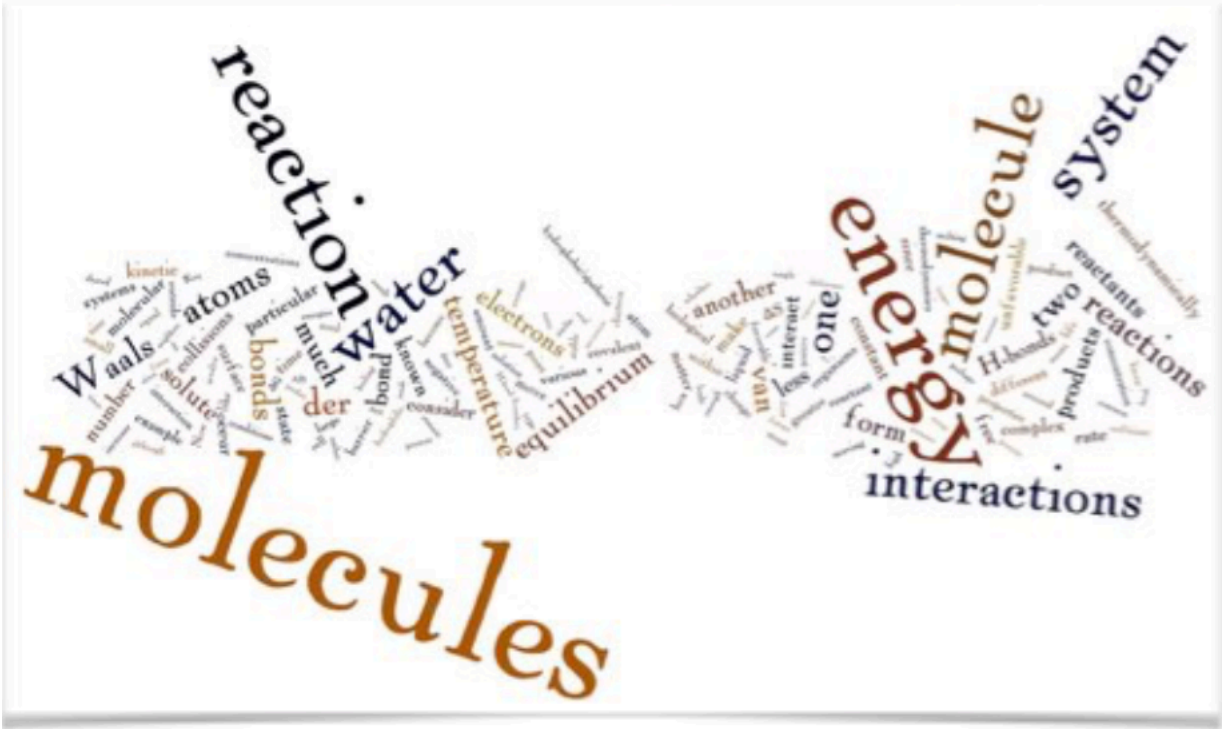


Questions: moving across membranes and building gradients

course web site

Questions to answer:

84. Draw diagrams to show how increasing the length of a lipid's hydrocarbon chains affects the structures that it can form and use your diagrams to explain how the effects at the hydrophobic edges of a lipid bilayer are minimized?

85. Some lipids have phosphate groups attached to the glycerol as well as fatty acids - explain how the presence of “phospho-lipids" will impact membrane structure and stability.

86. Make a set of general rules on the effects of size and composition on the ability of a molecule to pass through a membrane.

molecular simulation of membrane + water

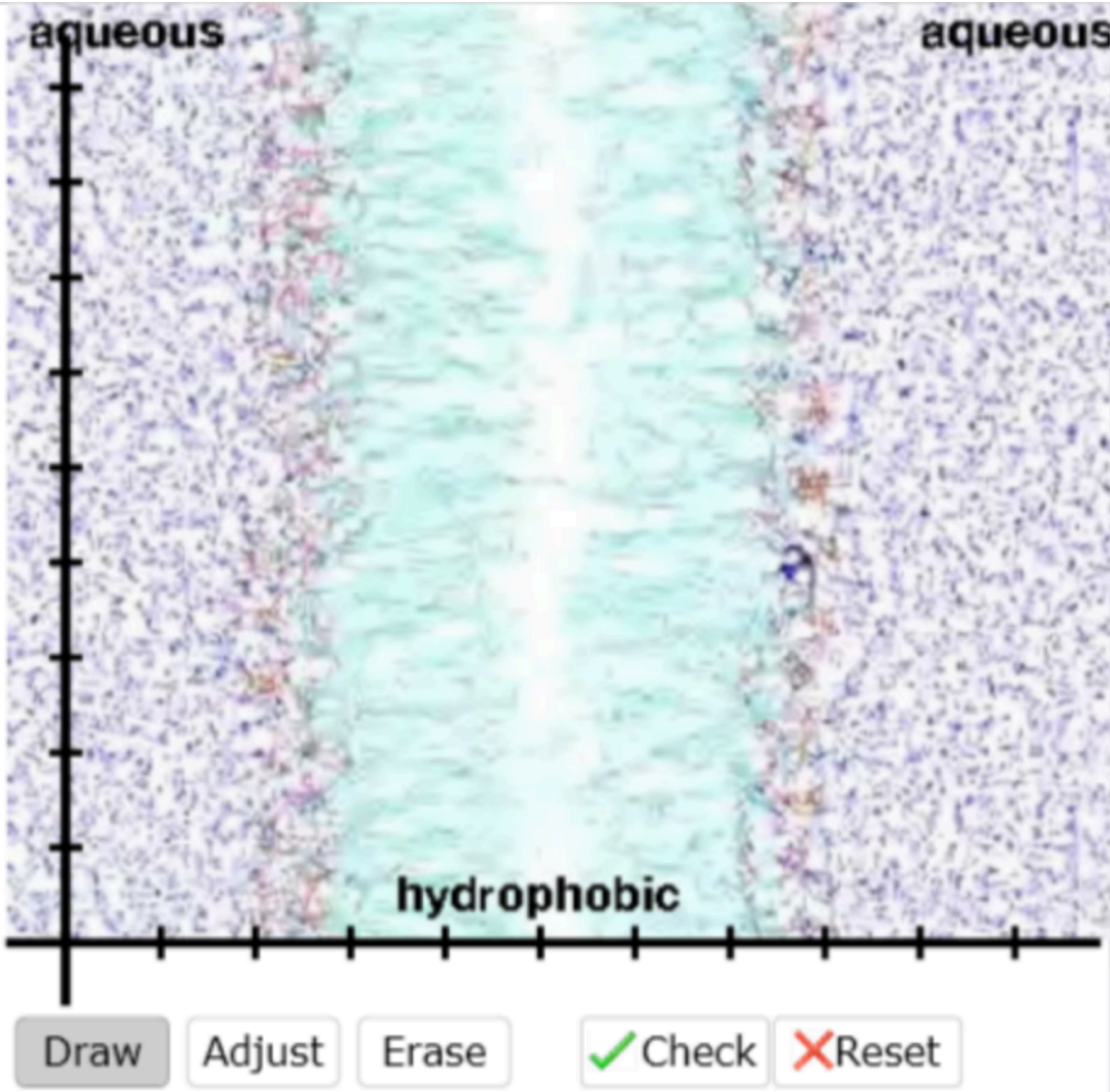
What are the forces that explain the movements of the water molecule?

