

MCB110
Second Midterm

April 8, 2010

Your name and student ID

QUESTION	POINTS
1 (10 points)	
2 (10 points)	
3 (15 points)	
4 (20 points)	
5 (15 points)	
6 (20 points)	
7 (20 points)	
8 (20 points)	
9 (20 points)	

TOTAL (150 points)

WARNING: Your exam will be taken apart and each question graded separately. Therefore, if you do not put your name and ID# on every page or if you write an answer for one question on the backside of a page for a different question, you are in danger of irreversibly LOSING POINTS!

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Q1 – Describe clearly but concisely what Fluorescence Recovery After Photobleaching (FRAP) is (6 points). If you use this methodology to visualize two integral membrane proteins in vivo, one resident in the nuclear inner membrane and tightly attached to nuclear lamins, and one in the plasma membrane that does not interact with the cytoskeleton, what are the differences in behavior you will see (4 points)

Q2 – Describe in one short sentence each, what special step will be required to separate from the plasma membrane: 1) an integral membrane protein, 2) a peripheral membrane protein, 3) a lipid-anchored protein (6 points) In the first case, what kind of information will you be able to get about the protein by analysis of its hydrophathy plot? (4 points)

Q3 – Briefly explain how voltage-gated ion channels are able to sense and respond to changes in electric potential across the membrane (15).

Q4 – Describe the structural steps in the ATP cycle of the Ca^{++} ATPase that lead to the pumping of Ca^{2++} out of the cell. (20).

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Q5 – Describe and explain two essential differences between ion channels and ion pumps that relate to speed and directionality (15 points)

Q6 – Describe the molecular players and the distinct steps involved in the cotranslational translocation of an integral membrane protein with an N-terminal signal sequence and a stop-transfer anchor sequence in the middle of the protein (15 points)
What topology will the protein have on the plasma membrane (5).

Q7 –During the process of clathrin-mediated endocytosis,

(a) What is the role of clathrin? (5)

(b) What is the role of adaptor proteins and ligand receptors?(5)

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(c) What is the role of dynamin? (5)

d) How is clathrin recycled? (5)

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Q8 – In the response of a muscle cell to adrenaline (epinephrine),

(a) How is the signal amplified? (10)

(b) How is the signal terminated (10)

Q9 – In the response to insulin which roles do these molecules play (20):

a) Insulin receptor

b) IRS proteins

c) PIP3

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- d) Concerning glucose metabolism, how do glucagon and insulin have opposite effects?