1. **Pick up** Name Folder

- Pick up name folder and set it up at seat.

2. **Sit** with your lab group.

- laptops almost closed (avoid distracting)

3. **Clicker** Attendance

- Launch your Top Hat, and get ready to click.

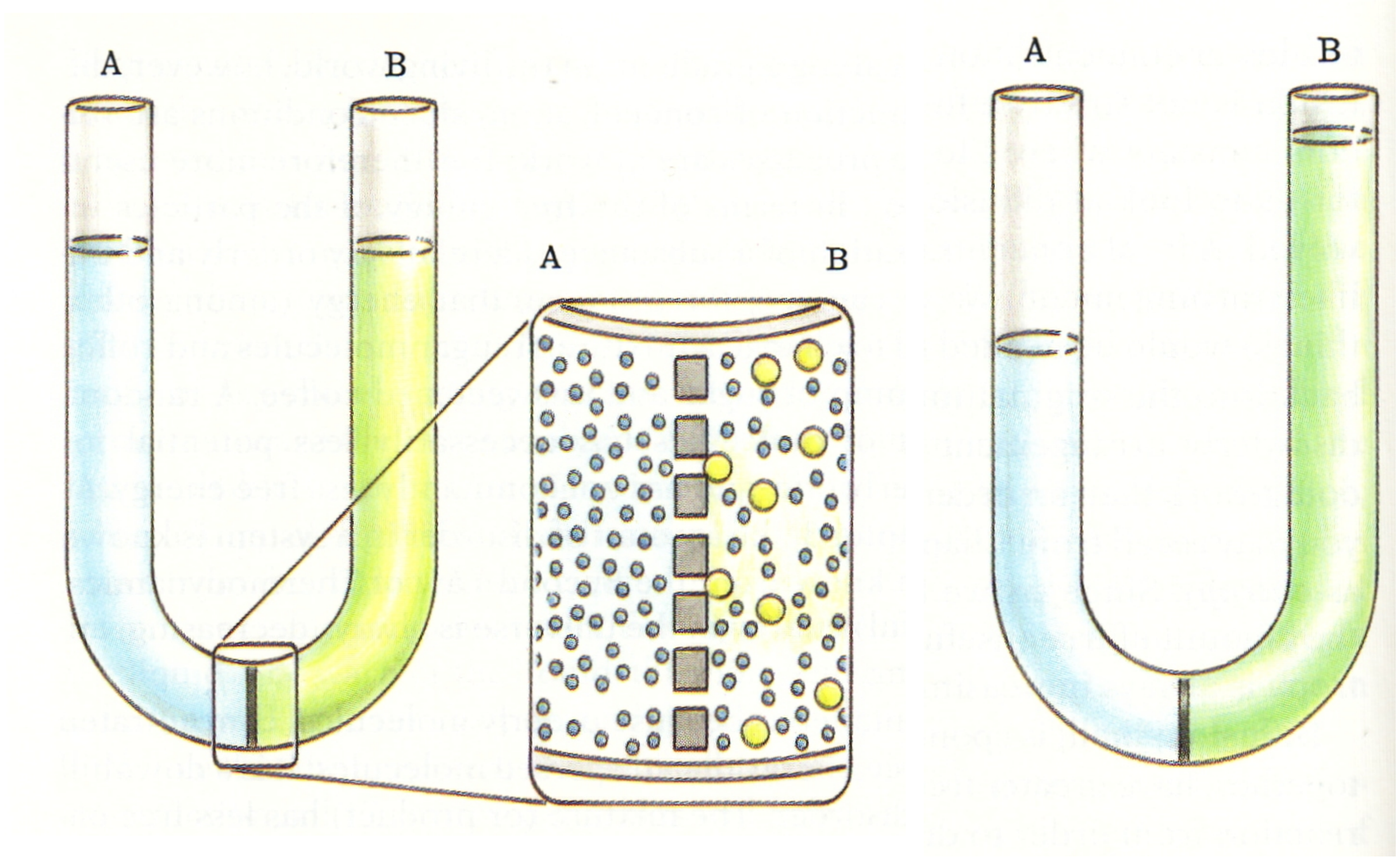
Announcements

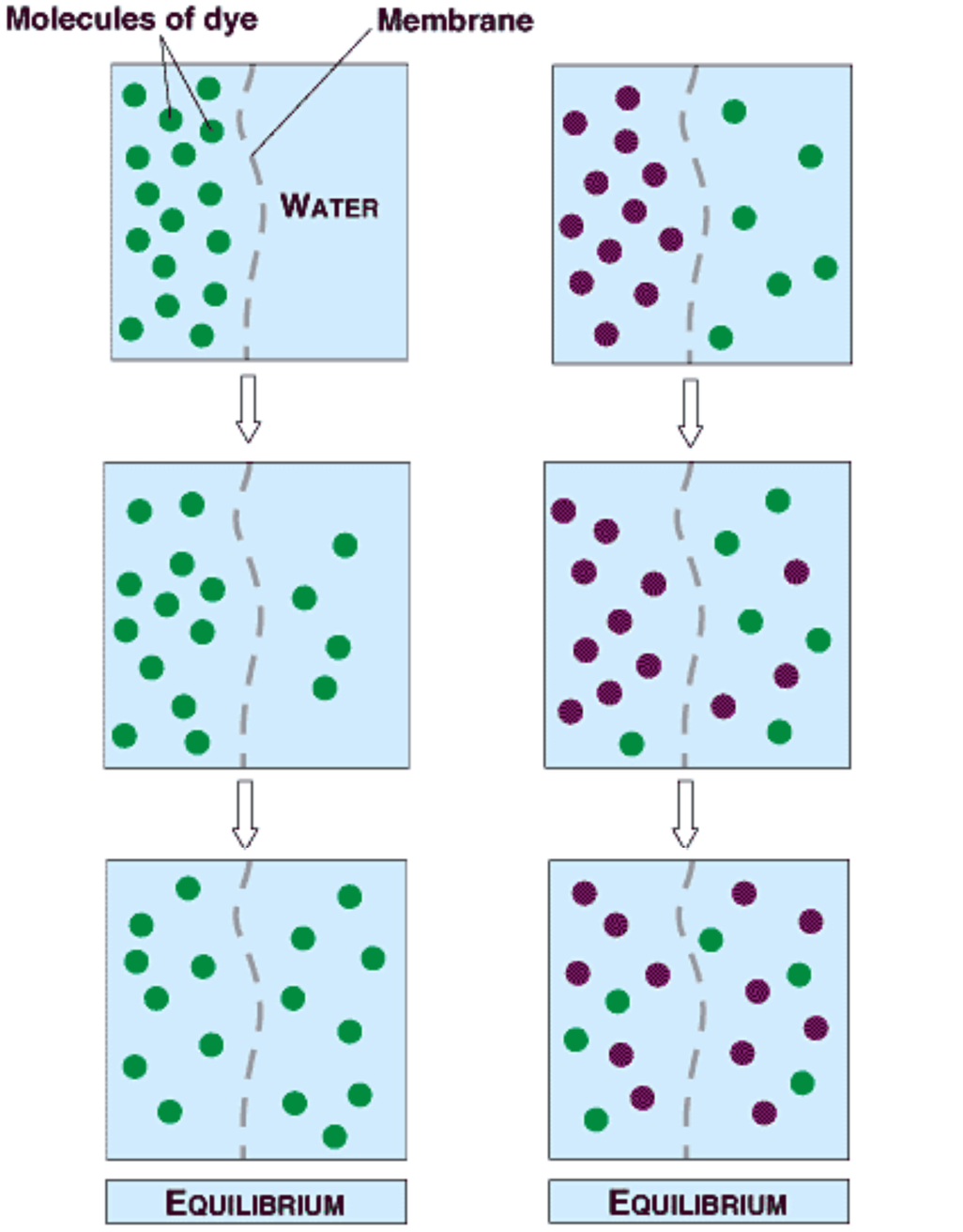
1. MidSemester SALG Survey is online, please provide feedback.
2. Take home exam (do not share your text with others, just your ideas)
3. This week ONLY: **BUMP points for Exam II score, for each full experimental entry in your official lab notebook!**