Moving across membranes a reaction (concentration and free energy)

$$\text{Molecule}_{\text{outside}} \rightleftharpoons \text{Molecule}_{\text{inside membrane}} \rightleftharpoons \text{Molecule}_{\text{inside cell}}.$$

Make a graph for the FREE energy associated with a hydrophilic molecule as it moves through a membrane.

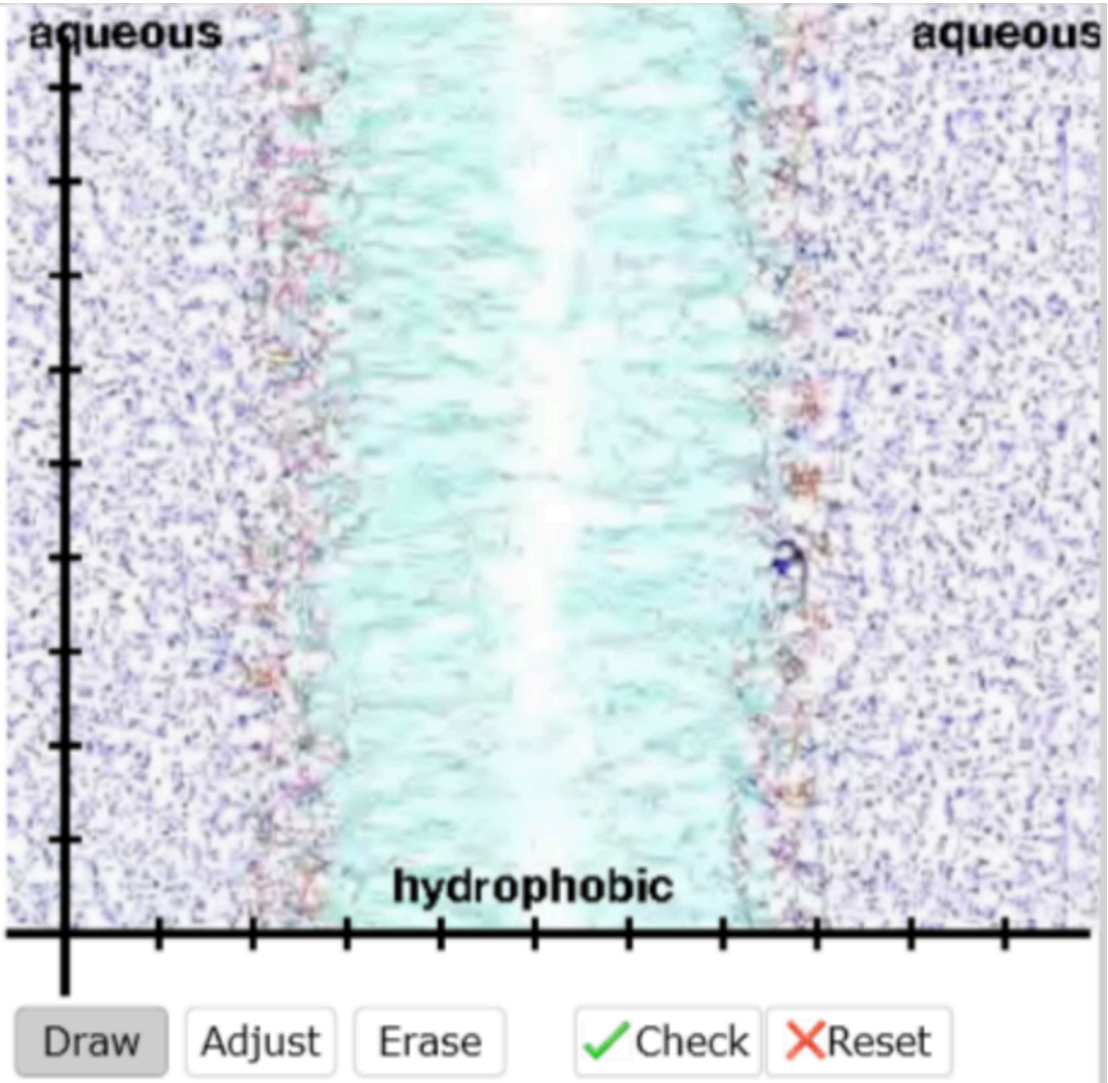
Explain your reasoning, and indicate where, at equilibrium, would most of these hydrophilic molecules be located.



