

OPEN-ENDED LAB: OSMOSIS AND DIFFUSION IN DIALYSIS TUBING

Name(s):

Background: It is very difficult to measure or see osmosis actually occurring in cells because of the small size of most cells. However, if an artificial membrane that acts in some ways like a real plasma membrane could be found, than a study of osmosis using a model cell would be possible. Dialysis tubing is a manmade semi-permeable membrane that is used to treat people who have kidney failure. Dialysis is a process where substances in solution are separated by their difference in molecular weight (size). The driving force behind dialysis is the concentration difference between two solutions on opposite sides of the membrane.

Materials: (per lab team)

- 250 ml beaker
- 1- 10 cm length of Dialysis tubing (soaked in warm water)
- 2 pieces of Cotton string 10 cm long
- 15 ml Starch solution with transfer pipette
- 5 ml Supersaturated glucose solution with transfer pipette
- 10 ml Iodine solution
- Tap water
- Glucose test strip

Procedure:

1. Gather one piece of dialysis tubing and two pieces of string.
2. Under gently running water rub the tubing between your fingers until it opens up to form a tube. **!!!BE GENTLE DIALYSIS TUBING IS EASILY TORN!!!**
3. Once the tubing has opened twist one end shut and tie a knot at least 2 cm from the edge.
4. Fold the tail upwards and tie a second knot.
5. Fill the tube with water and check for any leaks.
6. If no leaks are found empty the tube and fill it with 5 cm of starch solution.
7. Add one pipette full of glucose solution to the tube.
8. Twist the top end of the tube shut just above the surface of the starch-glucose solution and tie a knot.
9. Fold the tail over and tie a second knot.
10. Rinse the tubing off under gently running water.
11. Cut off any remain string
12. Fill your 250 ml beaker to the 150 ml line with tap water.
13. Place the tube in the beaker and add water if necessary to cover the tube.
14. Add several drops of iodine so that the color of the water in the beaker turns orange.
15. Use masking tape to label your beaker with your group name and period #.
16. Clean up your lab area and return materials to the cart.

Predictions: Make a written prediction for each solute and solvent and then draw a beaker diagram showing your predicted flow of materials.

Observations:

1. In the space below, list the observations or measurements you will make BEFORE and AFTER the experiment.

SELECTIVE PERMEABILITY OF DIALYSIS TUBING LAB REPORT

Lab Reports should follow the following format.

1. **Introduction:** Include a statement of the problem investigated, why the work was carried out, background of the problem including an explanation of how the problem relates to you and the world, a brief statement of the general method of approach to the problem, and expected results.
2. **Methods and materials:** This section tells the reader how and with what “stuff” the work was done. You should try to strike a balance between an over-detailed description of even the most trivial items and a very sketchy statement that provides insufficient information. The important guideline is that another worker of similar training and ability, following your description, should get the same results. This section should be written as a description of what you did, not as a set of instructions.
3. **Results:** Here is the real meat of a report. In this section you should **describe** the important qualitative and quantitative observations in your work. You are **not yet** drawing conclusions from your data. Data should be tabulated and/or graphed and described. One of the common errors in report writing is to say, “The data are plotted in Fig. 1” without saying something like, “As can be seen in the graph, the rate of germination over 5 days was slow for the first three days after which a sharp rise is noted.” Be aware that tables and graphs are not self-explanatory, and must be summarized for the reader. All graphs and tables should be numbered and provided with a title. Any additional information that makes the data more comprehensible should be provided as needed.
4. **Discussion and conclusions:** This section serves two functions. First, it provides a place where the data may be fully discussed and interpreted (you answer all the WHYS and HOWS), and second, it allows the author to delve into the realms of speculation. Here one may address questions like “why did something unexpected happen?” or “what would happen if the glucose solution was of higher concentration” or “why did the expected results not materialize?” In this section the author may (discreetly) pat him- or her-self on the back, criticize other workers results, suggest improvements in methodology, etc. You should also find and explain one major source of experimental error. This could be as simple as “we did not tie the bag tightly and so solution leaked rather than diffused out of the bag.” To concepts as complicated as differences in the osmotic pressure at room temperature for liquids of varied specific gravity.
5. **References:** Some papers have no references while others have 200 or more.

Required Diagrams

- A diagram of your beaker and bag (including solutions) before you began
- A diagram of your beaker and bag (including solutions) at the conclusion

Be sure you address the following in your lab report:

- Experimental error (human or otherwise)
- Your conclusion for the permeability of dialysis tubing to starch, iodine, glucose and water
- A labeled drawing of the lab apparatus used in this experiment

“Starch Bag” Osmosis Lab Report Rubric

For this assignment you were asked to think critically, creatively and adaptively while working collaboratively to gain knowledge, to identify, understand, and solve problems while completing an authentic, inquiry-based task.