4. **DRAFT2**: How we are grading your papers (**process**).
5. Noticed that some folx did not participate at all, or hardly at all, in writing/revising your section for DRAFT2.

If this was you: please realize you may use your TARDIS pass to get another chance to do the work, and avoid that low score for DRAFT2. Remember higher score for DRAFT2 also raises DRAFT1 score!

Back to Biology…
(last time)

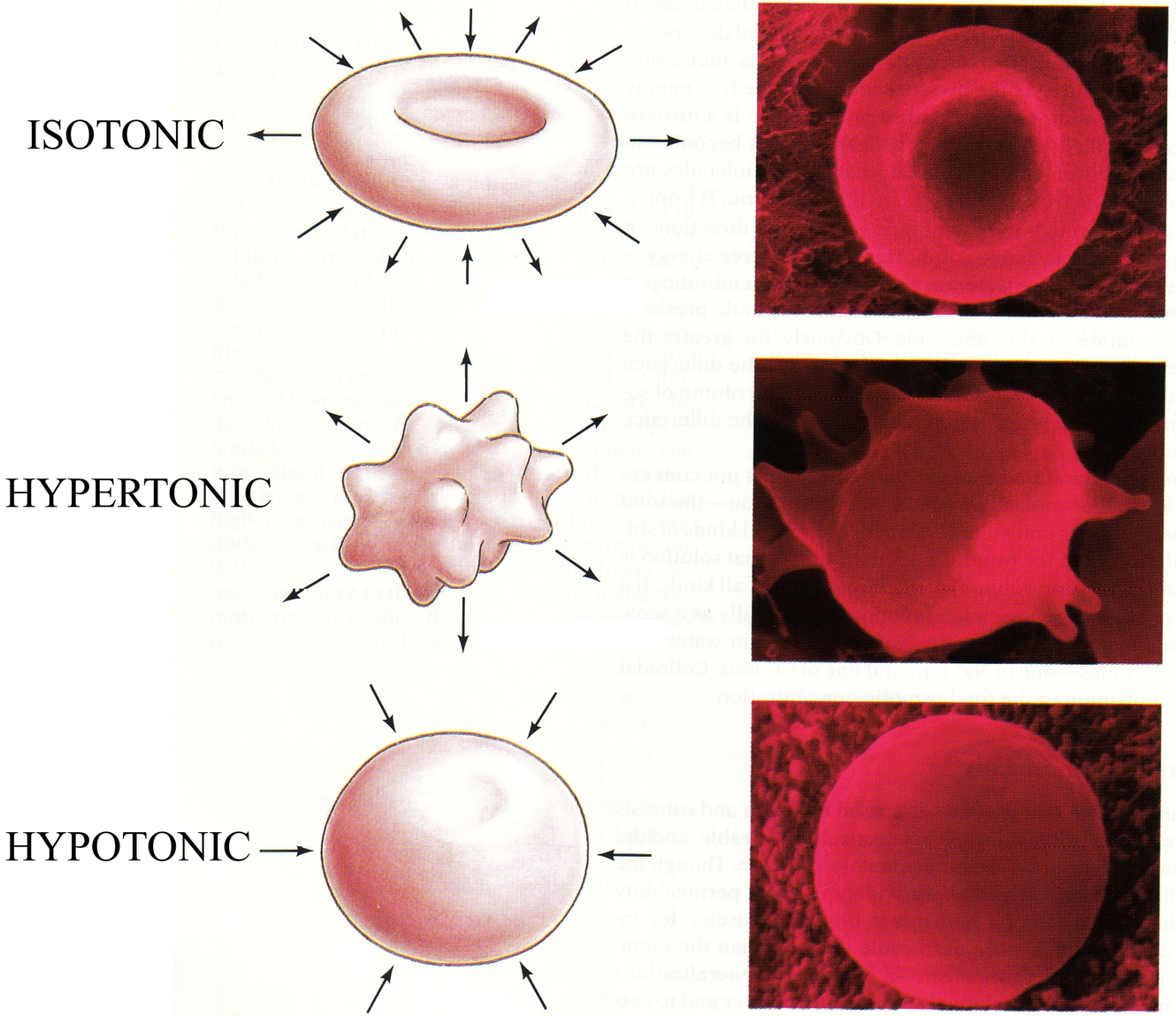
Osmosis (diffusion of water)





(a) Diffusion of one solute (b) Diffusion of two solutes

Which person was injected by poorly prepared saline solution, how can you tell?