negative free energy = favorable
positive free energy = unfavorable

Make a graph for the energy associated with a hydrophobic molecule as it moves through a membrane.

Explain your reasoning, and indicate where, at equilibrium, would most of these hydrophbic molecules be located.



negative free energy = favorable
positive free energy = unfavorable

Questions to answer:

87. Consider the reaction diagram for flipping a lipid molecule's orientation by 180° perpendicular to the plane of the membrane: what energy barriers are associated with such a movement?

88. Draw a graph to show how the potential energy changes as an ion moves across a membrane.

89. What do you expect to happen to the O_2 gradient if an aerobic cell's ability to use O_2 is inhibited?

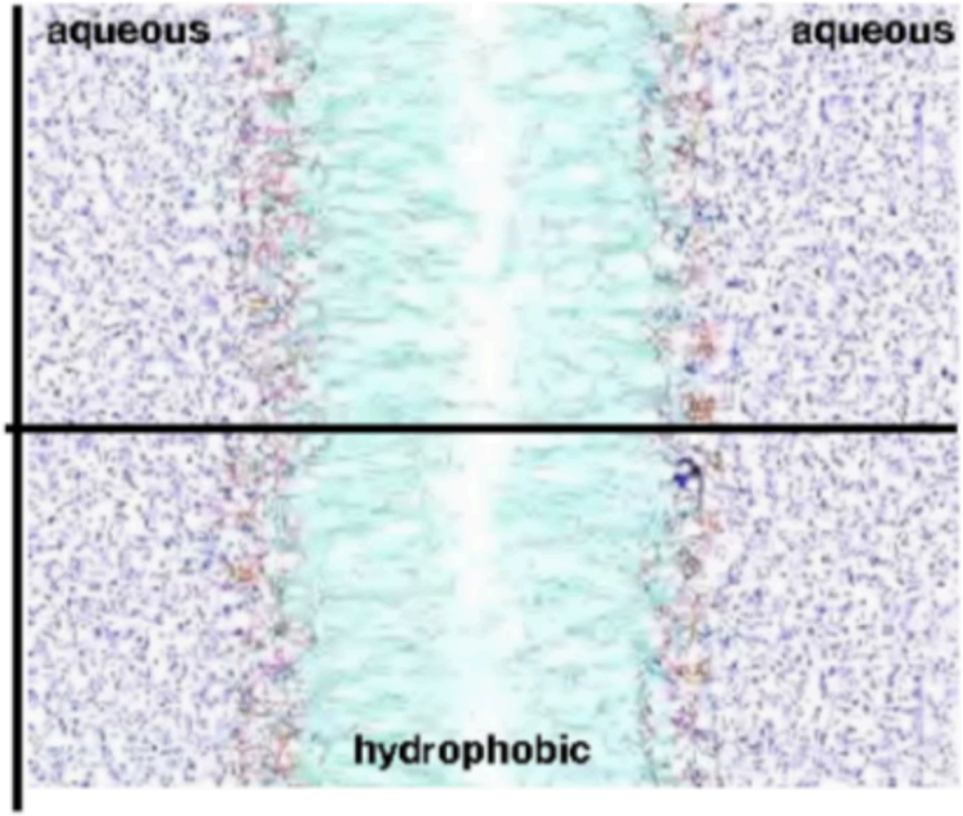
What do channels and carriers to the energy needed to cross membrane?

How are channels and carriers like enzymes?

6.2 read pages 135-139 first

Draw the reaction path for a hydrophilic molecule that is at a higher concentration outside the cell than inside.

