Diffusion and Osmosis Experiments

Introduction:

Diffusion is the movement of molecules from high to low concentration. Osmosis is the diffusion of water from high to low concentration. Osmosis consists of three types of solutions, Hypertonic, Isotonic, and Hypotonic. Hypertonic, is the movement of solutes, which makes the cellar molecule shrink. Isotonic concentration stays consistent which makes the cellar molecule remain the same. Hypotonic has low concentration solutes which makes the cellar molecule absorb everything and expand. In Biology class we experimented on two different experiments one was Diffusion, the second was Osmosis, which contained the differences from high to low concentration. Our first experiment was based upon Methylene Blue concentration and how it would affect the diffusion rate. Our hypothesis was that a high concentration of MB (2.5%) will diffuse slower than a low concentration of MB (0.25%). Our second experiment was based upon how salt concentration affects Osmosis in plant cells. Our hypothesis was that plant cells will shrink when placed in salt water.

Materials:

- Agar plates
- 2.5% Methylene blue
- 0.25% Methylene blue
- Cork borer
- Wax pencil or sharpie
- Ruler
- Microscope
- Slides and cover slips

- Elodea (or similar) plant
- Droppers
- Distilled water
- Aquarium or pond water
- Salt water

Diffusion Experiment:

Method:

In our first experiment which contained diffusion rates of Methylene blue, we started off by first poking a hole in the center of the agar plate. Secondly we took the droppers and placed 4 drops of MB (2.5%) in the center of the hole. Next we took another agar plate and poked a hole in the center and placed 4 drops of MB (0.25%). We recorded our timing every 15 minutes, observing and writing down the measurements of how much it expanded.

Results:

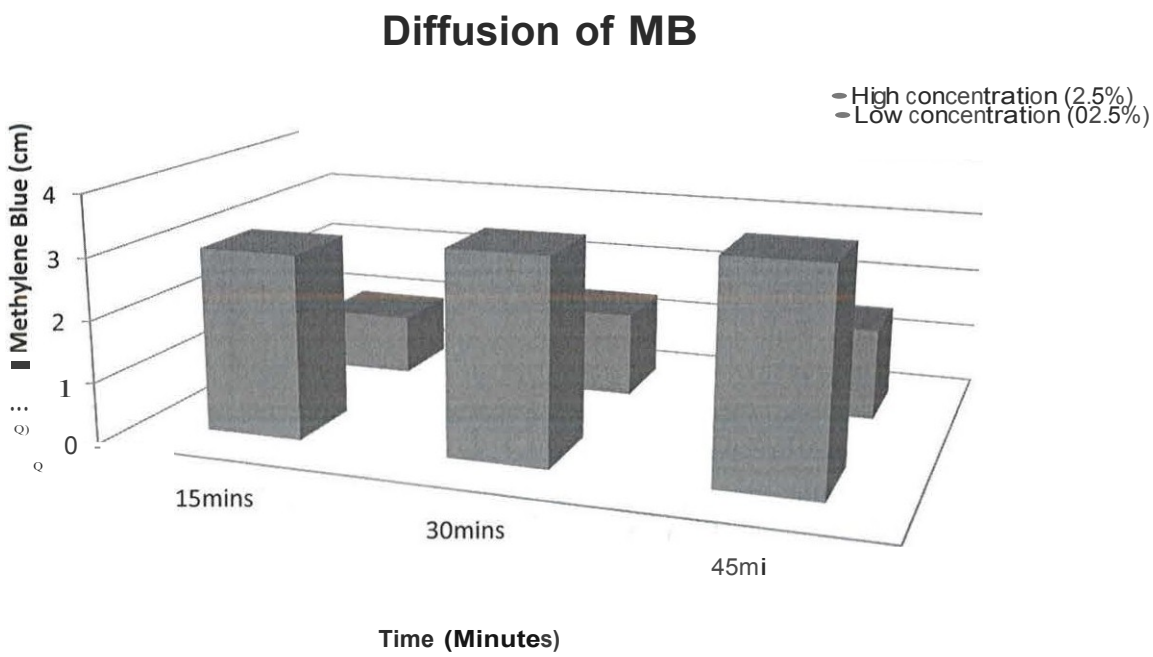
In the first 15 minutes our data showed that MB (2.5%) grew 3.0 cm and MB (0.25%) grew 1.0 cm. MB (2.5%) expanded out more than MB (0.25%). After 15 more minutes passed we seen another great change, our data was now 3.3cm for the MB (2.5%) and 1.4cm for the MB (0.25%). Our final measurements after 45mintues passed was that MB (2.5%) measured to be 3.5cm and MB (0.25%) measured to be 1.5cm.

Discussion:

Our group thought about the process and how the two different concentrations affected the same sort of agar plate. We then figured that our hypothesis was incorrect because the high concentration

of MB (2.5%) made the chemical move more quicker threw the agar plate. Meanwhile , the low concentrations of MB (0.25%) took longer to spread through the agar plate.

