**Observing Osmosis in Eggs**

**INTRODUCTION**

Osmosis is a process in which water moves through a membrane. The natural movement of water is from the side of the membrane with a high concentration of water to the side with a low concentration of water. Solutions with a higher concentration of water are deemed “hypertonic” and solutions with a lower concentration of water are deemed “hypotonic”. Isotonic solutions have an equal concentration of water to the solution in question. The term osmosis is particular to solutions (dissolved mixtures) separated by a membrane. Diffusion is similar but refers to *any* substance spreading from a higher concentration to a lower concentration and doesn't necessarily involve a membrane.

Inside the shell of an egg there is a membrane that surrounds the contents of the egg (a cell itself). This membrane is selectively permeable. This means that it lets some molecules move through it and blocks out other molecules. Water moves through the membrane easily. Bigger molecules like many sugar molecules do not pass through the membrane. In this investigation, you will use several solutions of sugar and water to identify the concentration range that is most isotonic to the tonicity of an egg.

**PROBLEM**

What concentration of sugar solution is isotonic to an egg cell?

**VARIABLES**

What is the independent variable in this experiment?

What is the dependent variable in this experiment?

What are the constant variables in this experiment?

What is the control group in this experiment?

**PREDICTIONS**

What are your predictions for this lab? Justify what you think will happen with scientific reasoning.

**MATERIALS (per group)**

|  |  |
| --- | --- |
| * 1 “naked” egg * 1 plastic/Styrofoam cup * Large spoon * Graduated Cylinder * Digital Balance | * Distilled Water * \_\_\_\_% Sugar Solution * \_\_\_\_% Sugar Solution * \_\_\_\_% Sugar Solution * \_\_\_\_% Sugar Solution |

**PROCEDURE**

Write your version of the procedure that we agreed upon as a class in the space below.

**OBSERVATIONS**

INDIVIDUAL DATA

Table Title:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solution** | **lnitial Mass of Egg (g)** | **Final Mass of Egg (g)** | **% Change in Mass** | **Physical Change** |
|  |  |  |  |  |

CLASS DATA

Table Title:

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Solution** | **Trial** | **lnitial Mass of Egg (g)** | **Final Mass of Egg (g)** | **% Change in Mass** | **Average % Change** | **Physical Change** |
| **Distilled Water** | Trial 1 |  |  |  |  |  |
| Trial 2 |  |  |  |  |
| Trial 3 |  |  |  |  |
| **\_\_\_% Sugar Solution** | Trial 1 |  |  |  |  |  |
| Trial 2 |  |  |  |  |
| Trial 3 |  |  |  |  |
| **\_\_\_% Sugar Solution** | Trial 1 |  |  |  |  |  |
| Trial 2 |  |  |  |  |
| Trial 3 |  |  |  |  |
| **\_\_\_% Sugar Solution** | Trial 1 |  |  |  |  |  |
| Trial 2 |  |  |  |  |
| Trial 3 |  |  |  |  |
| **\_\_\_% Sugar Solution** | Trial 1 |  |  |  |  |  |
| Trial 2 |  |  |  |  |
| Trial 3 |  |  |  |  |

*How to determine the percent change in mass:*

E.g. initial weight 5g and final weight 10g

1. Find the difference between the 2 masses (10-5 = 5). If the difference is negative, it means a loss of weight
2. Take the answer from (a) and divide by the original weight 5/5 = 1
3. Multiply the answer from (b) by 100% (1 x 100% = 100% increase)

*Complete the following lab components on a separate piece of paper.*

**EXPERIMENTAL PROGRESS**

Summarize any notable events that occurred during your experiment.

**ANALYSIS**

Part One:Graph

Create a bar or line graph that shows the average % change in egg mass for all 5 solutions. Ensure your graph is adequately sized, labeled, and titled.

Part Two: Discussion

Describe what happened to the egg in different solutions using vocabulary such as osmosis, hypotonic, hypertonic, isotonic, concentration, concentration gradient, water, sugar.

