BIOL 200 (921): SUMMER, 2006

Final Exam Study Guide and Review questions

FINAL EXAM (IN CLASS) FROM 1 PM TO 3:30 PM ON JULY 7, 2006

The final exam will cover material covered up to and including the Lecture on July 5 and will also include the pre-midterm material. Be prepared to integrate material covered in these lectures. Emphasis will be placed on understanding of general concepts, experimental approaches, and ability to interpret new information and data in light of what you know. You should supplement your class notes with details and questions from the textbook and the BIOL 200 web site material. **You are responsible for the reading material listed in the outlines for each lecture, and the material provided in the lecture notes, tutorials 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. Understand the relationship between structure, cellular composition and function of cell organelles and macromolecules.
2. Understand basic terminology and concepts in cell biology e.g. membrane transport systems, membrane transport processes, protein sorting and transport, photophosphorylation, oxidative phosphorylation, microtubules and associated proteins, cyclins and CDKs, DNA replication, cell division phases etc.
3. 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.
4. Concentrate on understanding cell biological processes e.g. membrane transport processes, protein sorting and transport, photophosphorylation, oxidative phosphorylation, microtubules/actin filaments and associated proteins, cyclins and CDKs, DNA replication, cell division, membrane structure and transport etc.

Final exam preparation material: For the Final exam, one sheet of 8.5 x 11 paper, double-sided, **"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) There will be an essay question on a major cell biology topic in the final exam.
2) Short answer, multiple-choice, definitions, true/false, fill in the blanks, small essay-type questions. Test objectives: Familiarity with terms, concepts, and basic principles covered in lectures. Ability to make connections between different topics covered.
3) Problem (e.g. explain experimental results which are 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 biology. Ability to integrate information. Please study the problems and their solutions given in your textbook.

4) Structure-function relationships of cell, organelles, macromolecules etc.
5) Structural and functional differences between different cell types (e.g. animal, plant, bacterium)
6) Use of appropriate experimental methods/techniques to support cell biological hypotheses/theories/results
7) Ability to analyze a given set of data in the form of a Table or Figure pertaining to topics covered in lectures.
8) See the Study Questions from the textbook given in lecture outlines.
9) Some examples of questions given in final exams in the previous years are given below:

Final Exam Review Questions

Review Questions - Some examples of representative questions from previous final exams are given below:

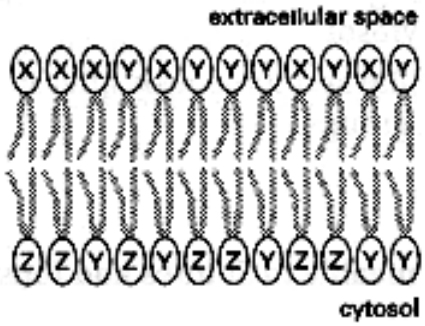
Question 1. Briefly explain the structure-function relationship of the following:
a. Myosin-II filament:
b. *trans* Golgi network:
c. Dynamin

Question 2. Short Answer
a) Explain in one or 2 sentences why plants need to have mitochondria in every cell, even when the sun is shining.
b) There are no motor proteins that move on intermediate filaments. Can you suggest a reason based on the structure of the intermediate filaments? What does this tell you about motor proteins?

Question 3. Fill in the blanks:
a. A small GTP-binding protein called _____ assembles around the neck of each coated vesicle and helps in pinching off the vesicle from the membrane.
b. _____ is the motor protein that moves along cytoplasmic microtubules and towards the plus end of the microtubule.

Question 4. Design an experiment using appropriate experimental technique(s) to study the kinesin-assisted transport of macromolecules.

Question 5. Three phospholipids X, Y and Z are distributed in the plasma membrane as shown. For which of these phospholipids does a flippase probably exist?



a. X only
b. Z only
c. X and Y

d. Y and Z
e. X and Z

Explain your answer briefly.

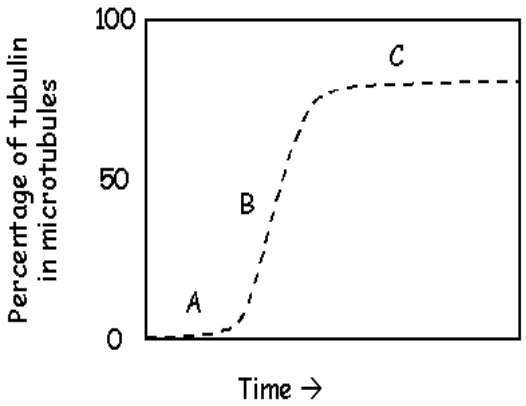
Question 6. Based on your understanding of cell structure and function, please state if the following statements are **TRUE** or **FALSE** and provide an **explanation for your choice**.

a) Membrane-bound and free ribosomes, are structurally and functionally identical and differ only in the proteins that they happen to be making at a particular time.

b) All of the glycoproteins in the intracellular membranes have their oligosaccharide chains facing the lumen, whereas those in the plasma membrane have their oligosaccharide chains facing the outside of the cell

c) The pH of the chloroplast thylakoid space (or lumen) increases in the light.

Question 7. A typical time course for polymerization of purified tubulin to form microtubules is shown below.



Explain the different parts of the curve labeled A, B and C.
How would the curve change if centrosomes were added at the onset?

Question 8. Circle the correct answer on the exam.

A. What are the molecular components of ATP?
   a. adenine, thymine, and phosphates
   b. adenine plus three phosphates
   c. adenine, ribose and three phosphates
   d. alanine, ribose and three phosphates
   e. alanine, threonine and phosphate

B. A yeast strain that has a mutation that prevents vesicle fusion with the plasma membrane may have a mutation in the gene that codes for:
   a. Clathrin
   b. COP protein
   c. Dynamin
   d. Adaptin

e. V SNARE

C. What keeps the Golgi apparatus in the middle of the cell, and away from the periphery?
   a. Intermediate filaments
   b. Kinesin
   c. Dynein
   d. Myosin
   e. Actin

Question 9. Essay Question. Sorting of proteins to the correct intracellular compartment is essential to cells. I-cell disease is a rare human disorder in which enzymes normally found in lysosomes are actually secreted from the cell. Describe the process of synthesis of lysosomal enzymes in normal individuals in comparison with individuals affected by I-cell disease. Your description should begin with the mature mRNA in the cytoplasm that encodes a lysosomal enzyme and describe how the protein produced by translation of this mRNA is sorted through each successive organelle. Do not describe the details of the translation process.

Question 10. Essay question. Beginning with the electron donor molecule, **describe in detail, using essay format** (NO DIAGRAMS) the cellular events that result in electron transport, proton pumping and ATP synthesis during oxidative phosphorylation or photophosphorylation