Cell membrane transport

Science, Biology

The purposes for these experiments is to be able to understand osmosis and its relationship to tonicity of solutions, and the transportation of molecules across cell membranes. It's also used to understand, and how temperature affects diffusion. You also learn how to test for presences of starches and sugars in solutions. In the first exercise I will be testing for diffusion through an artificial membranes. This one has forty five steps to it. I will not go into it step by step but I'm going to say just the important ones. You need a cup to put 150mL of distilled water in cup number one.

Then you soak the dialysis tubing in this cup for five minutes. Then you add in the graduated cylinder, 4mL of distilled water, 2 mL of starch solution, and 2 mL of the glucose solution, then pour it into cup number two. Then use the glass stirring rod to stir the solution in cup two. Then remove the dialysis tubing from cup one, set the cup aside for later, tie up one end tightly. Then test the tubing with distilled water for any leaks, then pour out the water. Place a funnel at the end of the tubing and then pour the glucose-starch solution into the dialysis tubing from cup two.

Then get all of the air out of the tubing and then tie that end securely. Rinse the outside of the tubing to remove what contents could have gotten on the outside of it. Then record the color of solution inside the dialysis tubing. Then use the IKI dropping pipet to slowly add IKI solution to the 150 mL in cup one until it looks like the color of strong tea, stirring with the glass rod while adding the drops. Then record the color of the contents in cup one in before dialysis. Put the dialysis tubing inside cup one, and you let sit for an hour. After the hour, record the color of the dialysis tubing under after dialysis.

Then clean cup two and label it dialysis tubing contents. Hold the dialysis tubing over cup two and cut the tubing to release the contents, but save the contents of cup one for later. Then prepare a hot-water bath, and marking the test tubes numbers one through three. In test tube one add 2 cm of the solution from cup one, and then add 1 cm of Benedict's reagent. In test tube number 2 add the solution from cup two and then add 1 cm of Benedict's reagent. In test tube three add 2 cm of distilled water and then add 1 cm of Benedict's reagent. Record the color of each tube in the before heating column.

Place the test tubes in the test tube rack that is inside the hot-water bath, and leave them for about ten minutes. After the ten minutes, use the test tube clamp to remove one at a time and record any color change in the column after heating. This is how you test for diffusion through an artificial membrane. The second test is about diffusion at different temperature using potassium crystals. THe first step is to label three styrofoam cups hot, cold, and ambient. In the cold water cup add two pieces of ice and then fill the cup 3/4 full with tap water.

The ambient cup add 3/4 water to this cup, and hot water cup add 3/4 full of hot tap water. You let each stand for about five minutes, and then add the temp of each cup to the table. Then label three test tubes and put into test tube rack, using tweezers add about five grains of potassium to each test tube, remember to add the same amount to each one. After this you add 7 mL of water from each cup into a seperate test tube. Remember not to stir when adding water, observe the color of the water in each test tube and

record these finding under the 0 minutes in the table. Then place the test tubes inside the cups.

After five minutes check the test tubes for the colors of them and then record them in the table. This experiment is to check how the temperature affects the rate of diffusion. In this third experiment we are going to check for tonicity and diffusion. The first step you will add 10mL of distilled water in the graduated cylinder and then one gram of salt to make a sodium chloride solution, then mix well. Mark two test tubes and one and two, filling the first one with distilled water two-thirds full. The second tube add the sodium chloride two-thirds full.

After this you will need to cut two pieces of potato about 0. 5 cm wide and 7 cm long. Measure each piece and record in the table. Place a piece of potato in each test tube, and wait for an hour. After that hour empty out the water and sodium chloride. The on a paper towel put the piece of potato from the first test tube, distilled water, on the left side of a paper towel, and on the right side place the potato from the sodium chloride solution. Check and see which one is hard and soft. The table makes it easier to keep up with the results of each experiments. In the first experiment there are two tables one for before and after dialysis and the other one is before and after heating.