(Preparing for) **Wednesday's lecture:**

Budgeting homework time (30 min): Section 5.3 of **Structure and Function of Plasma Membranes (OSB)** is 1532 words in length with four art figures (no data figures for trifectas). Reading at 200 words per minute would mean the section might take 8 minutes to read. If done properly, when you pause to review figures and take careful notes, this assignment should take you more like 30 minutes.

1. _____ **For Wednesday's lecture,** read section 5.3 "Active Transport" in the chapter **Structure and Function of Plasma Membranes (OSB)** (1532 words) and take handwritten notes in your notebook.

2. _____ While reading, be sure you can explain **Figures 1 and 3.** We will discuss these in class.

3. _____ **Advanced**: What is one way to determine whether ion movement is due to passive transport or active transport? Does this hold true for CFTR?

Structure and Function of Plasma Membranes (OSB)

Edit Tools

5.3 Active Transport

Summary: By the end of this section, you will be able to:

- Understand how electrochemical gradients affect ions
- Distinguish between primary active transport and secondary active transport

active transport mechanisms require the use of the cell's energy, usually in the form of adenosine triphosphate (ATP). If a substance must move into the cell against its concentration gradient—that is, if the concentration of the substance inside the cell is greater than its concentration in the extracellular fluid (and vice versa)—the cell must use energy to move the substance. Some active transport mechanisms move small-molecular weight materials, such as ions, through the membrane. Other mechanisms transport much larger molecules.

Electrochemical Gradient

We have discussed simple concentration gradients—differential concentrations of a substance across a space or a membrane—but in living systems, gradients are more complex. Because ions move into and out of cells and because cells contain proteins that do not move across the membrane and are mostly negatively charged, there is also an electrical gradient, a difference of charge, across the plasma membrane. The interior of living cells is electrically negative with respect to the extracellular fluid in which they are bathed, and at the same time, cells have higher concentrations of potassium (K^+) and lower concentrations of sodium (Na^+) than does the extracellular fluid. So in a living cell, the concentration gradient of Na^+ tends to drive it into the cell, and the electrical gradient of Na^+

(A) Cell Movie Post test?

3-15-23 Plasma Membranes 5.3 Active Transport

L.O.
- Understand how electrochemical gradients affect ions
- Distinguish between primary active + secondary active transport

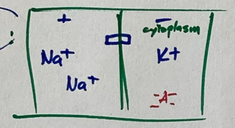
Active Transport – require use of energy, usually ATP. If substance moves against its gradient must be..

Previously discussed simple gradients of concentration but in life some things are charged. Cells (when alive) have negative charge inside and charged ions or molecules are attracted or repelled by charge.

So BOTH conc gradient + charge gradients are relevant. gradients two.

Na, K-ATPase (pump) always running pushing $3Na^+$ out of cell + pulling $2K^+$ in

Electrochemical gradient: Na^+_{out} conc in, elect in → into cell

Figure 1: 

K^+_{in} conc out, elect in → into cell / out mixed

(X) Q: What is CFTR? (X) HHs in Chloroplast ?

Moving against gradient (walking up river, against flow of water) ✓

active term = pump ← passive term = channel or "carrier" ?? mix ← facilitated diffusion

Figure 2: metabolic poisons → ↓ATP → problematic for all active processes (no electricity + sump pump)

1° active transport uses ATP + pumps against gradient

2° active transport uses existing gradients to move stuff against conc.

vocab for transporters: "uniporter" – carries one thing, "symporter" two things same direction, "antiporter" opposite directions

Figure 3: Attempt to show actions of Na/K-ATPase via drawings

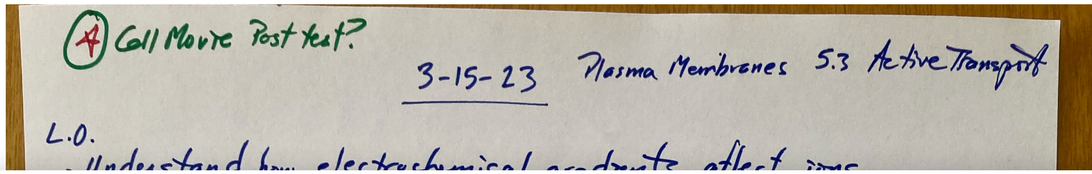
Text explains each step with regard to which direction open orientation points

→ pump is electrogenic → generates electric current $3^+ + 2^+$ net 1^+ out

↳ created/source of life membrane potential

Figure 4

→ Na+K gradient created by pump can be used to power carriers (HHs) that move other molecules against there gradient (aa's, sugars)



