

Osmosis Inquiry Labs

Summary

Students will observe the qualitative effects of osmosis in plant cells and to quantitatively measure the rate of osmosis in potato slices.

Time Frame

2 class periods of 60 minutes each

Group Size

Small Groups

Materials

- [student sheet](#)
(attached)
- [materials list for overhead](#)
(attached)
- microscope slides
- medicine droppers
- coverslips
- compound microscopes
- forceps
- salt
- tap water
- distilled water (1000 ml)
- paper towel
- small white potatoes
- 250 ml beakers
- balance
- pencils
- masking tape
- single edge razor blade
- red onion
- Elodea
- turnips
- food coloring
- toothpicks
- iodine
- any other supplies you or your students can think of to create labs on osmosis

Background for Teachers

Objective:

The purpose of this lab is for students to observe the qualitative effects of osmosis in plant cells and to quantitatively measure the rate of osmosis in potato slices. This should help the students understand how cells maintain homeostasis with the aid of organelles like the cell membrane and cell wall. It will also help students learn to create and design an inquiry lab.

Safety Issues: Students should use caution when handling the microscopes. They should also be careful handling the glass slides and coverslips. Extreme caution should be used when using the

razor blade to cut the potatoes. You may choose to do this for the students before they arrive in class if you feel it necessary.

Student Prior Knowledge

Students should have used a microscope before and be familiar with the parts. They should also know how to make a wet mount slide. Students should also be familiar with cell organelles.

Instructional Procedures

Obtain needed supplies. Print out list of materials and make an overhead of it.

If you do not have access to distilled water fill 1000 ml beaker with water and allow the water to sit overnight. Mix up the salt solutions as directed below:

5% = 50 g salt + 1000 ml water

10% = 100 g salt + 1000 ml water

15% = 150 g salt + 1000 ml water

You may choose to cut the potatoes ahead of time to save time and help prevent injury with the razor blades

Pass out student sheets

Have students read the background and purpose.

Put up overhead of materials and allow students to look at them.

As tables have the students generate 2 hypotheses, one for a qualitative lab and one for a quantitative lab. You may need to go over the definitions of these words with the students again, depending on their prior knowledge.

Allow students to complete labs. You may want check their hypotheses and procedures for their qualitative lab before they begin. The best labs should include a wet mount slide and observations under the microscope of cells placed in different solutions of salt water.

After students complete the labs allow time for each group to present their lab results and explain the lab design.

Assessment Plan

Sample Scoring Guide:

Hypothesis.....8 points

Procedures.....4 points

Data before.....4 points

Data after.....4 points

Data Table.....4 points

Written observations.....2 points

Analysis Questions.....24 points

Conclusions.....6 points

Total.....50 points

Answers to Questions:

- 1. The cytoplasm of the cells shrink because water is moving by osmosis from the high concentration in the cell to the lower concentration of water outside the cell. The cell wall remains the same because it is a rigid structure to support the cell.*
- 2. It is a little different. In animal cells the cytoplasm shrink but it ends up being the whole cell which shrinks because there is no cell wall to keep the shape of the cell.*
- 3. The cell is trying to maintain a constant internal environment (homeostasis) by keeping the concentration of solutes the same inside and outside to the cells.*

4. *There would be no change in the plant cell because solute concentrations are the same when two things are isotonic.*
5. *The cell membrane is responsible to helping the cell maintain homeostasis in this type of environment. Some organisms have cell vacuoles also.*
6. *Answers will vary.*
7. *The distilled water (beaker A) gained the most mass and the 15% sodium chloride solution (beaker D) lost the most mass.*
8. *The distilled water solution was hypotonic to the potato cells, therefore, water was moving into the inside of the potato cells causing them to gain the most mass. The 15 % salt solution was the most hypertonic solution so the most water moved out of the potato cells causing them to lose the most mass.*
9. *The results would be magnified. No. The cells would probably get to a limit where they could not increase or decrease the amount of water any longer.*
10. *You would be surrounded by salt water. You cannot drink salt water because it is hypertonic to your cells. If you drank the water it would cause your cells to shrink in your body and eventually kill you.*
11. *The first part of the lab included written observations and drawings. Data that is not measured using numbers or quantities. The second part of the lab used numbers like mass and % change which are quantities therefore it was quantitative.*

Conclusions: will vary

Bibliography

Lesson Design by Jordan School District Teachers and Staff.

Authors

[Utah LessonPlans](#)