**Celery Prototype**

**How will you Make Your Celery “Toy” Grow (Increase in Mass)?**

**Idea 1: Celery placed in distilled water (which is not a solution)**

**Idea 2: Celery placed in plain tap water (which is a solution of salts in water)**

**Idea 3: Celery placed in corn syrup solution (20 g in 200 mL)**

**Idea 4: Celery placed in vinegar (which is acetic acid-water solution)**

**How will you Make Your Celery “Toy” Shrink (Decrease in Mass)?**

**Idea 1: Celery placed in distilled water (which is not a solution)**

**Idea 2: Celery placed in plain tap water (which is a solution of salts in water)**

**Idea 3: Celery placed in corn syrup solution (20 g in 200 mL)**

**Idea 4: Celery placed in vinegar (which is acetic acid-water solution)**

**Gr 7 Review**

**Describing the Concentration of Solutions**

**Weak solution (1 tsp salt in 100 mL of water)**

**Dilute solution. It is unsaturated (it can hold more solute)**

**Medium concentration solution (3 tsp salt in 100mL of water)**

**Strong solution (10 tsp salt in 100 mL of water)**

**Concentrated solution. It might be saturated (or even supersaturated if you heated it to force it to hold extra solute).**

**Potato Prototype**

**How will you Make Your Potato “Toy” Grow (Increase in Mass)?**

**Idea 1: Potato placed in distilled water (which is not a solution)**

**Idea 2: Potato placed in plain tap water (which is a solution of salts in water)**

**Idea 3: Potato placed in corn syrup solution (20 g in 200 mL)**

**Idea 4: Potato placed in vinegar (which is acetic acid-water solution)**

**How will you Make Your Potato “Toy” Shrink (Decrease in Mass)?**

**Idea 1: Potato placed in distilled water (which is not a solution)**

**Idea 2: Potato placed in plain tap water (which is a solution of salts in water)**

**Idea 3: Potato placed in corn syrup solution (20 g in 200 mL)**

**Idea 4: Potato placed in vinegar (which is acetic acid-water solution)**

**Grade 8 Science Design Project**

Major Concept: Osmosis and Diffusion

Knowledge Outcomes:

Describe the movement of nutrients and wastes across cell membranes and explain its importance.

Predict the DIRECTION of movement of materials from a solution into and out of a prototype “toy” which has a membrane.

MB Report Card Outcomes:

* Identifies practical problems to solve
* Seeks solutions to problems and selects and justifies a method to be used to find a solution
* Creates a written plan which includes materials, steps to follow, safety considerations, and detailed diagrams
* Develops criteria to evaluate a prototype
* Constructs and tests a prototype using predetermined criteria
* Identifies and makes improvements to a prototype and justifies the changes

**Design Challenge**: A common toy novelty for many young children is to take a small toy, place it into water and watch it grow. The toy company, Axemen Unlimited, wants to create a toy that will grow (or shrink). Your task is to grow (or shrink) the toy as much as you can and report back to the company exactly how much your toy was able to grow (or shrink). Before designing the toy, the company has asked that you prove how your plan will work using a PROTOTYPE instead of the actual toy, which is still being decided upon. They would also like advice on what to make the toy out of.

**Criteria**: You must shrink your “toy” and report exactly how much it increases or reduces in mass. You will design the experiment, set up your experiment, and test your results for 3 days.

**Materials**

|  |  |
| --- | --- |
| * Celery, potato
 | * Digital scale
 |
| * 200 mL of vinegar
 | * 200 mL of distilled water
 |
| * 200 mL of corn syrup
 | * 10% of salt water(200 mL of water; 20 g of salt)
 |

**Data Analysis (4 marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solution Type** | **Initial Mass of the Egg** | **Final Mass of the Egg** | **% Change** | **Observations** |
| **Distilled Water** |  |  |  |  |
| **Salt Water** |  |  |  |  |
| **Corn Syrup** |  |  |  |  |
| **Vinegar** |  |  |  |  |

**Calculations of Percent Change (4 marks)**

*Make sure to show all your work in order to receive full marks!*

$$Percentage Change=\frac{\left(Final Mass\right)-(Initial Mass)}{Initial Mass} × 100$$

**Conclusion**

Which liquid caused the egg to swell? Which liquid caused the egg to shrink? Explain.