Edit

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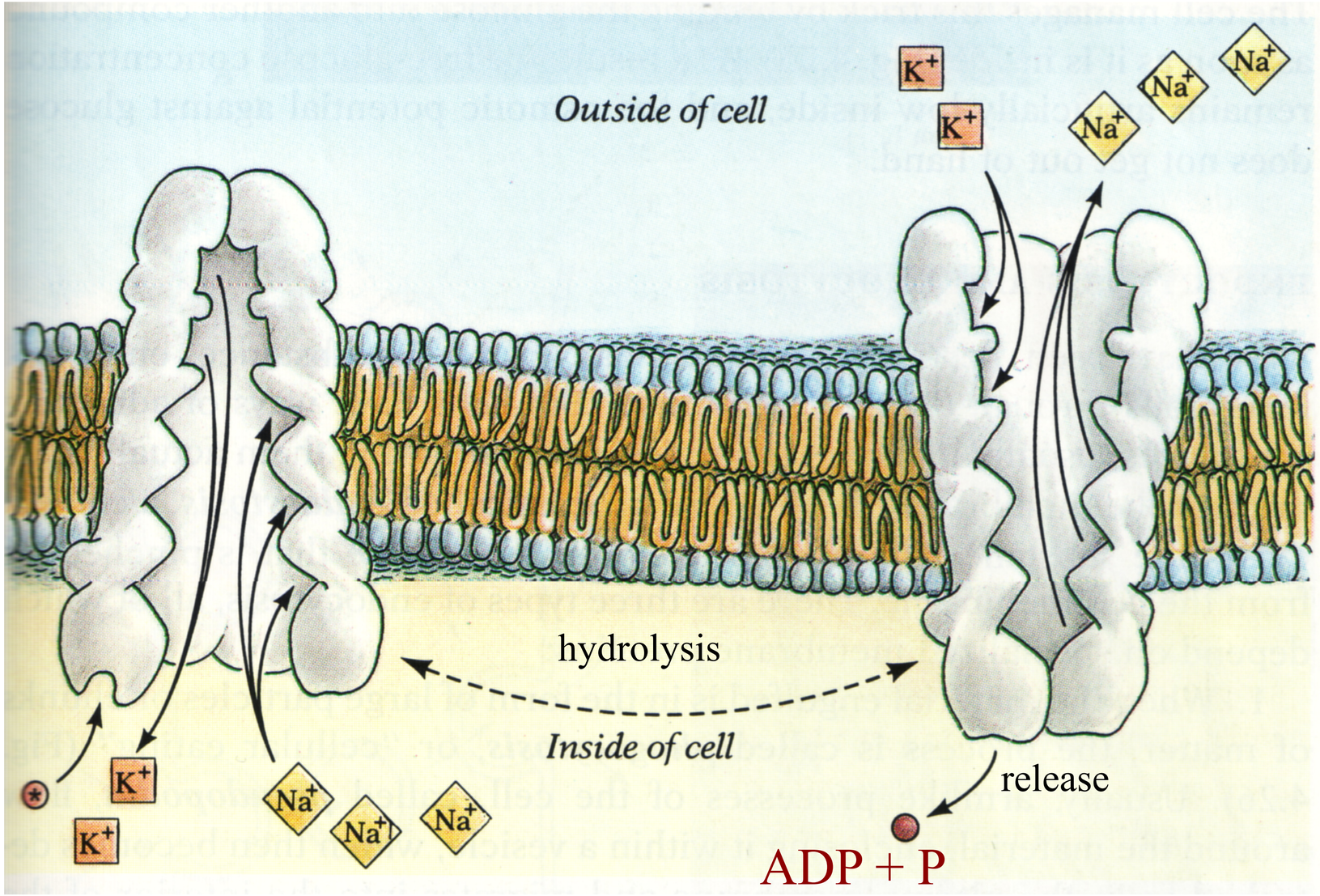
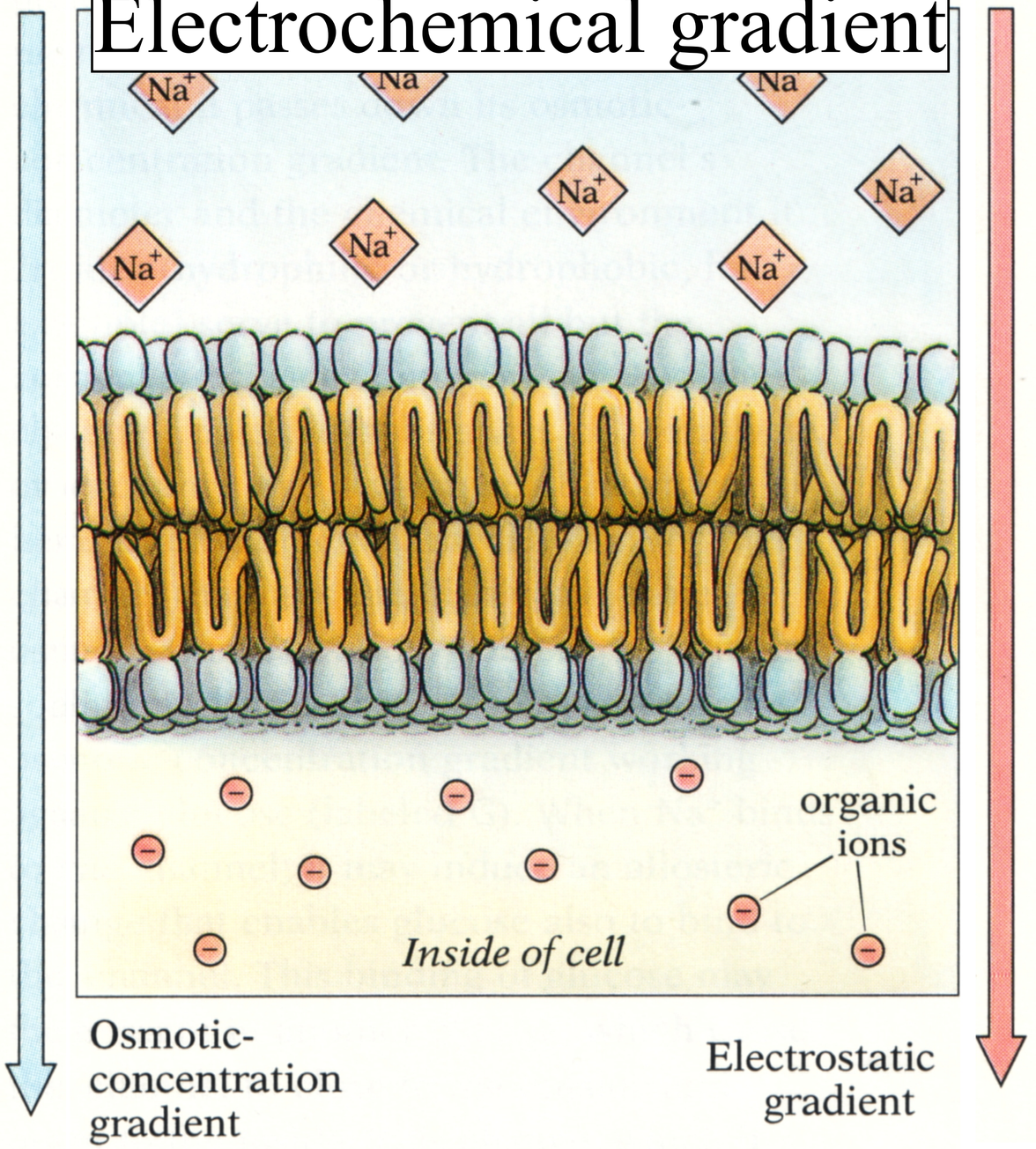
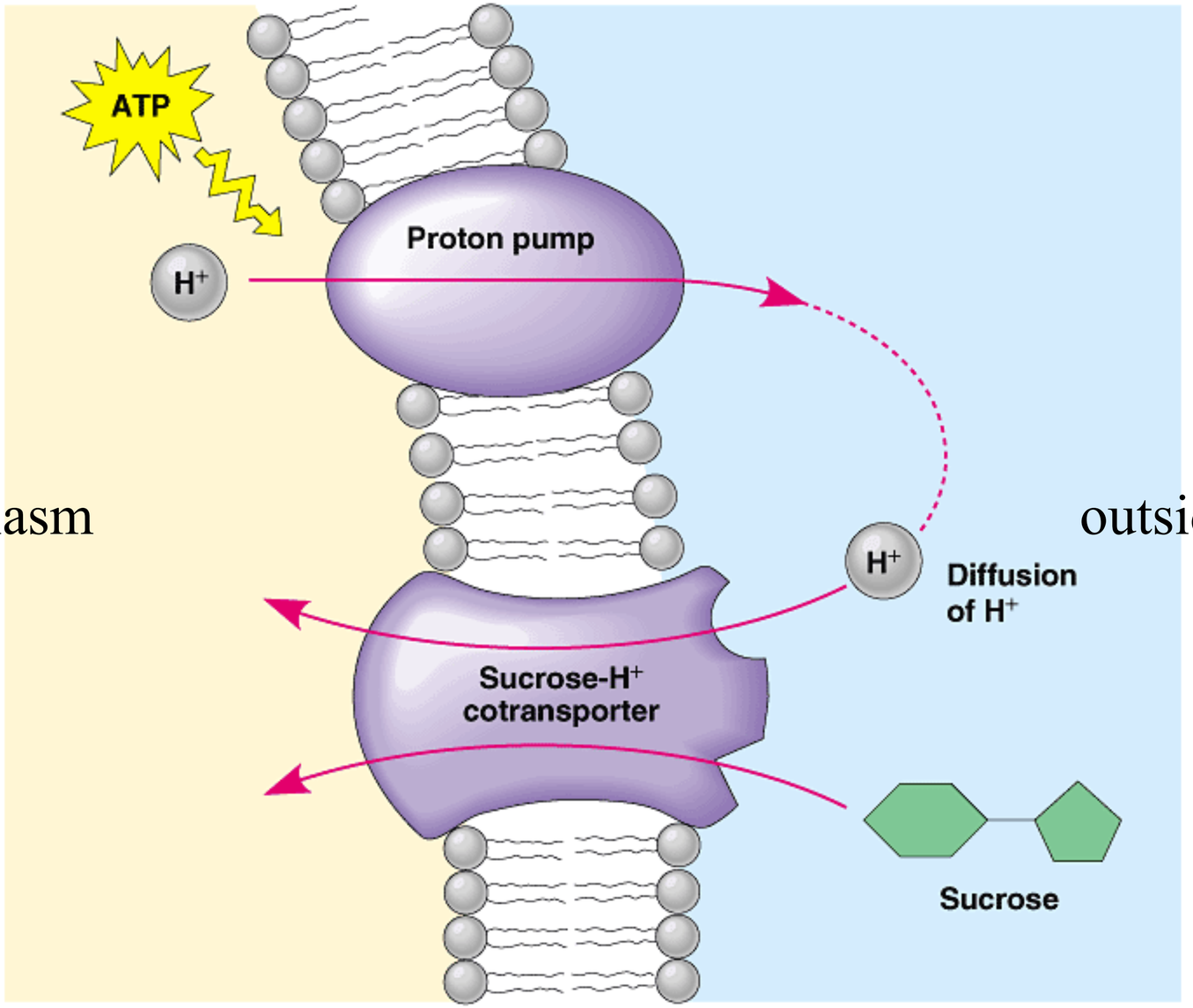
Active Transport