The first table is for recording the changes during dialysis and the second table is for Benedict's Reagent results. These tables help keep track of which one is positive and which one is negative. In the second experiment the table is used for the study of diffusion at different temperatures. You write down the color of the solutions in each tube at the beginning and the second thing is you write the color after five minutes. This one gives the results of how

diffusion reacts at different temperatures by color. The third experiment table is to determine the results for tonicity and diffusion.

First you write down the dimensions of the slices potatoes before you begin the experiment, in the distilled water column and the sodium chloride solution. Then after the allotted time you take out the slices of potatoes and measure them, and write it down in the after column. Then you determine which is one of the following: tonicity, hypertonic, isotonic, or hypotonic. The observations that I had for the first was how a cell membrane works. The changing of the color in the dialysis tubing was pretty amazing to watch. It was interesting how the clear solution turned into a dark purple, almost black.

Then after the second part of the experiment how they all change from a light blue to either the same color to a yellowish brown. The second experiment is when we use temperature a chemicals to determine diffusion in different states. It just amazes me that so far the main thing that we use is distilled water, except in this one, I used tap water. Sometimes I can smell the chemicals and sometimes I don't. I like this experiment because I don't have to use the stove, I just use the hot water, cold water with ice, and room temperature water. The third experiment is to define tonicity and diffusion.

This one was very interesting for me. Even though I had to wait for an hour for the results it was worth it. After you follow the procedure step by step, you get to see the results. After you take the potatoes out of the test tubes, you lay the on a paper towel and you get to feel them. For me this was a more hands on because you got to feel the difference between the two and determine what each one means. In the first experiment there was eight

questions to answer starting out with the first one, What is the purpose of this exercise and what is being tested?

The answer to this is the purpose is to demonstrate how the dialysis tubing represents the cell membrane, and the discovery of which contains starch. The second question is What color change did you observe in the dialysis tubing and what does that change indicate? It went from a clear liquid to a dark blue almost black and that indicates there is starch present. Another question is Was there a color change in the water around the tubing and if so explain? There was no color change in the surrounding water. What does the Benedict's reagant detect? This detects sugars in the solutions.

What does the IKI solution detect? The IKI solution detects starches. The seventh question asks about the similarities of the dialysis tubing and a cell membrane. They both are thin and do not allow molecules to flow through areas they do not belong in. The last question is the transport mechanism in the model cell passive or active and why? I say it is active because it has to constantly not let any molecules pass through. In the second experiment there was only two questions. The first being How does temperature affect the rate of diffusion? With the cold water the potassium just settles at the bottom.

The ambient water is a little darker, like a medium pink, and darker on the bottom. While the hot water is dark pink all the way, it is a even color. The third experiment has six questions with the first one being What is the condition of each potato strip after soaking in the test tubes for an hour, and which one in limp and which is crispy? The sizes changed on both, the one that soaked in just distilled water, grew a little bit and was crispy, which

means it soaked up water. The sodium chloride got a little smaller, and was limp which means it is hypertonic.

The second question is How would you explain the difference in the conditions of the potato strips using the concept of tonicity? One of them soaked up some water and the other one did not. What was the tonicity of the fresh water solution withrespectof the potato cells? It soaked up the water but with it having soaked up just water it didn't soak up any chemicals. What is the tonicity of the salt water solution with respect of the potato cell? In this one it soaked up salt and this made the potato limp. How does the changes in the conditions of the potato strips relate to the wilting of plants?

It all depends on what the roots and the plant itself is soaking up, such as chemicals. The last question is How does keeping vegetables cool slow them from wilting? The coolness slows down the process of tonicity and it doesn't soak up moisture from the air. In the first experiment I learned how a cell membrane works and if it can contain starch without contaminating the surrounding areas. The second experiment taught me how different temperatures affect how chemicals react. The third experiment showed me how salt affects the state of the potato and that it can affect other things, too.