extracellular intracelluar



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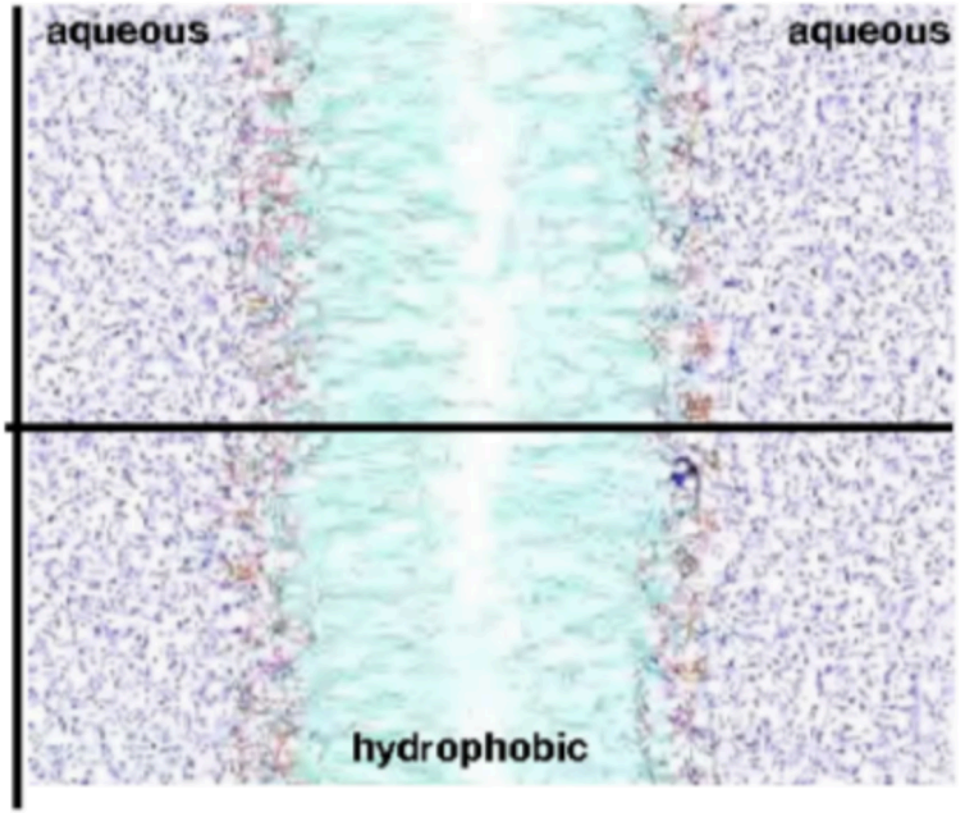
Explain your logic and then describe how your diagram would change if the concentration of the molecule were higher inside the cell than outside.

Now draw what will happen if we add a channel protein that allows the molecule to pass through the membrane.

extracellular intracellular



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Explain your logic. Does the direction of the concentration gradient matter to the effect of channel protein?

90. What does it mean to move up (against) a concentration gradient? Is this a favorable or unfavorable event?

91. Where does the energy involved in moving molecules come from?

92. What happens to the movement of molecules through channels and transporters if we reverse the concentration gradients across a membrane?

93. Draw a diagram to show how K+ ions are transported by an ionophore across a membrane. Draw a graph to show how the potential energy changes as the ion moves. Be sure to include the relative concentrations.

What is a concentration gradient?

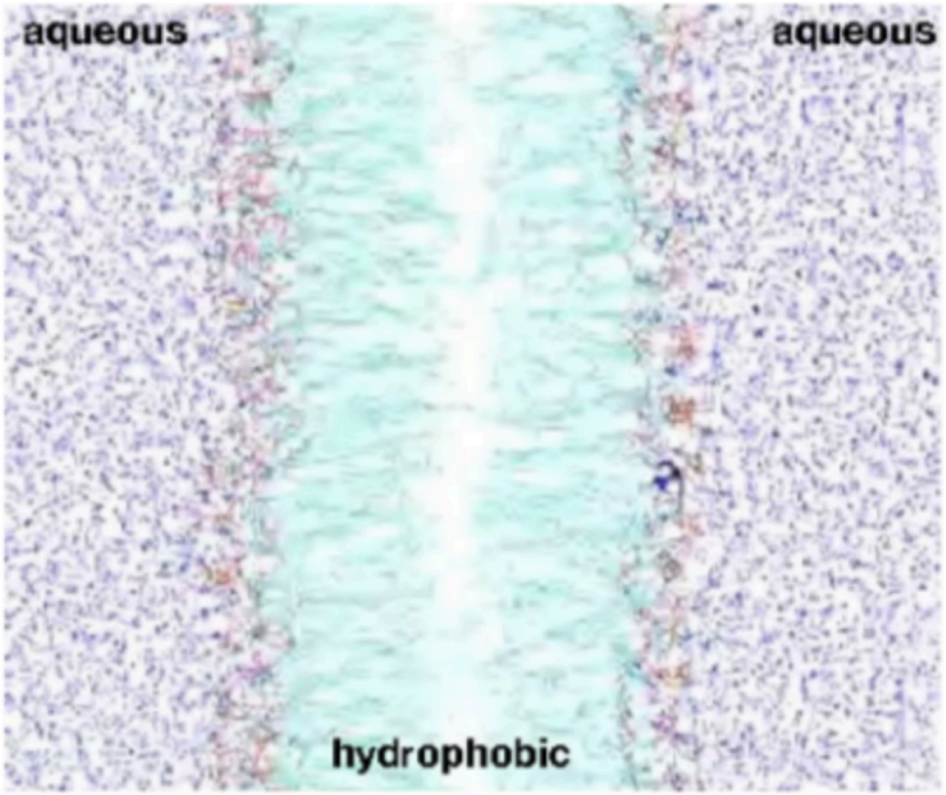
How does a concentration gradient influence a channel or carrier?

How is a concentration gradient generated?

The membrane contains a pump protein; draw the components of the system necessary for the pump protein to produce a concentration gradient of the molecule X across the membrane.

