BIOL 200 (Section 921) Mid-term exam Study Guide

Midterm Exam (In class) on June 29, 2006

Things to consider when studying for the exam:

You will not be responsible for material in the text that was not covered in class. You are, however, responsible for the reading material listed in the outlines for each lecture, and the material provided in the lecture notes and powerpoint slides. The Study Questions from the textbook given in the lecture outlines are a good way to review most of the topics covered. Reading in the text is designed to expand upon and support this material. You may be asked to consider information in such figures, as it relates to material we have covered in lecture.

As a guide, here are some specific comments about questions in the relevant chapters:

1. Be familiar with basic principles and types of microscopy and their suitability for studying particular level of cell structures.
2. Understand the relationship between structure, cellular composition and function of cell organelles and macromolecules.
3. Understand basic terminology and concepts in cell biology e.g. biopolymers, different levels of protein structure, chromatin, nucleosomes, proteolysis, fluorescent microscopy, transcription, RNA processing, translation, fluidity and asymmetry of lipid bilayers in membranes etc.
4. Understand how the biochemical and cell biological approaches/techniques we have discussed can be used to answer questions in cell biology. Be prepared to propose the use of systems and tools to approach a specific problem.
5. Concentrate on understanding cell biological processes e.g. transcription, RNA processing, translation, membrane structure and transport etc.

Midterm exam preparation material: For the midterm exam, one sheet of 8.5x11 paper, **"study sheet"** will be allowed as a memory aid. Memorizing facts are not the goal of this course, you must be able to use information to solve problems and defend a point of view.

Specific type of questions to consider:

1. Short answer, Multiple-choice, definitions, true/false, fill in the blanks. Test objectives: Familiarity with terms, concepts, and basic principals covered in lectures; ability to make connections between different topics covered in the course.
2. Problem Solving (e.g. explain experimental results presented, explain how to approach a particular problem, predict results from an experiment, etc). Test objectives: Ability to use information in new situations and to solve problems, depth of knowledge concerning basic concepts, understanding of approaches used to investigate cell biological processes. Ability to integrate information.
3. Short essay type of question on a specific area (e.g. Levels of protein structure; Biological information Flow; Membrane structure or function).
4. Ability to analyze a given set of data in the form of a Table or Figure pertaining to topics covered in lectures.
5. Provide experimental (biological techniques/methodology) basis to demonstrate/support a cell biological process/theory/observation.
6. See the Study Questions from the textbook given in lecture outlines.
7. Some examples of exam questions are given below.

Study Questions for Midterm examination

Question 1. List the following items in order of size from the smallest to largest: (**1 mark**)

A. Nucleosome — smallest _____
C. Mitochondrion _____
D. Diameter of a DNA molecule — Largest _____

Question 2. Give experimental evidence to support that DNA, and not protein, is a genetic material.

Question 3. Fill in the blanks:

a. Disulfide bonds can form between two _____side chains in proteins.
b. The 5'end of RNA is capped by the addition of _____.
c. Nucleotides are joined together by _____ linkage between 5'and 3' carbon atoms to form nucleic acids.

Question 4. Short answers.

a. Cholesterol comprises up to 50% of membrane lipids in many animal cells. Explain in no more than two sentences why it is not possible to form lipid bilayers with cholesterol alone.
b. RNA splicing is considered an important rather than a wasteful process? Explain.

Question 5. Briefly describe the structure-function relationship for each of the following terms:

a. Small nuclear ribonucleoprotein particles:
b. Aminoacyl-tRNA synthetases:
c. Lysosomes:

Question 6. Answer question (see below) in reference to the Figure (Fig. 7-8, ECB 2nd ed.):

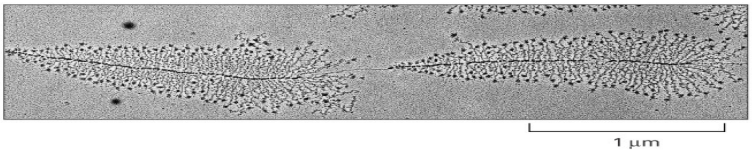

Figure 7-8 Essential Cell Biology, 2/e. (© 2004 Garland Science)

1. Where are Polymerases?
2. Where are transcription start/stop sites?
3. Where are the 3' and 5' ends of the transcript?
4. Which direction are the RNA polymerases moving?
5. Why are the RNA transcripts so much shorter than the length of the DNA that encodes them?

Question 7: Write a short essay on the biological information flow (DNA → RNA → protein) in eucaryotes.

Question 8. Which of the following statements are correct? Explain your answers.

A. Lipids in a lipid bilayer do not rotate rapidly around their long axis.
B. Lipids in a lipid bilayer do not flip flop readily from one lipid monolayer to the other.
C. Glycolipids move through different membrane-enclosed compartments during their synthesis but remain restricted to one side of the lipid bilayer.

Question 9. Problem Solving: Shown in the table below are the sequences of selected amino acids from different types of human hemoglobin (abbreviated Hb). Some forms of hemoglobin are defective, while others are not. From what you know about protein structure, explain why Sickle Cell and Hammersmith Hbs are defective while delta Hb is not.

	Amino acid number
Type of Hemoglobin (Hb)	3 4 5 6.. 9... 40 41 42 43
Normal beta Hb	Leu Thr Pro Glu Ser Gln Arg Phe Glu
Sickle Cell Hb (defective)	Leu Thr Pro **Val** Ser Gln Arg Phe Glu
Hammersmith Hb (defective)	Leu Thr Pro Glu Ser Gln Arg **Ser** Glu
Normal delta Hb	Leu Thr Pro Glu **Thr** Gln Arg Phe Glu