Electrochemical gradient



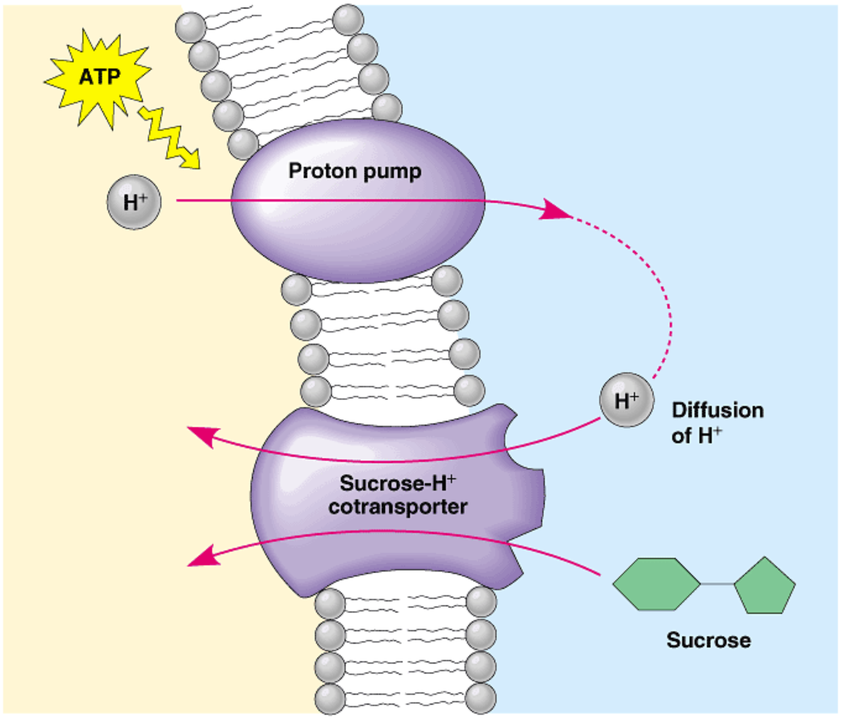
cytoplasm



outside cell

Which change would <u>increase</u> the rate of sucrose <u>uptake into cell</u>?
Alter: 1. [sucrose]? 2. [ATP]? 3. pH? (but on which side?)