extracellular

intracelluar



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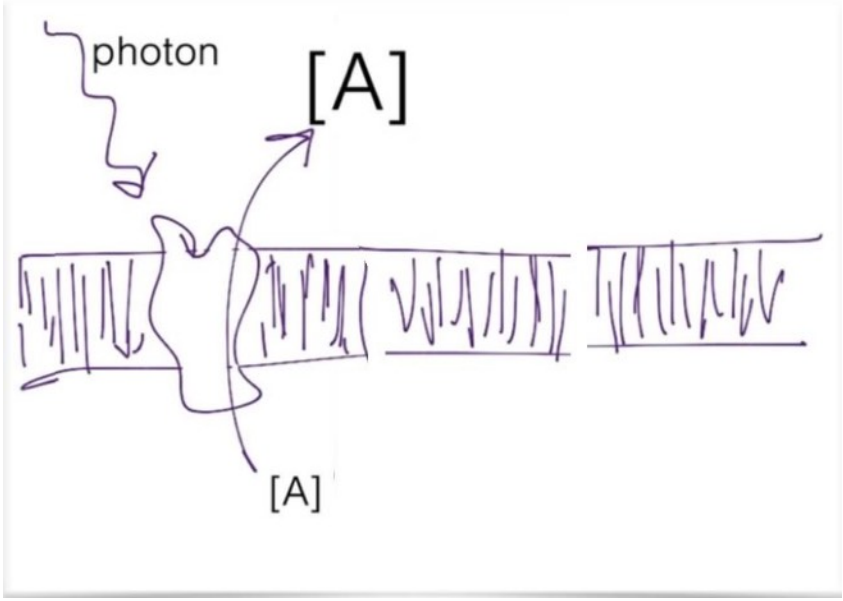
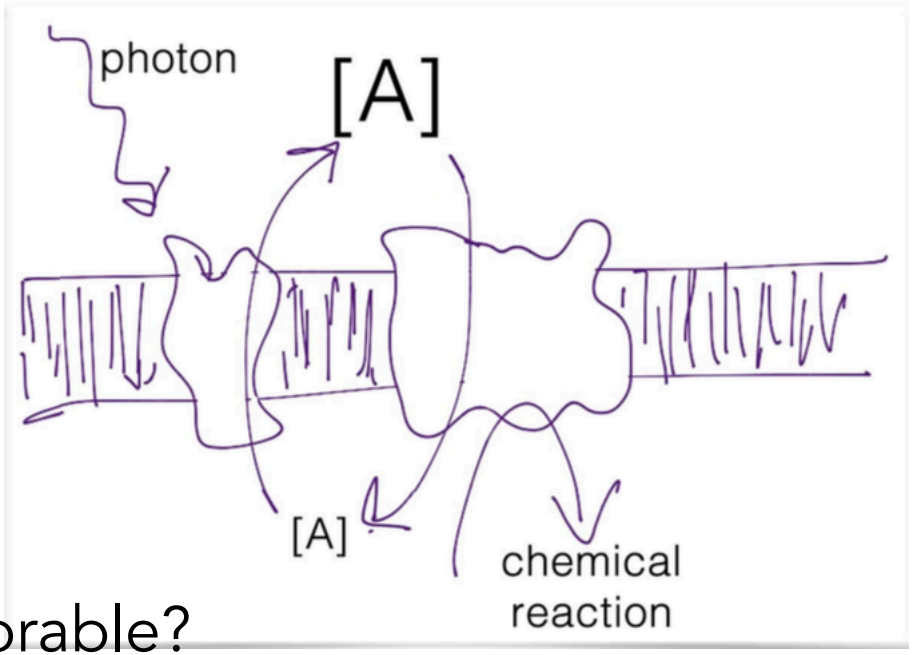
Explain your logic.

How does Halobium “eat” light?

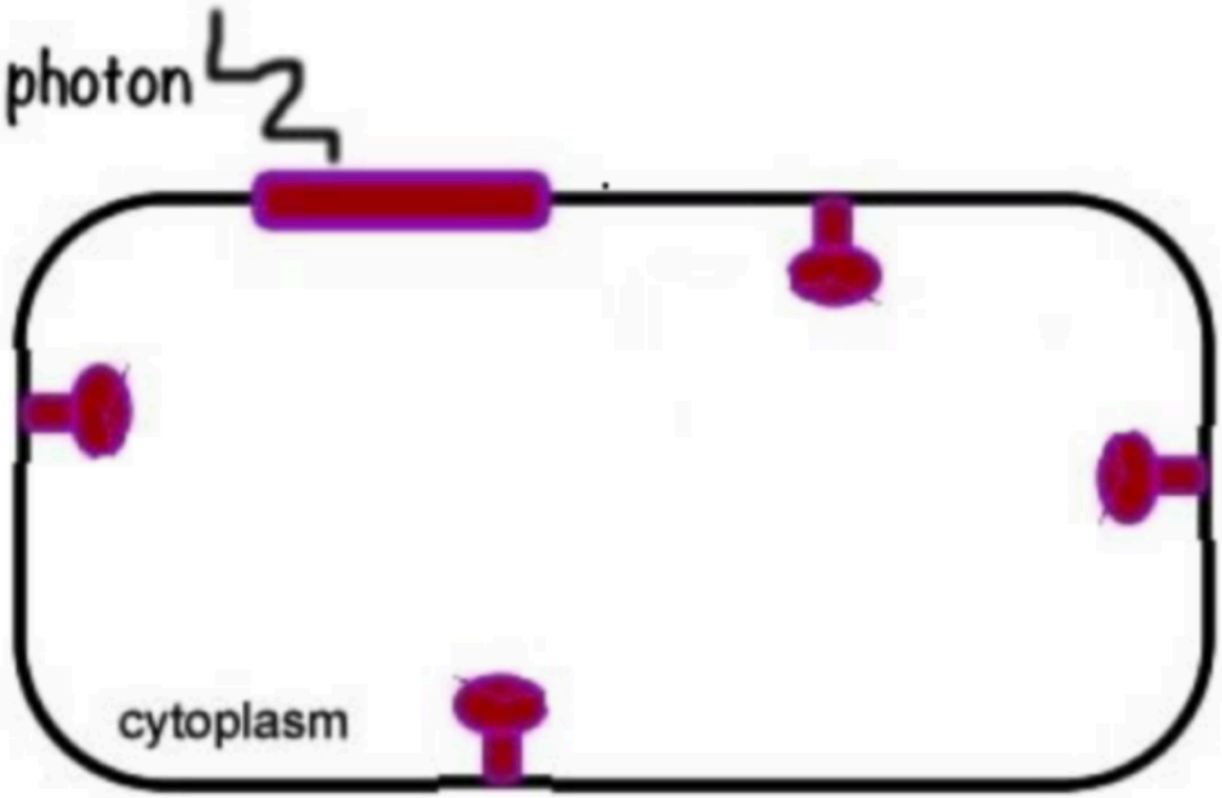




which is favorable, which is unfavorable?