Part Three: Analysis Questions

Answer the following questions:

1. A salt water fish may die if placed in fresh water. Why?
2. Doctors often recommend gargling with salt water to ease the symptoms of a bacterial infection in the throat. Why might be this be an effective treatment?
3. A small amount of fertilizer will make the grass of a lawn grow. Too much fertilizer will “burn” kill the grass. Why?
4. The red blood cells in our blood are suspended in a solution called blood plasma. Is the blood plasma isotonic, hypertonic or hypotonic? Explain your answer.
5. How can fish live in salt water without becoming dehydrated?

**CONCLUSION**

Summarize your findings and address the problem. Include interesting findings, experimental error, new questions and suggest improvements that could be made to the procedure of your lab. Connect this lab to the big idea (homeostasis).

**Anatomy & Physiology 12 – Lab pre-and post-assessment Name:**

**EGG**

**Observing Osmosis in Eggs**

|  |  |
| --- | --- |
| **Prelab**   * Prediction   - In table format   * + For each solution, predictions of what will happen to egg are present * Flowchart   + Excellent organization   + Diagrams clear and catch the eye   + Clear concise word commands for each step   + All steps included with creativity and originality | **During**   * Fully participates and follows the steps of the lab including clean up * Data table filled out – fully and neatly * Experimental progress – detailed notes taken * Answers the mystery question easily   **Post lab**   * Analysis Graph completed correctly and clearly labeled * Description of results uses appropriate vocab * Discussion Questions answered correctly in full, thoughtful sentences * Conclusion paragraph contains all criteria below |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | **Beginning** | **Developing** | **Accomplished** | **Exemplary** |
| **Prediction** | - not included | - only some predictions are completed or the predictions are vague or unclear | - a prediction is made for each solution but not in table format | - includes a table in which a prediction is made for each solution and its effect(s) on the egg |
| **Flowchart**  **(due day of lab)** | - Unorganized  - No diagrams - Procedure is mostly copied/not in own words - Many steps are missing or unclear | - Unorganized - Diagrams are unclear - Words commands are unclear - Some minor steps are missing or unclear | - Organized - Diagrams clear - Clear word commands, but not concise - All steps included | - Excellent organization, easy to follow. - Diagrams clear and catch the eye - Clear, concise word commands - All steps included with originality /creativity |
| **Performance and Observations**  **(During lab)** | -Just watched the lab be performed and/or didn’t clean-up  -Only ½ of the data is included or almost impossible to read data  -No log of experimental progress  -Could not answer the mystery question fully | -Needed some help to follow the procedure and/or clean up  -Most data/observations included or date recording messy  -A couple of events are noted in the Experimental progress  -Answered the mystery question correctly when given a bit of help | -Followed the procedure an cleaned up  -All data/observations included and neatly recorded  -Most important notes are noted in the Experimental Progress  -Answer the mystery question correctly | -Followed the procedure carefully including cleaning up  -Detailed data & observations included and neatly recorded  -Detailed log of experimental  progress.  -Answered the mystery question easily and thoroughly |
| **Analysis**  **(After Lab)** | --Fragments or point form  -Does not demonstrate a **basic understanding** of concept. Substantial errors throughout | -Sentence structure lacking or confusing  -Demonstrates a basic understanding of concepts. Errors and inconsistency reveal some missing understanding of the concepts. | -Full sentences, well structured  -Demonstrates a solid understanding of concepts. Most answers are correct with only a few errors. | -Full sentences, well structured  -Demonstrates complete and in depth understanding of concepts. |
| **Conclusion**  **(After Lab)** | - Point form  - only 1 or 2 pieces of criteria are covered but not thorough  - Personal opinions are included “I like this lab” or, “This lab was FUN!” | - Sentence structure lacking  - 3 or 4 pieces of criteria are missing or incomplete | - Full Sentences, well structured  - 1 or 2 pieces of criteria are missing or incomplete | - Full Sentences, well structured and thorough/detailed  All criteria listed below must be included:  - Answers purpose ( summary of results and what they mean)  - Interesting Findings - States sources of error - Connects results to big picture (relevance) - Asks new questions  -Suggests improvement to this lab |