Purpose and Insight (Introduction)				
<ul style="list-style-type: none"> Experimental question is clearly stated; appropriate background information is provided regarding the topic What is the purpose of this experiment? Your specific predictions of solute and solvent movement are made along with a reason why. Background information on Dialysis tubing as it pertains to osmosis and diffusion. 				
Deficient	2	Rarely demonstrates a sense of purpose or an understanding of the task; presents ideas with inconsistent logic or in a simplistic manner.	Student	Teacher
Limited	4	Occasionally demonstrates a sense of purpose or an understanding of the task; presents ideas with inconsistent logic or in a simplistic manner.		
Acceptable	6	Frequently demonstrates a clear sense of purpose and an understanding of the task; presents clear and thoughtful ideas, employs logic, and identifies and/or addresses underlying questions with competence.		
Exemplary	8	Consistently demonstrates a clear sense of purpose and a thorough understanding of the task; presents sophisticated and insightful ideas, persuades with logic, and explores underlying questions and complexities with originality.		
Clarity and Conventions (Materials and Methods)				
<ul style="list-style-type: none"> Complete detailed list of ALL substances and equipment used in lab. Be Precise! Detailed List of steps taken in written in complete sentences; procedure should be repeatable. First person is okay. 				
Deficient	5	Rarely controls medium; uses rudimentary expression and shows little or no awareness of conventions of medium and genre, culminating in an unfinished product.	Student	Teacher
Limited	10	Occasionally controls medium; uses vague or clichéd expression and shows limited understanding of conventions of medium and genre, culminating in a rough finished product.		
Acceptable	15	Frequently controls medium; uses clear expression and employs conventions of medium and genre, culminating in a clean finished product.		
Exemplary	20	Consistently and effectively controls medium; uses vivid and mature expression and skillfully employs conventions of medium and genre, culminating in a highly polished finished product.		
Observation Skills (Results)				
<ul style="list-style-type: none"> Data, observations, drawings and notes taken from experiment, clear and understandable Presentation of data as two labeled diagram (before and after). All diagrams labeled clearly and drawn accurately 				
Deficient	4	Rarely able to identify subject or process.	Student	Teacher
Limited	8	Occasionally able to identify subject and process with some accuracy but minimal detail.		
Acceptable	12	Frequently able to identify subject and process accurately with adequate detail.		
Exemplary	16	Consistently able to identify subject and process accurately with exceptional detail.		
Audience and Evidence (Conclusion)				
<ul style="list-style-type: none"> Hypothesis (prediction) is accepted or rejected based on lab results Identify where each solvent and solute went. Report is typed, double spaced, using MLA format, no visible spelling errors or corrections. 				
Deficient	5	Rarely demonstrates an awareness of audience or uses an appropriate tone; provides limited or inappropriate explanations with little or no evidence or elaboration with limited or no organization.	Student	Teacher
Limited	10	Occasionally demonstrates an awareness of audience and/or uses an inconsistent tone; provides simplistic or insufficient explanations without adequate or accurate evidence with basic organization.		
Acceptable	15	Frequently demonstrates an ability to appropriately address and respond to audience, and uses appropriate tone; provides appropriate, concise, and sufficient explanations with adequate and accurate evidence, and/or valid connections and examples with clear organization.		
Exemplary	20	Consistently engages and responds to audience, and effectively controls tone; provides appropriate, concise, and convincing explanations, detailed and accurate evidence, and/or illuminating connections and examples with cohesive organization.		

Think critically (Conclusion)				
<ul style="list-style-type: none"> • Explanation of acceptance/rejection of hypothesis based upon analysis of data from lab (using what you know about diffusion) • Show how the collected data answers the lab question you wrote in the introduction. • What is the evidence/observational data that tells you that the solute or solvent is present. • WHY did the solute/solvent move • Your final conclusion for the permeability of dialysis tubing to starch, iodine, glucose and water 				
Deficient	5	Rarely uses facts and logic to synthesize, analyze, and/or evaluate solutions to problems.	Student	Teacher
Limited	10	Occasionally uses facts and logic to synthesize, analyze, and/or evaluate solutions to problems,		
Acceptable	15	Frequently uses facts and logic to synthesize, analyze, and evaluate solutions to problems,		
Exemplary	20	Consistently uses facts and logic to synthesize, analyze, and evaluate solutions to problems.		
Promptness				
<ul style="list-style-type: none"> • Darien High School students will value and demonstrate personal responsibility and ethical decision-making. • Lab is handed in on the day it is due. 				
Deficient	0	Report is not turned in on time or sections of the lab report are missing entirely	Student	Teacher
Limited	2	Report is not turned in on time or sections of the lab report are missing entirely		
Exemplary	5	Report is on time and the entire lab report is completed		
Emotional Maturity				
<ul style="list-style-type: none"> • Student follows all lab safety guidelines • Students performs experiment without any disruptions to other lab groups 				
Deficient	2	Rarely demonstrates an understanding of the consequences or accountability of personal decisions and actions.	Student	Teacher
Limited	4	Occasionally demonstrates an understanding of the consequences and/or accountability of personal decisions and actions.		
Acceptable	6	Frequently demonstrates an understanding of the consequences and accountability of personal decisions and actions.		
Exemplary	8	Consistently demonstrates an understanding of the consequences and accountability of personal decisions and actions.		
Learning Expectation #3: Darien High School students will develop reading and research strategies, observation skills, and aesthetic awareness through engagement with authentic, inquiry-based tasks.				
<ul style="list-style-type: none"> • Research Application • Citations 				
Deficient	2	Rarely able to apply or interpret information.	Student	Teacher
Limited	4	Occasionally able to apply or interpret information.		
Acceptable	6	Frequently able to apply and interpret information.		
Exemplary	8	Consistently able to effectively apply and interpret information.		
			Total	Total
			105 points possible	

You will need to use the internet to look up information about dialysis tubing, starch and glucose. You must provide parenthetical citations for your sources of information along with a works cited.

Use the DHS Library Website if you need help with formatting your works cited or parenthetical citations.

- <http://www.darienps.org/dhslibrary/helpfullinks.php>