Here is a schematic of a Halobium, which absorbs light and uses the energy to generate a [H+] gradient across its plasma membrane. The energy stored in that gradient to drive ATP synthesis. As the sun rises, indicate which directions H+s are moving and were ATP is synthesized

explain you logic



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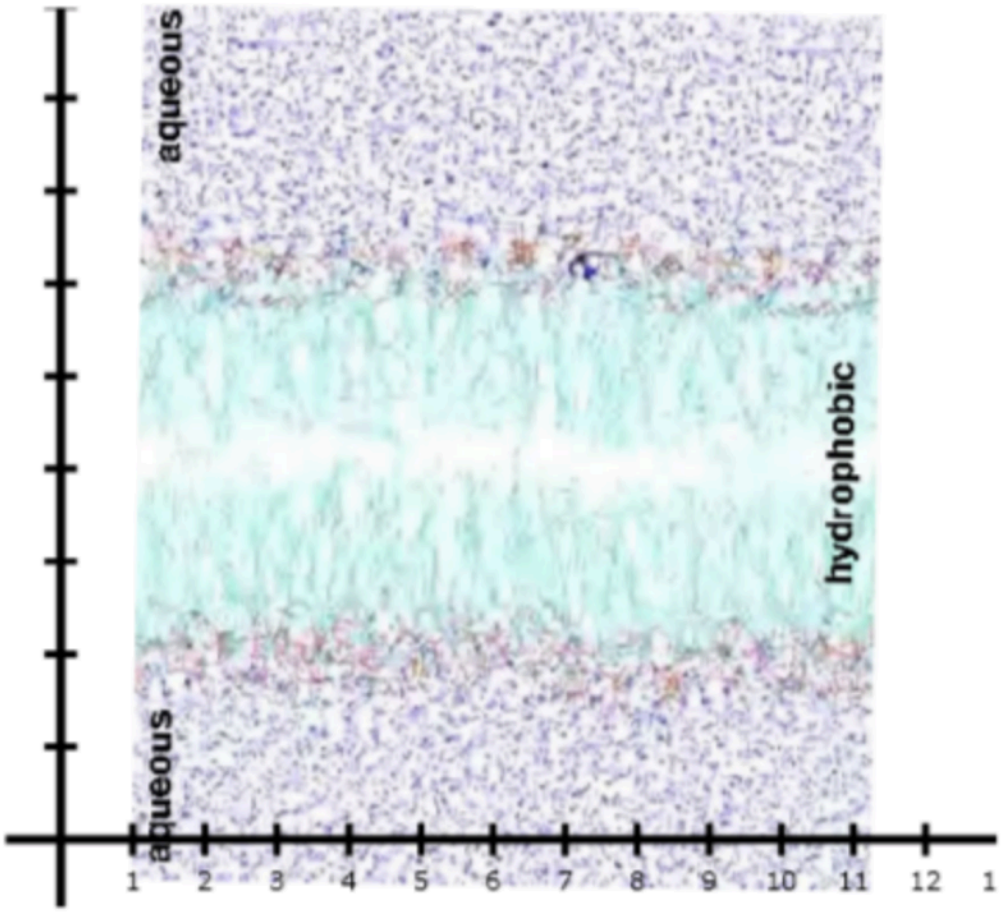
page 4 of 9

In the Halobium (purple) membrane, the light turns on at time = 2, indicate on the graph the size of the [H+} concentration gradient.



