Study Questions for Membrane Function

Campbell, Chapter 7.

1. **Terms**:

amphipathic molecule	cotransport
integral and peripheral proteins	exocytosis
transport protein	endocytosis
osmoregulation	phagocytosis
facilitated diffusion	pinocytosis
gated channel	receptor-mediated endocytosis
active transport	ligands
Na^+ / K^+ pump (a.k.a. Na^+ / K^+ ATPase)	

2. Read the section dealing with the development of our ideas about membranes closely; it is an excellent example of the scientific process. It is also covered in the notes that follow. Review the process in the science notes from the start of the course and from Campbell Ch. 1.

3. What does membrane fluidity mean? What movements are allowed by membrane lipids? Do they commonly "flip-flop"? As part of your answer, explain the forces that act on the lipids. What is the role of water in all of this? How can the fluidity of membranes be increased at a given temperature? What do you expect is the effect of changing temperature on membrane fluidity?

4. What would be the characteristics of the parts of a transmembrane protein that are found within the membrane? How about the parts the project away from the membrane into the cytosol or the extracellular environment?

5. List and be able to define the six functions of membrane proteins listed in fig. 7.9.

6. What are the characteristics of molecules that can easily pass through a membrane? What are the characteristics of those that cannot? What is it about the lipid bilayer that makes for this selective traffic?

7. What is the role of proteins in membrane permeability (speaking generally)?

8. Look at fig. 7.16 very carefully. Not only does it explain how active transport works (in this case the antiport of Na^+ and K^+) but it also shows

how the breakdown of ATP fuels a process. Note the orderly series of conformational changes of the transport protein. The role the breakdown of ATP is most directly to make the process thermodynamically irreversible; we'll consider this in more detail at the end of the notes that follow this question.

NOTES STUDY QUESTIONS

1. Explain the role of proteins in producing functional specialization in membranes.

2. What is a model? How would one construct a model? What purposes should a model serve? What are the general limitations of models?

3. About the fluid mosaic model: How can what is essentially a liquid be a stable barrier between the cell and the environment (or between different parts of the cell). Consult your textbook and think about what you have just read before answering this one.

4. Explain the various ways material moves between a cell's interior and surrounding environment.

5. Explain why a disordered state is more probable than an ordered one and why it takes energy to create an ordered state.

6. Be able to explain diffusion, osmosis and the creation of a Gibbs-Donnan equilibrium. Why can concentration gradients still exist at equilibrium in osmosis and in a Gibbs-Donnan system? -- is there still a net potential energy in these systems?

7. Explain the role of conformational change and hydrolysis of ATP in active transport. What causes conformational changes to occur?

8. In regards to active transport and many other processes in cells, what is the role of coupling agents and what types of compounds are they?

9. Explain the diffusion equation -- especially be sure you know what each of the terms in the equation represents.

10. Distinguish between each of the following:
a. facilitated diffusion and simple (non-facilitated) diffusion
b. active and passive transport
c. concentration and electrochemical gradients

d. cation and anion
e. Davson-Danielli and fluid mosaic models
f. exocytosis and endocytosis
g. channel and pump
h. receptor and enzyme
i. integral, peripheral and transmembrane proteins
j. selective permeability, localization of chemical reactions and reception of information

11. Identify each of the following:
a. osmosis
b. hypo-, hyper-, and iso-tonic (osmotic) solutions
c. osmotic pressure
d. osmotic gradient
e. Gibbs-Donnan equilibrium
f. permeability
g. gated channels
h. structural protein