

Molecular Cell Biology 5068 Exam 1
October 4, 2016

Exam Number: _____

Please print your name: _____

Instructions:

Please write only on these pages, in the spaces allotted and not on the back. Write your number on each page (not your name), so that we can split them up and grade them anonymously. There are a total of 7 pages including this cover page. You may not use any books or notes, and no electronic aids, including calculators.

Answer only in the space provided; short, concise answers are preferred and will be rewarded. Please be as neat as possible.

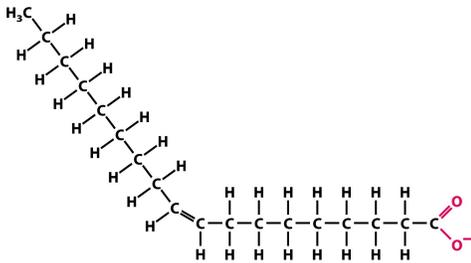
When you are finished, turn this in to the TA.

MCB 5068 Exam 1 October 4, 2016

Dr. Mueckler's Lectures (30 Points)

1. Name 3 functions of cellular membranes. (3 points)

2. Is the following fatty acid saturated or unsaturated? What kind of double bond does it have? (2 points)



Oleate
(ionized form of oleic acid)

Figure 2-21 part 2
Molecular Cell Biology, Sixth Edition
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3. Name 2 ways that phospholipids are involved in signal transduction. (2 points)

4. Name 4 movements of phospholipids within the lipid bilayer. Which movement is most uncommon and why? (5 points)

5. What is the function of the SAM complex? [2 points]

6. What is a karyopherin? (1 point)

7. Why is a membrane spanning protein domain considered “inside-out”? (2 points)

8. Name 3 properties of the Secretory Signal Sequence. (3 points)

9. List the steps involved in signal-mediated targeting of proteins to the rough ER. Be sure to include all components involved. (6 points)

10. Draw a route of a single pass protein into inner-mitochondrial membrane. Aside from the proteins involved, what else is required for import into inner-mitochondrial membrane? (4 points)

Dr. Hanson's Lectures (35 Points)

1. A newly synthesized glycoprotein in the ER that efficiently folds the first time is directly targeted for secretion. Briefly describe the process beginning with translocation into the ER lumen and ending with export from the ER. Be sure to mention all major proteins and functions in order. (4 points)

2. When a newly synthesized glycoprotein in the ER fails its first attempt to fold on the calnexin/calreticulin complex, this "nearly native" form of the protein undergoes several intermediate steps to try to be folded correctly again. Name two proteins that are involved in this intermediate step and identify the function of each. (4 points)

3. Why is glycosylation necessary? How does it guide proteins through the secretory pathway? (2 points)

4. If a glycoprotein is fatally misfolded, there are several steps involved in trimming sugars, transporting and degradation. Name two proteins that are involved in this final step and identify the function of each. (4 points)

5. What major biochemical change is associated with the maturation of an endosome? (1 point)

6. Describe two characteristics of the lysosome. List three types of enzymes located within it. (5 points)

7. Name the two processes that act as a failsafe when misfolded proteins accumulate in the ER. (2 points)

8. Answer either A or B. (4 points)

A. Name and briefly describe four different pathways of internalization at the cell surface mentioned in class.

B. Pick one receptor transport pathway (Transferrin, LDL, EGF) and describe it in detail. Please be sure to comment on the fate of the receptor and cargo. (4 points)

9. Name one disease mentioned in class that is associated with misfolded proteins? (1 point)

10. Describe the experiment that delineated the secretory pathway in *Saccharomyces cerevisiae* using sec mutants. Describe the set up, and the classes of mutants and each phenotype. How was the order of events worked out? (8 points)

Drs. Greenberg, Mahjoub, and Morley Lectures (35 Points)

1. Fill in the following table. (9 points)

	Subunit	Charged ends (Y/N)	Relative size (large, medium, small)
Microtubules			
Actin			
Intermediate filaments			

2. Name three ways that force can be generated by the cytoskeleton. (3 points)

3. What are two types of microtubule organizing centers (MTOCs)? Name one cellular process associated with each. (4 points)

4. List three ways cells regulate the level of polymerization. (3 points)

5. Name three ways heterogeneity and specificity of microtubule function are regulated. (3 points)

6. Hypertrophic cardiomyopathy (HCM) is associated with variants in which cytoskeletal component? (1 point)

7. Match the cytoskeletal features or processes that Rac, Rho, and Cdc42 correspond to. (3 points)

- | | |
|------------|---------------------------|
| ___ Rac: | a. filopodia |
| ___ Rho: | b. stress fiber formation |
| ___ Cdc42: | c. lamellipodia |

8. Match the following actin-binding proteins with their function. (4 points)

- | | |
|-----------------------|---|
| ___ Cofilin | a. Cross-linking |
| ___ Profilin | b. Nucleation |
| ___ Arp2/3 | c. Sequestration of disassembled subunits |
| ___ Plastin (Fimbrin) | d. Nucleotide exchange |

9. True or false: Nucleators reduce the energetic barrier to nucleation. (1 point)

10. True or false: Rac, rho, and cdc42 are downstream regulators of ABP. (1 point)

11. True or false: For Ras-related proteins, GTP-bound = inactive, and GDP-bound = active. (1 point)

12. True or false: In microtubule catastrophe, dynamic instability results from release of strain following loss of GTP cap. (1 point)

13. True or false: Instability allows for a dynamic cytoskeleton. (1 point)

