
c. exons
d. introns
e. a methylated guanosine nucleotide

25. Which of the following is not true?

a. G1 cyclin triggers the S phase.
b. G2 checkpoint ends G2.
c. M phase triggers cytokinesis.
d. G2 cyclin triggers entry into M phase.
e. M cyclin triggers prophase.

BIO 1140 SECTION B 75 MARKS

Prof. Fenwick – Dept. Biology

No books, notes, or calculators permitted. Please do not ask any questions during the exam as they will not be answered.

General Instructions: Please use black or blue ink as it is much easier to mark. Keep the marker happy! Use only the space provided and use take this space as an indication of how long your answer should be. More space is provided than you actually require.

BE CERTAIN TO FILL IN YOUR STUDENT NUMBER AND NAME

DO NOT MAKE ANY MARKS BELOW THIS LINE

Question	Score	Possible Value
PART 1		**50**
1		**5**
2		**5**
3		**5**
4		**5**
5		**5**
6		**5**
7		**5**
8		**5**
9		**5**
10		**5**
PART 2		**25**
1		**10**
2		**10**
3		**5**
TOTAL		**75**

SECTION B PART 1 (50 MARKS)

Ten questions worth five marks each for a total of fifty marks. Answers must be confined to the spaces provided. You may use point form if you wish but be certain that your statements are complete.

1. Use a diagram to show non-steady state treadmilling by a microfilament and then in words describe under what conditions this occurs.

2. Draw and label a diagram of a hemidesmosome, naming all of the main parts and proteins.

3. Draw a diagram of a **generic** amino acid in the completely **unionized** state and label **all** of the parts.

4. Tell me all that you know about targeting proteins to the lysosome.

5. Without a diagram, describe the **fluid mosaic model** of cell membranes.

6. The following are abbreviations of what? **(one mark each)**

1. ORC:_____
2. Cc tubulin: _____
3. nm: _____
4. ERGIC:_____
5. snRNPs: _____

7. In point form, list five functions of the sER.

1.
2.
3.
4.
5.

8. Briefly describe the structure of cellulose.

9. Describe how a protein is inserted into the ER membrane, starting from the point when the nascent protein has only partially emerged from a ribosome.

10. Describe where, why and how Okazaki fragments are formed. You may use a diagram but you must also describe the process in words.

SECTION B PART 2

Three questions: the first two are worth ten marks and the last one is worth five marks. Your answers must be confined to the spaces provided.

1. State the endosymbiotic hypothesis and list six pieces of evidence that support it. **(10 marks)**

1.

2.

3.

4.

5.

6.

2. Describe the sequence of steps involved from the very start of replication to normal DNA polymerase activity in eukaryotes. No diagram is required.**(10 marks)**

3. Fill in the blanks. One mark for each correct answer. **(5 marks)**

a. In DNA, the coding sequences are called exons and the intervening (noncoding) sequences are called _____.

b. The ER divides the cytoplasm into cytosolic and _____ spaces.

c. The initial mRNA produced is called the _____ and undergoes post-transcriptional modification to the final mRNA.

d. The cisterna of the ER is physically continuous with the _____ of the nuclear envelope.

e. The codons are located in _____.