cytoplasm

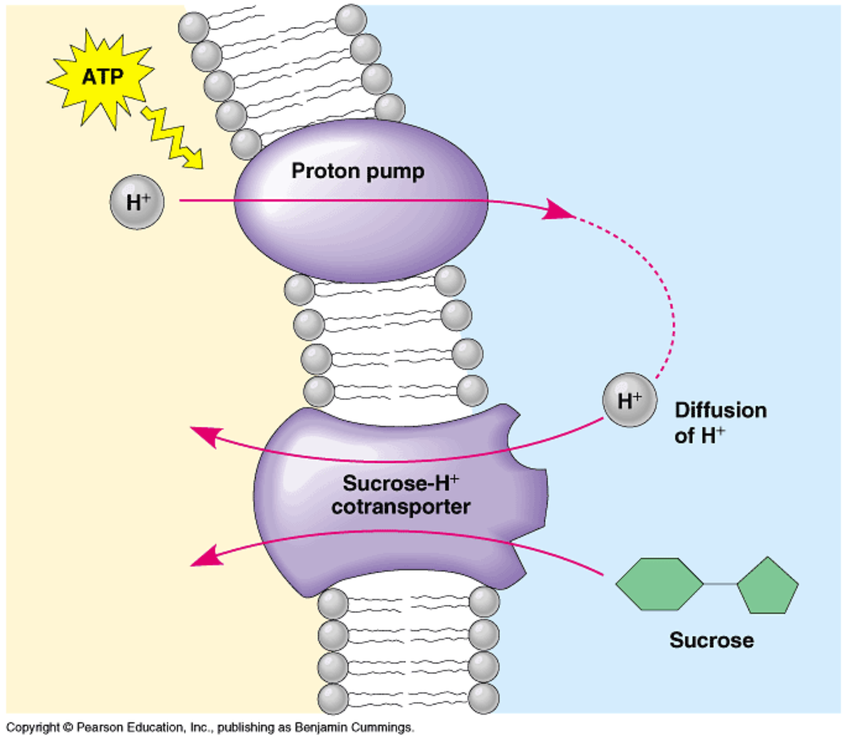


outside cell

Based on the model of sucrose uptake shown, which of the following treatments would increase the rate of sucrose transport into the cell.

a. Decreasing extracellular sucrose concentration.
b. Decreasing extracellular pH
c. Decreasing cytoplasmic pH
d. Adding an inhibitor that blocks the creation of ATP.
e. Adding a substance that makes the membrane more permeable to H+

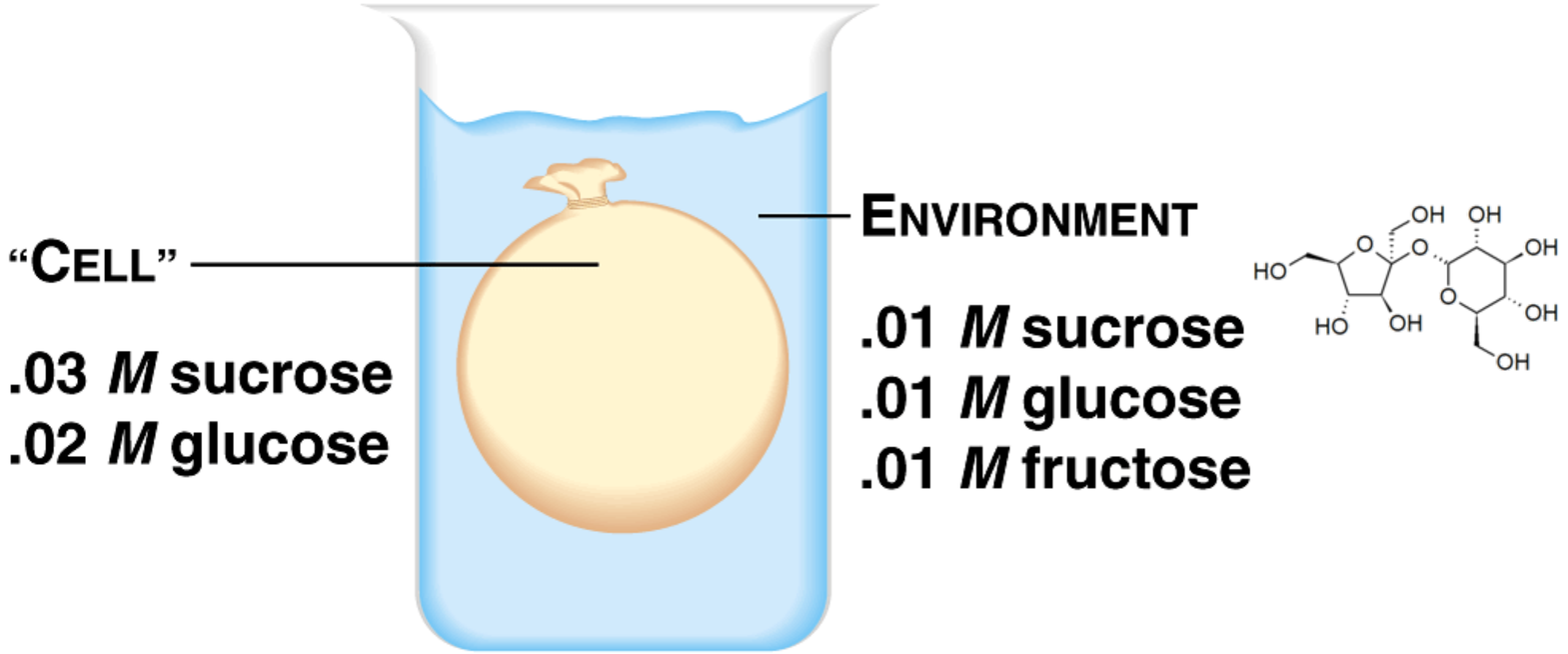
cytoplasm



outside cell

Predict: How would severely decreasing extracellular sucrose concentration alter extracellular pH?

