Exercise 1A: Diffusion
Analysis of Results
1. Which substances are entering the bag and which are leaving the bag? What experimental evidence supports your answer?

In Part A IKI moved into the bag as shown by the color change to a dark blue/black. Whenever IKI and starch are together, they turn blue. H20 moved in and out of the bag but there was no net change. Glucose is also exiting the tube.

2. Explain the results you obtained. Include the concentration differences and membrane pore size in your discussion.

In our experiment, we observed that IKI moved into the bag (color change) and glucose moved out of the bag. This shows that IKI and glucose molecules are smaller than the membrane’s pores while starch’s molecules are larger.

3. Quantitative data uses numbers to measure observed changes. How could this experiment be modified so that quantitative data could be collected to show that water diffused into the dialysis bag?

If we were to mass the bag before and after it sat in the beaker for 30 minutes, we could have to some data to work with.

4. Based on your observations, rank the following by relative size beginning with the smallest: glucose, water, IKI, membrane pores, and starch.


5. What results would you expect if the experiment started with glucose and IKI solution inside the bag and only starch and water outside? Why?

In this situation, I would expect to see the IKI exit the bag, turning the beaker solution dark blue/black and the glucose would only stay in the bag because glucose molecules are too large to pass through the membrane.

Exercise 1B: Osmosis
Analysis Results
1. Explain the relationship between the change in mass and the molarity of sucrose within the dialysis bags.

As the amount of sucrose in the bag increased in molarity, the percent change in mass also increased. This is a directly proportional relationship and would form a linear graph.
2. Predict what would happen to the mass of each bag in this experiment if all the bags were placed in a 0.4M sucrose solution instead of distilled water. Explain your response.

If each bag were placed in .4M sucrose, bags with molarities of sucrose less than .4 would lose mass while those with more would gain mass. This is due to a desire for equilibrium—an equal distribution of sucrose molecules on either side of the membrane.

3. Why did you calculate the percent change in mass rather than simply using the change in mass?

Since the initial mass of each bag was not the same, differences alone would not reflect any sort of pattern.

4. Calculate the percent change of mass, showing your calculations here.

\[ \frac{18-20}{20} \times 100 = -10\% \text{ change in mass} \]

5. The sucrose solution in the beaker would have been ___________ to the distilled water in the bag.

Hypertonic

Exercise 1C: Water Potential

Exercise 1D: Calculation of Water Potential from Experimental Data

2. The water potential of the solution at equilibrium will be equal to the water potential of the potato cells. What is the water potential of the potato cells? Show your calculations here.

\[ \Psi_s = -1(.25)(.0831)(295) \]
\[ \Psi_s = -6.128625 \]

Questions

1. If the potato core is allowed to dehydrate by sitting in the open air, would the water potential of the potato cells decrease or increase? Why?

The potato's water potential would decrease because it would be hypertonic to the environment.
2. If a plant cell has a lower water potential than its surroundings environment and if pressure is equal to zero, is the cell hypertonic or hypotonic to its environment? Will the cell gain water or lose water? Explain.

The cell is hypertonic to its environment. The cell will gain water because it tends to flow from high to low concentrations.

3. What is the water potential in the system?

\[ \Psi_p = 0 \]

4. In Figure 1.5 where is the greatest water potential?

dialysis bag

5. Water will diffuse ______ the bag. Why?

out of
Because the water potential is higher in the bag.

6. (data)
7. (graph)

8a. Calculate the water potential of the sucrose solution in which the mass of the zucchini cores do not change. Show your work.

\[ \Psi_s = -1(0.28)(0.0831)(295) \]
\[ \Psi_s = -6.864 \]

8b. Calculate the water potential of the solutes within the zucchini cores. Show your work here.

\[ \Psi = -6.864 + 0 \]
\[ \Psi = -6.864 \]

9. What effect does adding solute have on the solute potential component of that solution? Why?

It will decrease the solute potential because it will increase \( c \), making it decrease.

10a. Which would have the higher concentration of water molecules?

Distilled H2O
10b. Which would have the higher water potential?

Distilled H20

10c. What would happen to the red blood cell? Why?

Water will rush into the RBC, causing it to burst. This is due to water’s tendency to move to a lower concentration area—RBC’s low water potential.

Exercise 1E: Onion Cell Plasmolysis
1. Sketch and describe the appearance of the onion cells.

Rounded, rectangular cells interconnected, purple

2. Sketch and describe the onion cells. Explain what has happened.

Cells are fragmented. Water left the cells because it was hypertonic.

3. Describe and explain what happened.

The cells regained water and became isotonic.

Analysis of Results
1. What is plasmolysis?

The act of cell shrinkage due to loss of water.

2. Why did the onion playmolyze?

Because they were surrounded by a solution of lower water potential causing water to rush out of the cells.

3. In the winter, grass often dies near roads that have been salted to remove ice. What causes this to happen?

This happens because water is more concentrated in the grass (high WP) and it moves out to reach equilibrium with its environment, in terms of water concentration.