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# Potato Osmosis

## The Lab Sheet

**INTRODUCTION:**

Have you ever wondered whether you should drink sea water if you are stranded on a desert island? Today we are going to find out what would happen to your cells if you drank from the salty ocean.

You are a shipwrecked sailor stranded on a small desert island with no fresh water to drink. You know you could last without food for up to a month, but if you don't have water to drink, you would be dead within a week. Hoping to postpone the inevitable, your contemplate drinking the salty seawater. *Is this a good idea?*

Water is required for cell survival. Its presence is necessary for the chemical processes of cells to occur. Molecules pass through the cell membrane from areas of high concentration to areas of low concentration (this is **diffusion**).The act of water diffusing through the cell membrane is known as **osmosis**. Through osmosis, water **diffuses** from areas of high concentration to areas of low concentration by passing through the cell's **selectively permeable membrane**.

Selective permeability is just that…selective. The cell's membrane is picky. It allows some substances to pass through, while blocking others. Water molecules are small, so they easily pass through the cell membrane. This freedom of movement allows water from the external environment (outside) to have a dramatic effect on the internal water content (inside) of a cell.

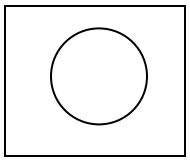
In today's lab we'll make a solution of **salt water** to represent the **sea**, and use slices of **potato** to represent **your body**. Potatoes are made of cells, just like you! We will figure out how salt water affects the slices of potato. Our (**hypothesis**) is that potato cells will behave like the cells in your body. We will also compare salt water to fresh water so we can see how fresh water affects your cells too.

**Pre-lab Questions**

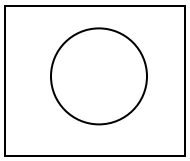
1. What is the definition of diffusion?

2. What is the definition of osmosis?

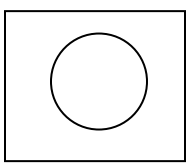
3. Define hypertonic and draw a cell in a hypertonic solution. Use an "x" to represent one molecule of solute.



4. Define hypotonic and draw a cell in a hypotonic solution. Use an "x" to represent one molecule of solute.



5. Define isotonic and draw a cell in an isotonic solution. Use an "x" to represent one molecule of solute.



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**HYPOTHESIS:**

If I put the potato in fresh water, then the potato will _____ (get bigger/get smaller).

If I put the potato in heavily salted water, then the potato will _____ (get bigger/get smaller).

**MATERIALS:**

- 2 beakers with 100 ml water each
- Salt
- Spoon
- Ruler
- Potato cubes
- Wax pencil/masking tape for labeling
- Paper towel
- Scale

**PROCEDURE: DAY ONE**

1. **Make your solutions**! Label one beaker "salt" and the other "no salt". Put your names on BOTH beakers.
    a. Pour 100 ml of water into each beaker.
    b. To the "salt" beaker, add about **10 – 20 grams of salt**. Record the amount of salt (in grams) you added to the beaker in the Data and Results section of this worksheet.

2. **Get <u>two</u> potato pieces!** Obtain two pre-cut pieces of potato from your teacher.

3. **<u>Weigh</u> the pieces!** Place potato pieces on the scale and record the mass for each piece individually. Record your results for each piece in the lab data table under **Day 1** (in grams).

4. **Measure the pieces!** In the lab data table, record the length and width of each potato piece for **Day 1** (in centimeters).

5. **Set-up the Beakers!** Once you have recorded ALL of your measurements in the data table, put the potato pieces into their beakers. Let the pieces sit **overnight**.

6. **Complete the Purpose!** Complete the purpose for this lab activity on your data sheet. Be sure to use <u>complete sentences</u>.

**PROCEDURE: DAY TWO**

1. **Weigh the pieces!** Put your potato pieces on the scale and record the mass for each piece individually (in grams). Record your results for each piece in the lab data table under **Day 2**.
2. **Measure the pieces!** In the lab data table, record the length and width (in centimeters) of each potato piece for **Day 2**.
3. **Calculate the Change!** Use your measurements to calculate the **change in mass** from **Day 1 to Day 2**. Record your answers in the data table.
4. **Calculate the % Change!** Use the formula provided to calculate the % change in mass and record your results in the data table.

**Percent change = (change in mass ÷ starting mass) x 100**

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## The Answer Sheet

**PURPOSE:**

Write a brief sentence to explain <u>why</u> we are completing this lab activity.

_____

_____

**PROCEDURE:**

Write a summary of the procedure you followed during the lab using <u>four numbered statements</u>.

_____

_____

_____

_____

**DATA:**

**Salt solution:** How many grams of salt were added to your "salt" beaker? _____g
The concentration of your salt solution is _____g/_____mL

Fill in the data table below. Show your work in the space below the table.

| | Day 1 Length | Day 2 Length | Day 1 Width | Day 2 Width | Day 1 Mass | Day 2 Mass |
|---|---|---|---|---|---|---|
| Fresh Water | | | | | | |
| Salt Water | | | | | | |

| Change in Mass | % Change in Mass |
|---|---|
| | |
| | |

**Percent change = ((Day 2 mass - Day 1 mass) ÷ Day 1 mass) x 100**

**CALCULATIONS (SHOW YOUR WORK!!!):**

**<u>CHANGE IN MASS</u>**= DAY 2 MASS- DAY 1 MASS

Fresh Water: _____ - _____ = _____

Salt Water: _____ - _____ = _____

**<u>% CHANGE IN MASS</u>**=
((CHANGE IN MASS – from above) ÷ DAY 1 MASS) x 100

Fresh Water: ( _____ ÷ _____ ) x 100 = _____ %

Salt Water: ( _____ ÷ _____ ) x 100 = _____ %

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**ANALYSIS QUESTIONS: Day Two**

*Be sure to **include DATA** you collected when answering these questions!*

1. Which beaker(s) contained a solution that was hypertonic to the potato? How do you know? What happens to cells in hypertonic solutions?

2. Which beaker(s) contained a solution that was hypotonic to the potato? How do you know? What happens to cells in hypotonic solutions?

3. In order to make an *isotonic* solution for this experiment, what additional information would you need about the potato?

4. What happened to the mass of the potato in fresh water? Explain **why** this happened based on your understanding of osmosis and be sure to use new vocabulary terms to describe what happened to the cell.

5. What happened to the mass of the potato in heavily salted water? Explain **why** this happened based on your understanding of osmosis and be sure to use new vocabulary terms to describe what happened to the cell.

6. Do you think it is a good idea to drink seawater, even if you are really thirsty? **Explain** your answer based on your understanding of **osmosis**.

**DISCUSSION QUESTIONS: Day Two**

*Use these questions to help you write a conclusion based on the **data you collected**.*

1. Use your understanding of osmosis to explain why cooking dried pasta in boiling water makes pasta soft.

2. What would happen to a sample of your red blood cells if they were placed in a hypotonic solution? Explain your answer using information from the lab. You may include a diagram to assist with your explanation.

3. A plant cell has become shriveled after having been placed in a solution. Is the solution mostly likely hypertonic, isotonic, or hypotonic? Explain your answer.