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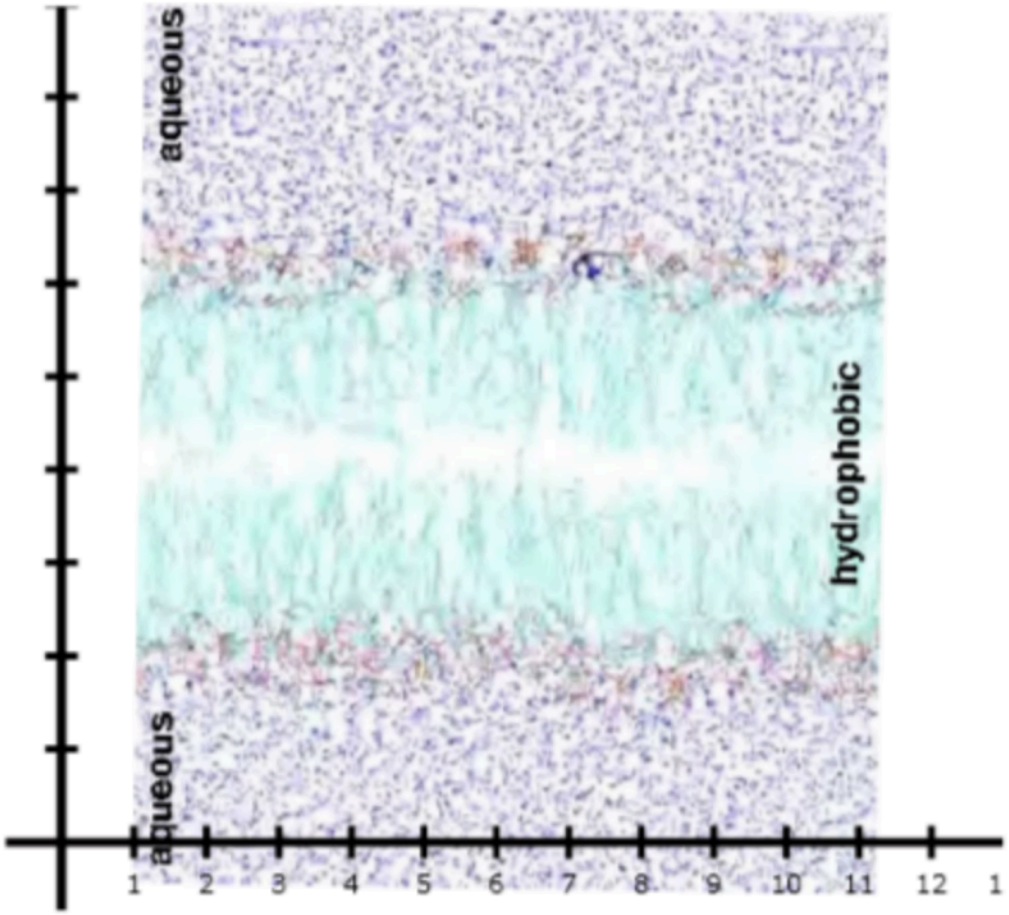
Explain your logic - what factors will act to limit the maximum size of the concentration gradient

The light turned on at time = 2; now assume the light goes off at t = 8. Indicate how that influences the [H+} concentration gradient.

intracellular extracelluar



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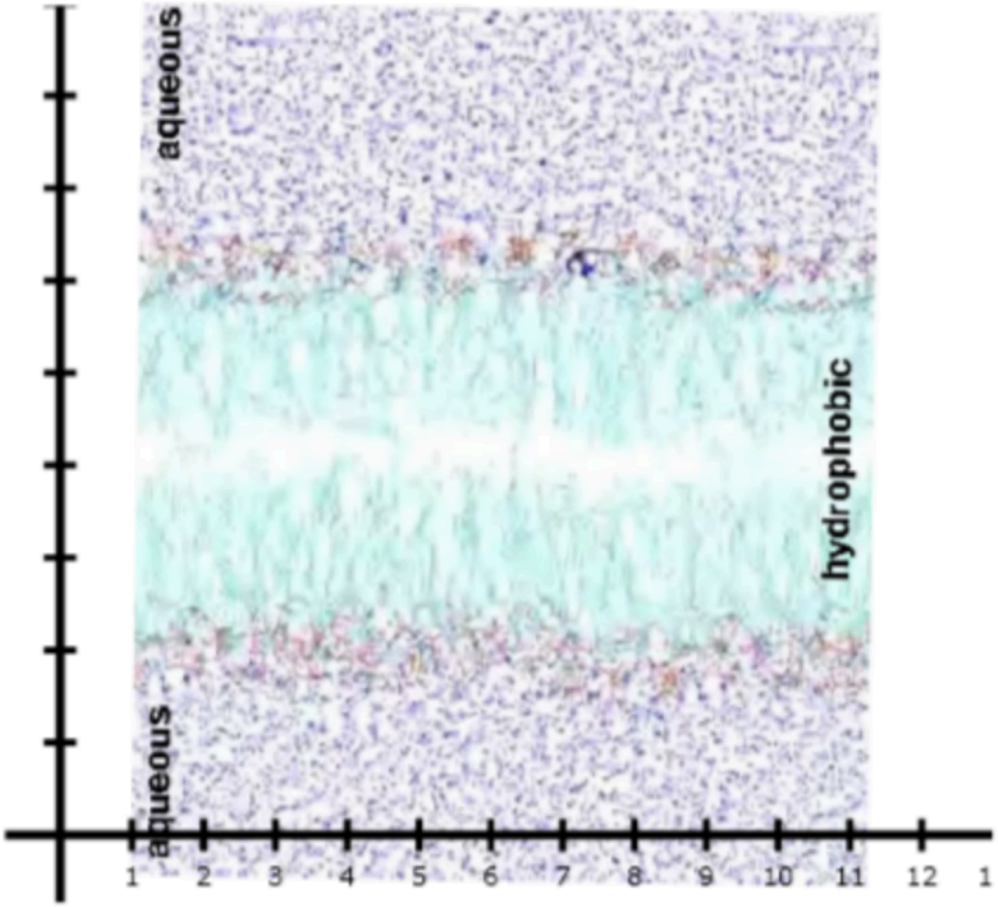
Explain your logic

On your graph light on at 2 and off at 8) indicate the rate of ATP synthesis as a function of time.