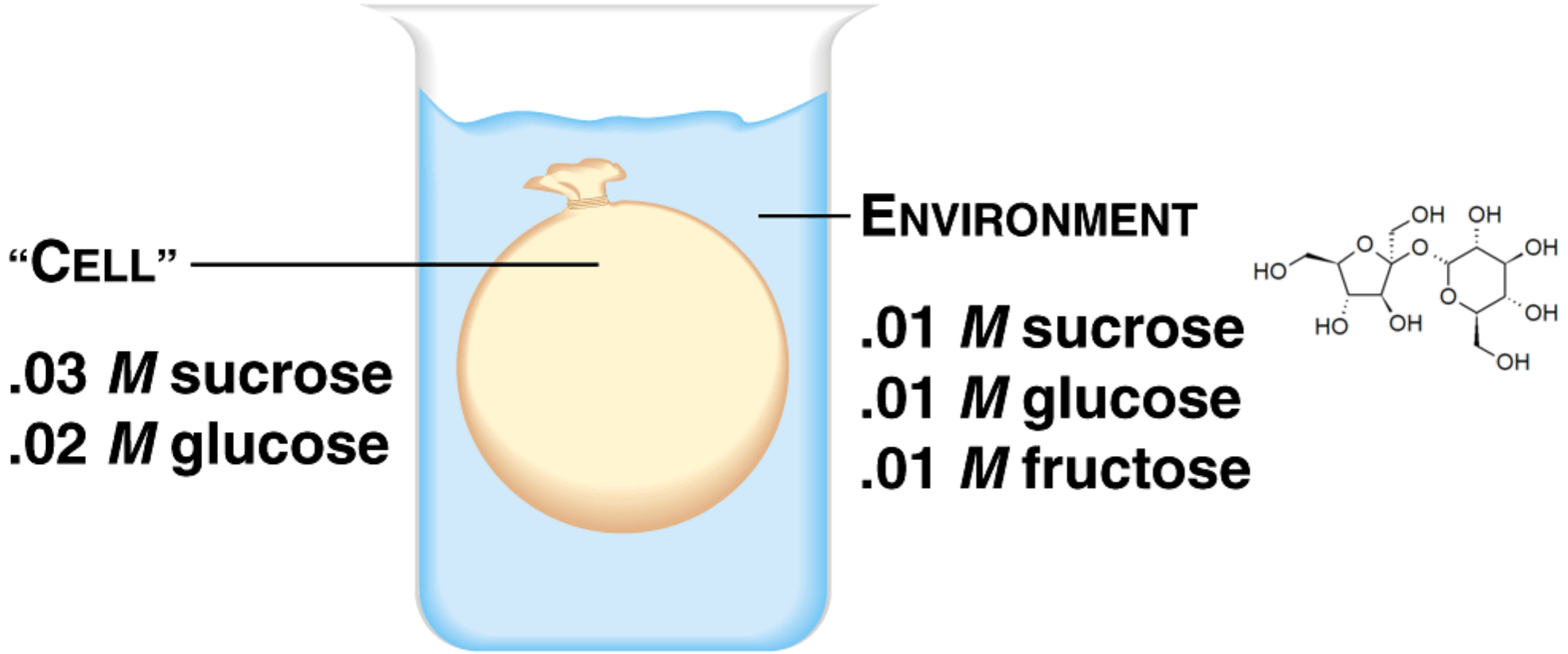
An artificial cell with an aqueous solution enclosed in a selectively permeable membrane has just been immersed in this beaker.



If the membrane is permeable to water and monosaccharides…

1. Which solutes will diffuse into the cell?
2. In which direction will water move?
3. Is the cell's solution iso, hypo, or hypertonic to the beaker's?
4. Will the cell die?

An artificial cell with an aqueous solution enclosed in a selectively permeable membrane has just been immersed in this beaker.

