

Permeability Model Lab Report

Problem: Is a plastic sandwich bag permeable to starch and/or to iodine?

Hypothesis: The iodine water solution will diffuse into the bag, making a purple mixture inside the bag.

Independent Variable: The presence or absence of iodine in the water outside of the bag.

Dependent Variable: The resulting color of the starch in the bag and/or the water outside of the bag.

Materials:

- Starch Solution
- Sandwich Bag
- Water
- Iodine
- Graduated Cylinder
- 2 Plastic Cups
- Materials to record data

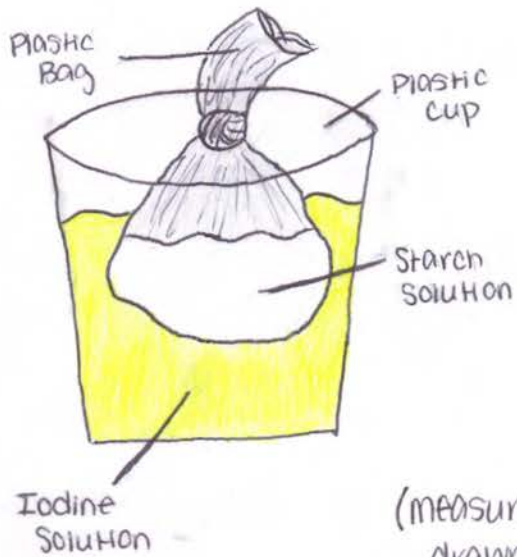
Procedure:

- 1.) Fill two plastic bags with 40ml of starch solution. Twist the top of the bags and tie them.
- 2.) Observe and record the color of the starch in the before section of the experimental data table and the control data table.
- 3.) Fill a plastic cup with 80ml of water, and add iodine to the water until the water is a golden yellow.
- 4.) Observe and record the color of the iodine solution in the before section of the experimental data table.
- 5.) Place one of the plastic bags containing the starch solution into the plastic cup containing the iodine solution.
- 6.) Fill the other plastic cup with 80ml of water
- 7.) Observe and record the color of the water in the before section of the control data table.
- 8.) Place the other plastic bag containing the starch solution into the water.
- 9.) Leave overnight.
- 10.) Remove the plastic bags from the cups.
- 11.) Observe and record (in the after 24 hours section of the data tables) the color of each starch solution inside the plastic bag in the appropriate charts.
- 12.) Observe and record (in the after 24 hours section of the data tables) the color of the iodine solution and the water inside of the plastic cup.
- 13.) Clean up.

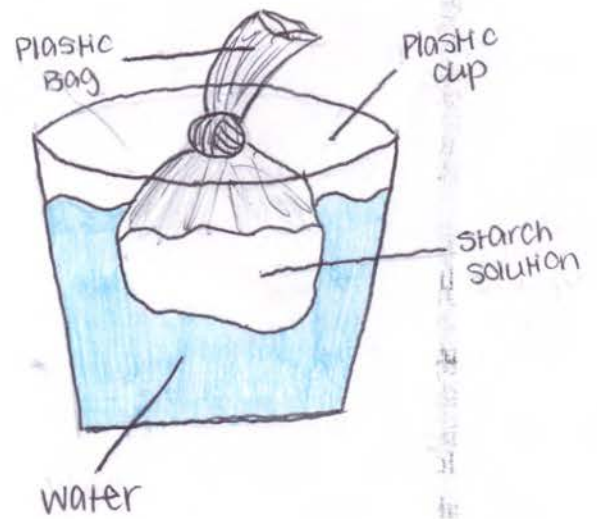
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Data:

Experimental Data Experiment Setup:



Control Data Experiment Setup:



(measurements not drawn to scale)

Experimental Data

	Before	After 24 Hours
Color of starch solution inside the bag	White	Dark Purple
Color of iodine solution inside plastic cup	Yellow	Lighter Yellow

Control Data

	Before	After 24 Hours
Color of starch solution inside the bag	White	White
Color of water inside the plastic cup	Clear	Clear