Graph:



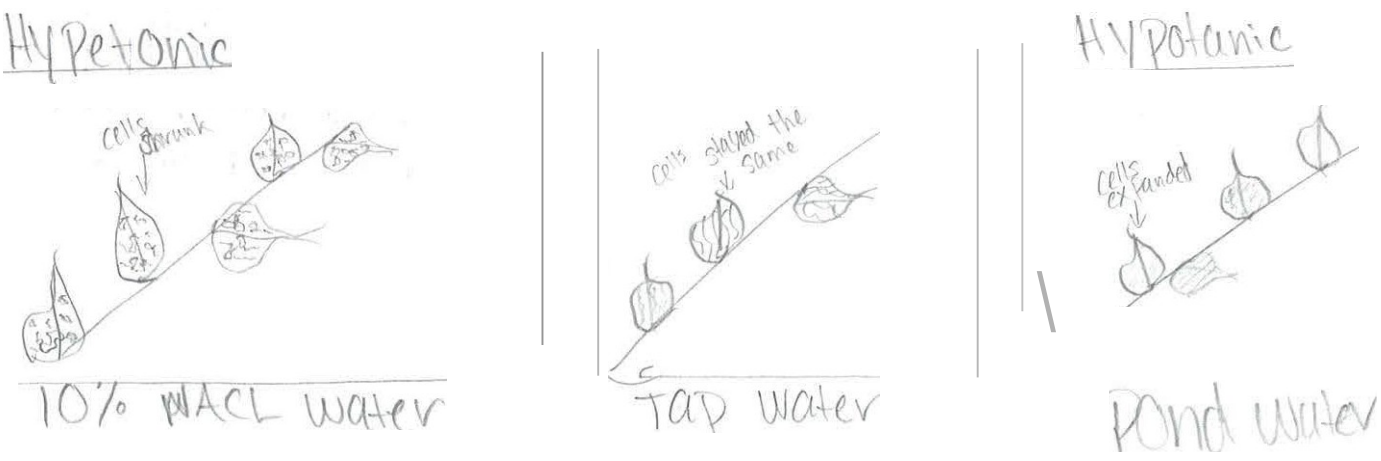
Osmosis Experiment:

Method:

Our second experiment involving plant cells was pretty simple. First we began by taking three pieces of pond plant and placing each piece onto a slide. We first observed them by drawing a sketch of each plant piece and seeing how their cells connected. Next we placed a drop of tap water onto one of the slides and labeled it T. We observed how the plant piece looked under the microscope. Next we got the second slide and put one drop of 10% NACL water and labeled it N. We observed and sketched the texture of the plant piece noticing that the cells shrunk. Then we grabbed the last slide and added a drop of pond water, and labeled it P.

Discussion:

Under the microscope you could notice the change in reactions that occurred within each slide. After a while of thinking we came up with the solution that the tap water was an isotonic solution to the plant because the Tap water had no effect. We thought that the plant may have been watered before with tap water causing it to have no real effect when we added more water. Then we came up with the conclusion that 10% NACL was a hypertonic reaction, because the water changed the reaction in the plant cell which contained salt and the salt must have shrunk the cells in the plant. This supports my hypothesis that salt water will shrink the plant cells. Our last solution of the Pond water had to be a hypotonic reaction because it expanded the cell molecules in the plant.



Conclusion:

Based on the experiments in class, our group has learned that Methylene Blue concentration affects diffusion rates depending on the high concentration of MB (2.5%) and the low concentration of MB (0.25%). The higher the concentration, the most likely it is to spread quicker. The lower the concentration, the slower it is likely to spread. Our group also learned that hypertonic, isotonic, and hypotonic depends on the salt that the water contains in Osmosis.

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Work Sample Evaluation

Subject Area: Biology
Task Title: Water Works: Cells & Osmosis
Student Work Sample Title: Diffusion and Osmosis Experiments

The document was scored using the *CCR Task Bank Rubric for Scientific Research Plans and Reports.* The final scores are indicated in the following chart.

Scoring Criteria	Insufficient Evidence	Developing	Progressing	Accomplished	Exceeds
Hypothesis Development		**X**			
Research Plan			**X**		
Results and Interpretation			**X**		
Communication		**X**			
Organization		**X**			
Accuracy			**X**		

Annotations: The following evidence from the work sample and the reviewer's comments support the scores above. Page and line numbers refer to the original work sample.

Scoring Criteria	Page #	Line #	Commentary about the work sample
Hypothesis Development: *Locating resources in order to develop a thesis or hypothesis*			In spite of instructions given to the student, the work sample does not cite any outside resources or research.
	1	6-9	The description of the three types of solutions and their effects on cells shows a lack of understanding of the concepts that are to be tested in the experiments.
	1	11-15	The work sample contains two clear, recognizable hypotheses.
Research Plan: *Planning, conducting, and describing an experiment or study*	2	8-13	The student's research design is generally well explained.
	4	3-9	The student uses simple language but adequately explains the details that are necessary to accomplish the experiment.
Results and Interpretation: *Describing and interpreting results in relation to the hypothesis*	4	11-18	The work sample includes a very simplistic interpretation of the osmosis experiment results.
	4	19-29	The drawings don't add any information to the report. It is unclear what the drawings represent – leaves or cells – and there is no way to compare the drawings.
Communication: *Using subject appropriate language and considering audience*	2	16-20	The data collection could have been represented in a table, but the graph on page 3 accurately displays the data.
	2	23-24	The discussion of results is very informal. The student uses the first person throughout the work sample.
	4	12	Same as above.
Organization: *Structuring main ideas and incorporating supporting information*	All		The layout of the lab report follows a basic, conventional format.
			The conclusion is inadequate, especially for the osmosis experiment.
Accuracy: *Attending to detail, grammar, spelling, conventions, citations, and formatting*	1	7-8	The work sample contains an unfortunate typo; "cellar" is substituted for "cellular."
			There are other minor errors throughout the work sample.