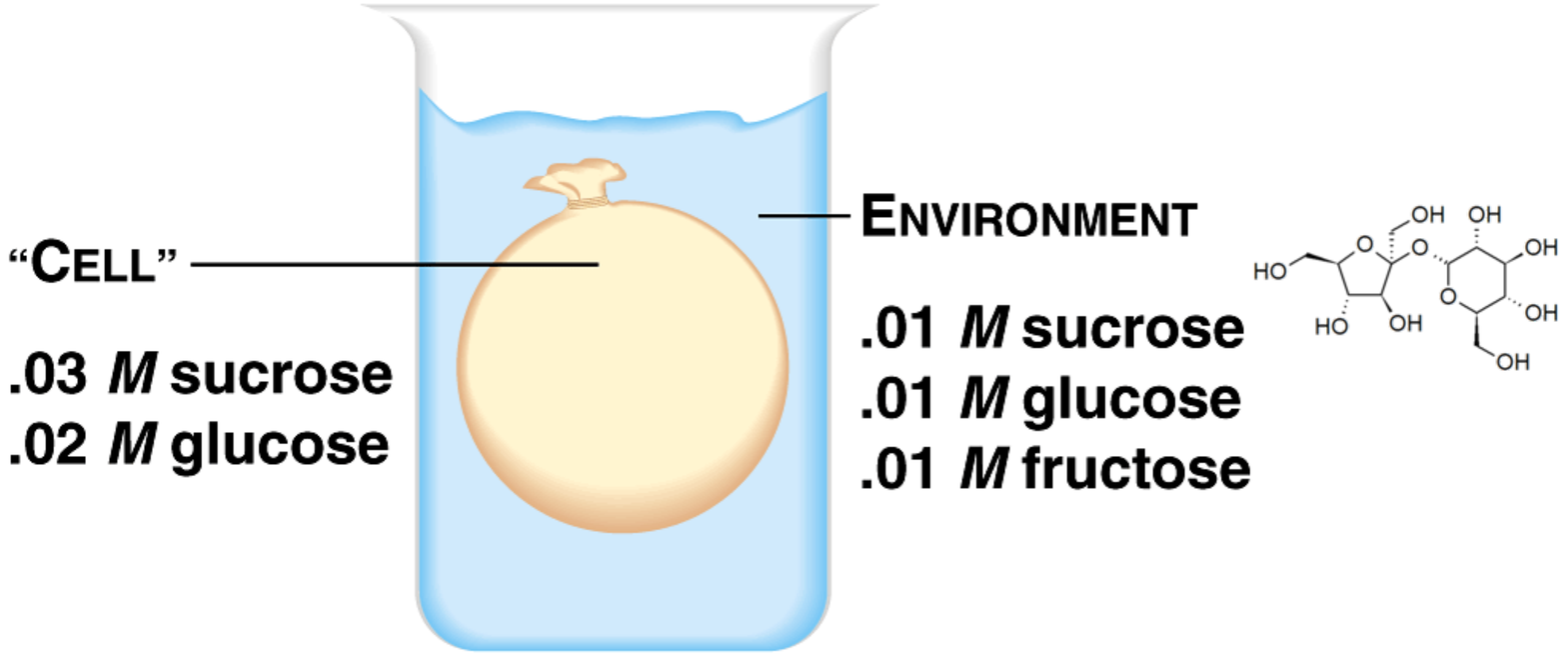


If the membrane is permeable to water and monosaccharides…

1. Which solutes will diffuse into the cell?

A. sucrose
B. fructose
C. glucose

An artificial cell with an aqueous solution enclosed in a selectively permeable membrane has just been immersed in this beaker.

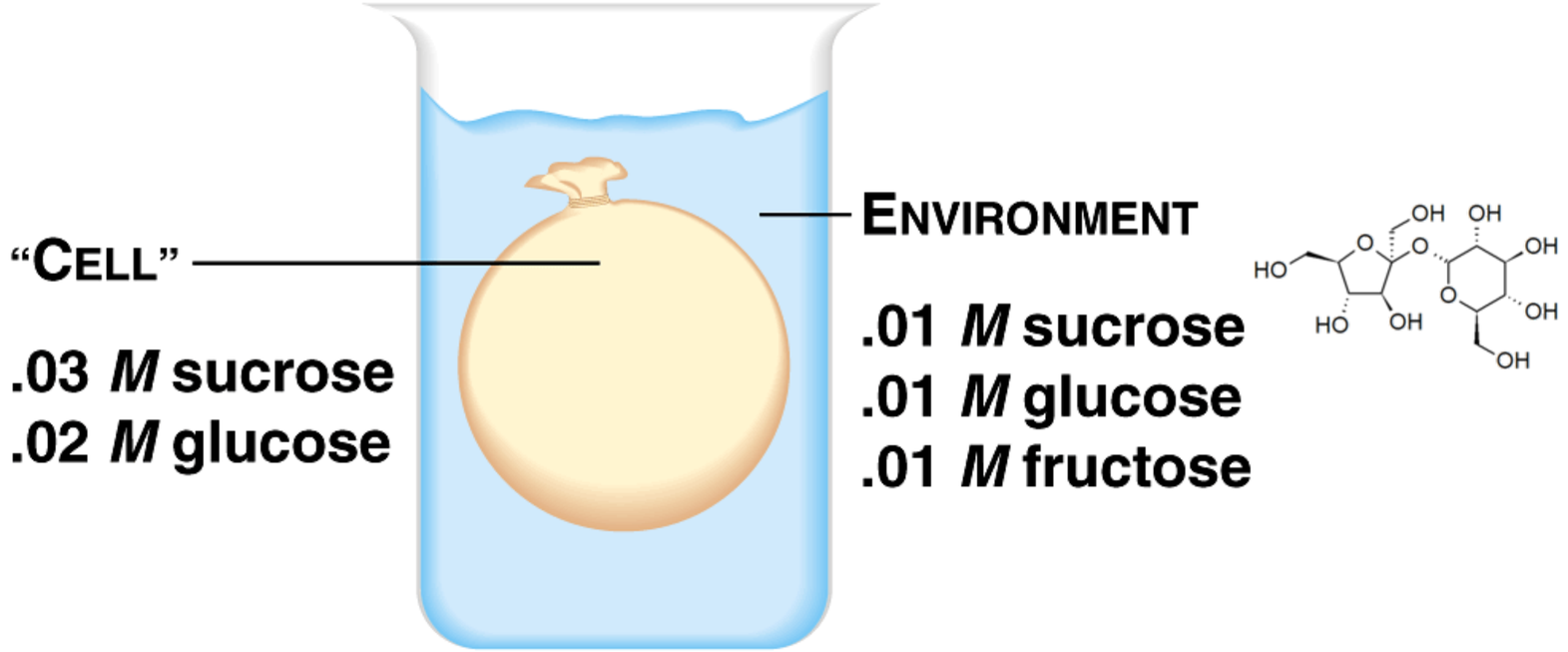


If the membrane is permeable to water and monosaccharides…

2. In which direction will water move?

A. Into the cell causing it to swell up
B. Out of the cell causing it to shrink
C. Equally in both directions

An artificial cell with an aqueous solution enclosed in a selectively permeable membrane has just been immersed in this beaker.



If the membrane is permeable to water and monosaccharides…

3. Is the cell's solution iso, hypo, or hypertonic to the beaker's?

A. Isotonic
B. Hypotonic
C. Hypertonic