Conclusion:

The purpose of this lab was to serve as a model of a cell membrane and its semi-permeability. It addressed the question of whether a plastic sandwich bag is permeable to iodine and/or a starch solution. The bag would be permeable to the solutions if the solutions are able to cross the "membrane". This crossing would be an instance of diffusion, or the process by which particles move from an area of high concentration to an area of low concentration. My hypothesis was that the iodine-water solution will diffuse into the bag, making a purple mixture inside the bag. The purple mixture in the bag would indicate that the iodine diffused into the bag, because the chemical reaction between iodine and starch, which is the substance in the bag, results in a dark purple mixture. The independent variable would be whether the water has added iodine or no iodine added, and the dependent variable would be the ending color of the starch in the bag and/or the water outside of the bag. Again, this color change would indicate a reaction between the iodine and the starch, showing a movement or diffusion of one of the substances across the membrane.

As you can see from the experimental data experiment set up diagram, a plastic sandwich bag filled with a starch solution is placed in a cup filled with an iodine and water solution. Before the experiment, the starch solution inside the bag was white in color. The iodine solution in the cup was a dark, golden yellow before the experiment. After 24 hours, the color of the starch solution inside of the bag turned from the white into a dark purple. The iodine water solution was a much lighter shade of yellow. These results indicate that the plastic sandwich bag is permeable to iodine. You can conclude this because the dark purple color reveals a chemical reaction between the iodine and starch. Also, the fact that there is less iodine in the cup (you can tell because of the lighter color) leads you to the conclusion that it moved or diffused into the plastic bag. You can tell the plastic bag is not permeable to the starch because there was no color change outside of the plastic bag, meaning there was no chemical reaction between the starch and the iodine outside of the bag.

There was also a control included in this experiment, which was the experimental setup without the iodine mixed in the water. This was to see if any diffusion would occur in the absence of the iodine solution. Before the experiment, the color of the starch solution inside of the bag was white, the same as in the experimental data setup. The color of the water in the cup before the experiment was clear, unlike the solution with the added iodine. After 24 hours, the starch solution was still white, showing there was no change in this solution, and the water was still clear, also implying that there was no change. These results indicate that the plastic sandwich bag is not permeable to water without the added iodine. They also showed that the bag is not permeable to the starch solution even when the iodine is not present outside of the bag. You can deduce this because both the water and the starch are exactly the same after 24 hours as they were at the start of the experiment.

Questions:

- 1.) **What part of a cell does the plastic bag represent?**

The plastic bag represents the cell membrane of a cell.

- 2.) **What color was the starch at the start of the experiment?**

The starch was white at the beginning of the experiment.

- 3.) **Did the iodine move into the bag? How do you know?**

You can tell the iodine did move into the bag because a purple mixture was produced. Iodine and starch mixed together cause a chemical reaction, turning the substance dark purple.

- 4.) **Did the starch move out of the bag? How do you know?**

You can tell the starch did not move through the bag because the iodine water mixture outside of the bag did not go through the chemical reaction that would cause it to turn dark purple.

- 5.) **Was the iodine in the plastic cup lighter in color before or after the experiment?**

The iodine in the plastic cup was lighter in color after the experiment was completed.

- 6.) **Is the plastic bag permeable to iodine? How do you know?**

The plastic bag is permeable to iodine. You can tell because the starch turned dark purple, showing the iodine moved through the plastic to react with the starch.

- 7.) **Is the plastic bag permeable to starch? How do you know?**

The plastic bag is not permeable to starch. You know because there was no purple outside of the bag, meaning there was no reaction between the iodine and starch outside of the bag.

- 8.) **At the start of the experiment, was the iodine in high or low concentration outside of the bag?**

At the start of the experiment, the iodine was high in concentration outside of the bag.

- 9.) **At the start of the experiment, was the iodine in high or low concentration inside of the bag?**

At the start of the experiment, there was no concentration of iodine inside of the bag.