intracellular

extracelluar



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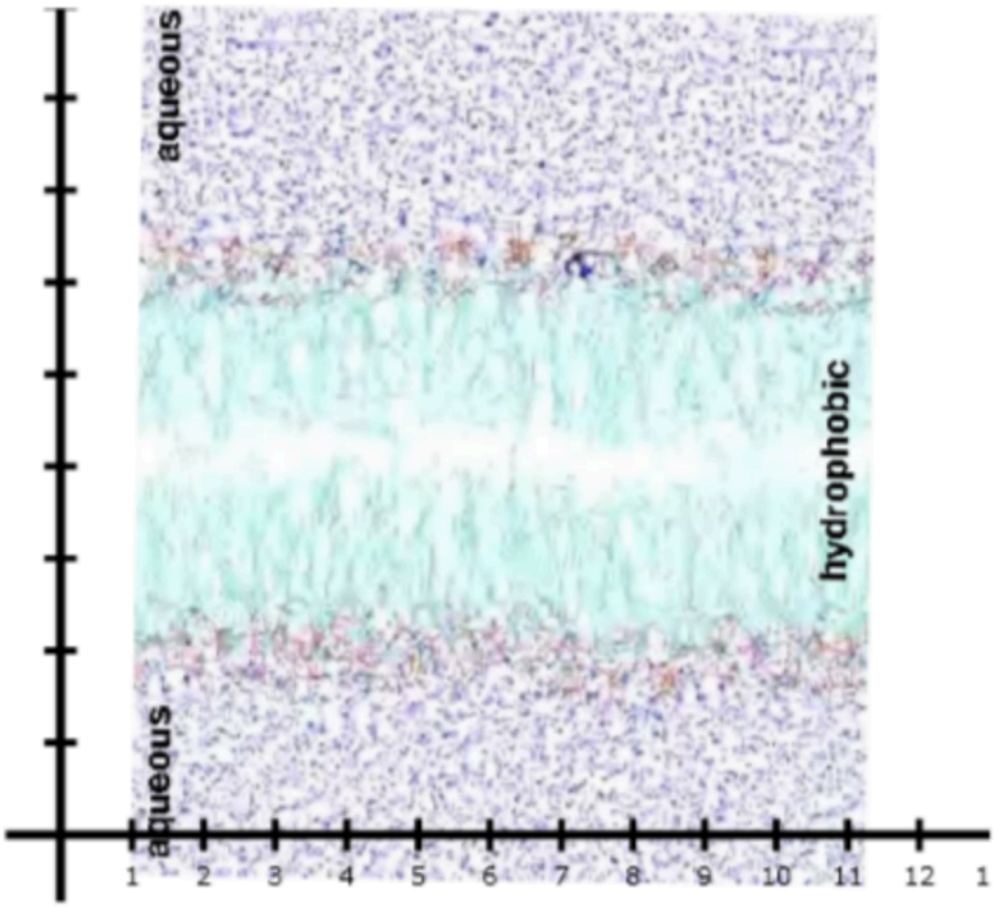
Explain your logic

Now at time equal 6, a nasty competitor microbe releases a H+ channel molecule. Indicate how that influences ATP production by the Halobium.



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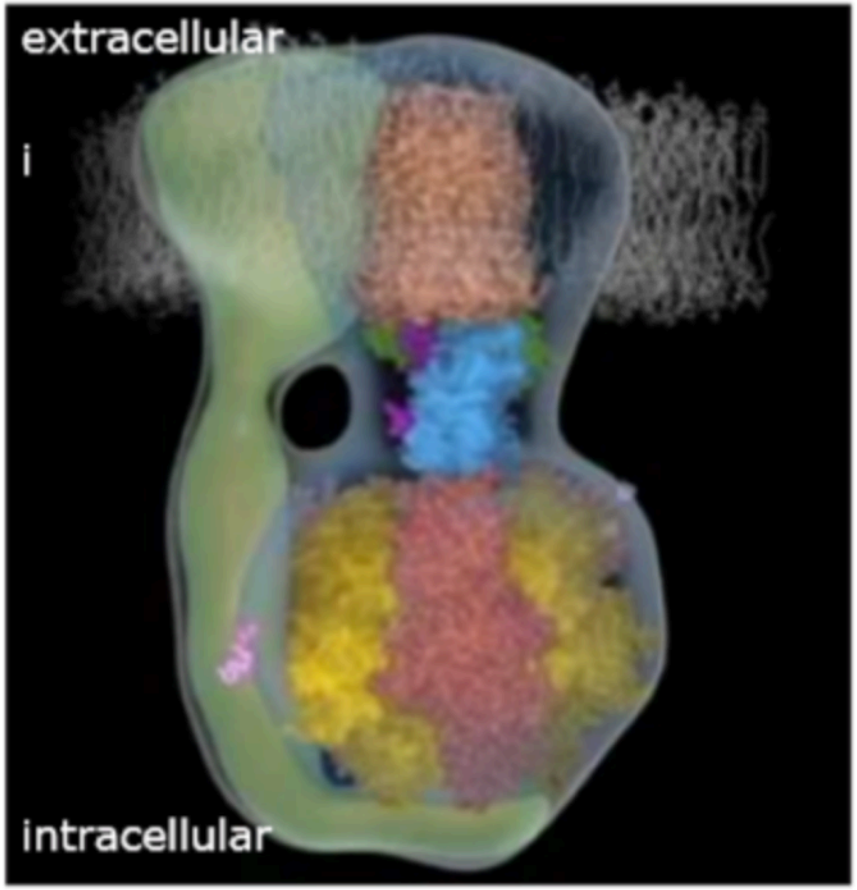
Explain your logic



here is a model of the ATP synthase that couples to the H+ gradient to drive ATP synthesis. Indicate what motions occur during this reaction.

Generate a model for how such a system might be used to drive cellular movement.

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First I Know It Now exam (at the final) = 30 possible points

Monday 16 Oct.	Chapter 6.3 Membranes and capturing energy	139-144	**Complete** beSocratic #18
Wed. 18 Oct.	Chapter 6.4 Membranes and capturing energy	144-150	**Complete** beSocratic #19
Friday 20 Oct.	**REVIEW for midterm #2**		previous midterm
Monday 23 Oct.	**second midterm exam**		exam answers