**Potato Design Lab**

Group Members:

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Can potato be used to demonstrate osmosis and diffusion?

* Potatoes are composed of cells.
* Potato cells have cell membranes.
* Potato cells have some water and some salt inside the cells.

Using the inquiry process, you will scientifically demonstrate the effects of osmosis and diffusion using potato slices.

In this lab, you MUST:

* Have a control
* choose a dependent variable that is quantifiable
* organize collected data using a table and a graph

**Materials:**

1 – 2 large potatoes

knife

salt

hot water

ruler

food scale

cups

saran wrap

paper towel

**Procedure:**

1. Cut potato into equal size slices. Aim for 1cm x 1 cm x 8 cm slices. Record the exact dimensions and weight.
2. Make salt water solution. Decide on the salt water concentration based on the number of test cases you plan to conduct. You need a minimum of 3 different concentration PLUS a control (0% salt).
3. Place a piece of potato into each cup.
4. Cover the cup with saran wrap and place in a cool dark area for 24 hours.
5. Remove potatoes, and gently blot each with paper towel. Record measurements/observations in observation.

**PART 1: Observing and Planning**

1. Using the procedure above, plan your experimental design.
2. Use the experimental design sheet (page 2) to plan out an investigation.

**PART 2: Collection Data (Control)**

1. Collect results from the control (0% salt water) for the dependent variable you selected
2. Record this in an observation table that you created (page 3)

**PART 3: Test Cases**

1. Alter the salt water concentration for each test case
2. Collect results from the test cases for the dependent variable you selected
3. Record this in an observation table that you created (page 3)

**Experimental Design**

Title:

Use the following chart to design an investigation.

**Designing the Investigation:** Complete the following flowchart to help you develop a testable question.

4 variables that I could change.

What will I measure?

**Independent Variable**

The 3 ‘test cases’ I will use.

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
3. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
4. Control: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**Dependent Variable**

*What and how will you measure? Include units.*

**Controlled Variables**

***(at least 4)***

**Testable Question: (What will happen to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ if I change \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_?)**

**Hypothesis** (prediction and explanation):

**Create a data table** to record your observations. [1 mark]

[3 marks]

|  |  |  |
| --- | --- | --- |
| **Material List** |  | **Equipment Setup (Diagram)** |
|  |  |  |

**Procedure (Be specific)**

* Procedure is a fair test – only one variable (the independent variable) changes between each experiment
* All other variables are kept constant – controlled variables
* Independent and dependent variables chosen are quantifiable – they can be measured
* There are 3 tests cases and the experiment is repeated
* All key steps are included and others can repeat the procedure exactly

**Observations**

* Data is organized into a chart/table that is easy to read and understand
* Both quantitative and qualitative data are included
* Table used includes a table title, row headings and column headings.

Create a table to record all observations from your control and test cases. (Quantitative Observations)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Test Cases | Initial Mass/length (grams) | Final Mass/ length (grams) | Change in mass/length (grams) | Texture change |
| Control: potato in tap water |  |  |  |  |
| Potato in \_\_% salt water |  |  |  |  |
| Potato in \_\_% salt water |  |  |  |  |
| Potato in \_\_% salt water |  |  |  |  |

Qualitative Observations

**Analyzing the Data**

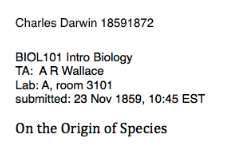
* A graph is titled, properly scaled, and have labeled axes.

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**Lab Write Up**

For this lab, you will be submitting a formal lab report with all the headings listed below. Please give your lab an appropriate title – the title must be descriptive, include the scientific name of potato used and what you were testing broadly (ie. don’t list all the test cases, but rather what independent variable you were testing). More information on how to write a formal lab report can be found on this website: [**https://tinyurl.com/y5raewks**](https://tinyurl.com/y5raewks)

**General Style and Format**

* Avoid the use of pronouns I, she, he, my partner… etc. Use past passive voice. (1C)
* Lab design (2A)
* Report included all subheadings indicated above. (1C)
* ****Format your document with 1” margins, and use a serif 12 point font (ie. Times New Roman, Cambria, etc)
* Include your information on the first page using the format below: (1C)
  + student name and student number
  + course name
  + Teacher’s name
  + date submitted
  + Title of report

**Introduction**

* Discuss why this study was conducted. What is/are the broad questions being asked? (1K)
* What is currently known about this topic? Use proper citation (ie. (last name, year)) (1K)
* State your hypothesis. (1K)
* Why are potatoes good for conducting this experiment? (1K)

**Material and Methods**

* Include a list of material (1K)
* Procedure should be numbered, written in past tense, in complete and concise sentences. (2K)

**Results**

* Results are stated without any interpretation/discussion. (1A)
* Use figures and tables to summarize the most important data and findings (trends and patterns). (1A)
* Display your results in a data table. Clearly indicate the concentration of salt water used for each test case. (1A)
* Graph your results. Assign an appropriate title, make sure to label each axis with a title and unit. (1A)
* Include a picture of your experimental setup. (1A)
* Each table, graph, and image should have a title, for example: (1A)
  + **Table 1:** Mass and length of potato…
  + **Figure 1:** This picture shows…

**Discussion – Answer the following questions in order. Include the questions in your report.**

* Analyze and interpret your results. What happened to the potato slices overnight (over the course of your experiment)? Why did it happen? (2T)
* Is diffusion or osmosis responsible for the changes? If so, what did we observe that would be evidence of osmosis and diffusion? (2T)
* What are somesources of experimental errors in your experiment? (1T)
* Does your result/interpretation agree with the literature? Does it open up new questions? (1T)
* Use your findings to explain: (3T)
  + Why road salt cause damage to street plants
  + Why wilted celery will become crisp when placed in a glass of pure water
  + Why would a sailor die more quickly drinking salt water than not drinking at all

**Literature Cited**

* Include at least 2 reputable references (not Wikipedia). Proper MLA or APA formatting must be used (1C)

**Communication:**    (2C)

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Communcation Rubric** | 0 | 1 | 2 | 3 | 4 |
| Overall Expectations | Did not meet expectations | Demonstrated with limited effectiveness | Demonstrated with some effectiveness | Demonstrated with considerable effectiveness | Demonstrated with thorough effectiveness |
| - Logical flow  - Proper use of scientific terminology  - No spelling/ grammatical errors  - Concise, and clearly presented  - Directly addresses the question  - Full sentences are used | Incomplete | Does not directly answer the question  Illogical  Spelling/ grammar errors  Scientific terms misused or not used  Point form used | Difficult to read and/or understand (lacks flow/logic)  Spelling/ grammar errors  Some scientific words misused or not used  Point form used | Wording unclear or difficult to follow  Insufficient and/or unrelated information  Scientific word(s) used incorrectly or insufficiently  Point form used | All expectations were met or exceeded |