 (**3 marks**)

**Data Analysis:**

**On a separate piece of paper answer the following questions.**

1. When the egg is first placed in vinegar, bubbles began appearing around it. What can be inferred about the cause of these bubbles? (**1 mark**)
2. Explain changes of the egg’s mass in terms of osmosis. (**2 marks**)
3. What would happen if the concentration of salt changed? Will the mass of the egg increase or decrease? Why does this happen? (**3 marks**)
4. Create a graph to represent your data. Use a two-bar graph to show how each solution affected a change in the egg’s mass (one bar will represent the initial egg mass in each solution and the second bar will represent the final egg mass (Day 4) in each solution).
 (**4 marks**)

a) What is the independent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (**1 mark**)

b) What is the dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (**1 mark**)

c) What is the controlled variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (**1 mark**)

**Hypothesis**

Predict what will happen when an egg is submerged for 72 hours in each of the four different solutions (vinegar, salt water, corn syrup, and plain tap water). Include the hypothesis for your solution type. (**2 marks**)

**Procedure**

***Day One***

1. Place a dish on the balance and push tare. Carefully place the first egg in the dish. Record the egg’s initial mass on the chart in the observations section.
2. Place the egg in a 250 mL beaker. Add enough vinegar to the container to cover the egg. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
3. Repeat steps one and two for the next three eggs.

 ***Day Two***

1. Carefully remove the egg from the beaker of vinegar. Observe any changes to the egg on the chart.
2. Place the dish on the balance and tare. Then place the egg on the dish to get the new mass of the egg. Record day two’s new egg mass on the chart in the observations section.
3. Empty and clean the beaker. Then add 200 mL of distilled water to the beaker.
4. After weighing the egg, place the egg in a 200 mL beaker of distilled water. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
5. Repeat steps one and four.
6. Empty and clean the beaker. Place weighing paper on the balance and push tare. Next, weigh out 20 grams of salt and add to the 200 mL beaker of distilled water and stir.
7. After weighing the egg, place the egg in a 200 mL beaker of salt water. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
8. Repeat steps one to four.
9. Empty and clean the beaker. Then add 200 mL of corn syrup to the beaker.
10. After weighing the egg, place the egg in a 200 mL beaker of corn syrup. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
11. Repeat steps one to four.
12. Empty and clean the beaker. Then add 200 mL of vinegar to the beaker.
13. After weighing the egg, place the egg in a 200 mL beaker of vinegar. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.

 ***Day Three***

1. Carefully remove the egg from the beaker of distilled water. Observe any changes to the egg on the chart.
2. Place the dish on the balance and tare. Then place the egg on the dish to get the new mass of the egg. Record day three’s new egg mass on the chart in the observations section.
3. After weighing the egg, place the egg back into the 200 mL beaker of distilled water. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
4. Carefully remove the egg from the beaker of salt water. Observe any changes to the egg on the chart.
5. Repeat steps two and three.
6. Carefully remove the egg from the beaker of corn syrup. Observe any changes to the egg on the chart.
7. Repeat steps two and three.
8. Carefully remove the egg from the beaker of vinegar. Observe any changes to the egg on the chart.
9. Repeat steps two and three.

***Day Four***

1. Carefully remove the egg from the beaker of distilled water. Observe any changes to the egg on the chart.
2. Place the dish on the balance and tare. Then place the egg on the dish to get the new mass of the egg. Record day three’s new egg mass on the chart in the observations section.
3. After weighing the egg, place the egg back into the 200 mL beaker of distilled water. Cover the container with plastic wrap or aluminum foil and leave it for 24 hours.
4. Carefully remove the egg from the beaker of salt water. Observe any changes to the egg on the chart.
5. Repeat steps two and three.
6. Carefully remove the egg from the beaker of corn syrup. Observe any changes to the egg on the chart.
7. Repeat steps two and three.
8. Carefully remove the egg from the beaker of vinegar. Observe any changes to the egg on the chart.
9. Repeat steps two and three.

**Experimental Results (4 marks)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Solution Type** | **Mass of the Shelled Egg****(Before Vinegar)** | **Mass of the Unshelled Egg****(After Vinegar)** | **Mass of Egg (Day 2)** | **Mass of Egg (Day 3)** |
| **Distilled Water** |  |  |  |  |
| **Salt Water** |  |  |  |  |
| **Corn Syrup** |  |  |  |  |
| **Vinegar** |  |  |  |  |