

Title: An Egg-cellent Osmosis Experiment

Grade Ranges:

 K-4
 5-8
 X 9-12

Subject Tag:

Science: Biology

Synopsis:

Students will conduct a simple experiment with eggs, vinegar, water, and corn syrup in order to understand the principle of osmosis. Students will weigh eggs with the shells dissolved in order to tell whether liquid has moved across the eggs' membranes. This lesson plan requires two days to prepare and then three days in the laboratory.

Keywords:

hands-on activity, kinesthetic learning, osmosis, lab work, laboratory, experiment, water movement, hypertonic solution, hypotonic solution, cell transport

Body:

The membrane for this experiment will be that of a "pickled" egg. By soaking an uncooked egg in vinegar for about 48 hours the shell can be dissolved. What remains after the shell dissolves is a rubbery inner membrane. Caution students to treat the eggs gently. Water can move in and out of the egg membrane freely and it is elastic enough to swell and shrink without bursting. To conserve materials, you can leave one egg in vinegar the entire time as a control.

This activity can be as simple or as involved as you wish. For example, you could require students to form a hypothesis, identify variables, collect data, and graph that data in a formal lab report, or you could just have students collect data and answer questions to interpret that data.

The procedures below for students are reproduced in handout one. The results table is in handout two.

**Safety: Vinegar is the only material that could be considered a safety concern because it is a strong acid. Please have students wash their hands thoroughly after handling the egg initially. You might also consider having students wear a lab aprons to avoid staining their clothes if the egg breaks or syrup is spilled.*

Related Links:

Gondar Design Science: Osmosis

<http://www.purchon.com/biology/osmosis.htm>

This site, designed by a science teacher in Great Britain, explains osmosis in detail.

Features:

- ___ Contains special education tips
- ___ Quick Activity (less than 30 minutes; story starter)
- ___ Requires Internet access for students to complete

Objectives:

1. The student will be able to form a hypothesis and test it.
2. The student will identify the independent and dependent variables.
3. The student will be able to measure mass and record data.
4. The student will witness visual and quantitative data that osmosis did occur in the egg.
5. The student will analyze data and make conclusions.

Standards:

NY: 1.2: Beyond the use of reasoning and consensus, scientific inquiry involves the testing of proposed explanations involving the use of conventional techniques and procedures and usually requiring considerable ingenuity. **1.3:** The observations made while testing proposed explanations, when analyzed using conventional and invented methods, provide new insights into natural phenomena. **4.1:** Living things are both similar to and different from each other and from nonliving things.

NYC: A3a. Gather information to assist in completing project work. **S2a.** The cell, such as cell structure and function relationships; regulation and biochemistry; and energy and photosynthesis. **S5a.** Frames questions to distinguish cause and effect; and identifies or controls variables in experimental and non-experimental research settings. Identifies problems; proposes and implements solutions; and evaluates the accuracy, design, and outcomes of investigations. **S5f.** Works individually and in teams to collect and share information and ideas. **S6a.** Uses technology and tools (such as traditional laboratory equipment, video, and computer aids) to observe and measure objects, organisms, and phenomena, directly, indirectly, and remotely, with appropriate consideration of accuracy and precision.

CT: 1: The Nature Of Science. Students will experience an inquiry-based learning environment in which they are free to ask questions, seek information and validate explanations in thoughtful and creative ways. Students also will understand that the processes, ways of knowing and conceptual foundations of science are interdependent and inextricably bound. **4:** Units Of Structure And Function. Students will understand that living things share common materials and structures which perform basic life functions.

NJ: 5.2: All Students Will Develop Problem-Solving, Decision-Making And Inquiry Skills, Reflected By Formulating Usable Questions And Hypotheses, Planning Experiments, Conducting Systematic Observations, Interpreting And Analyzing Data, Drawing Conclusions, And Communicating Results.

Prerequisite Skills:

Prior to assigning this activity, have students read about the concept of osmosis (the diffusion of water) and/or discuss the information in class. Students should be able to determine if a solution is hypotonic, hypertonic or isotonic and then predict which way water will move across a membrane.

1. Students have a working knowledge of passive cell transport concepts; diffusion, osmosis and osmotic solutions (hypertonic, hypotonic, and isotonic).
2. Students can form a hypothesis.
3. Students can define and identify independent and dependent variables.
4. Students know and understand basic lab procedures.
5. Students know and understand lab safety rules.
6. Students know how to use a triple-beam balance or digital balance to measure mass of an object.

Time Required:

Eggs must soak in vinegar for a minimum of 48 hours. After eggs are soaked, allow approximately 20 minutes for set-up and 20 minutes in the lab over three days.

Technology and Materials Needed:

1. One raw egg per student and for a control (pre-soaked in vinegar by teacher to dissolve the eggshell)
2. Two 200, 250, 300, or 400 mL beakers
3. Tap water
4. Corn syrup (approximately 150 mL per egg)
5. Labeling tape/pen
6. 1 plastic teaspoon
7. Paper towels
8. Triple-beam balance

Procedures :**DAY ONE**

1. Gently get your egg (which has been soaking in vinegar to remove the shell) from the teacher with your spoon and a paper towel. Gently pat the egg dry with the paper towel.
2. Find the mass of the egg on the triple beam balance. Record the mass in the appropriate data table in the Results section of this lab. Observe what the vinegar has done to the uncooked egg, and write your observations in the table.
3. Pour approximately 150 mL of corn syrup (enough to cover the egg) into one of your large beakers. Label the beaker with labeling tape and a permanent marker.
4. Using the spoon, gently place the egg in the beaker.
5. Wash the spoon with soap and water. Clean up your area.
6. Ask the teacher where to store your beaker.
7. Your teacher will place an egg in a beaker of vinegar as a control for the class.

DAY TWO

1. Gently get your egg from the beaker with your spoon and a paper towel. Gently pat the egg dry with the paper towel.
2. Find the mass of the egg on the triple beam balance. Record the mass in the appropriate data table in the Results section of this lab. Observe what happened to the appearance of the egg and write your observations in the table.
3. Pour the corn syrup down the drain and wash the beaker and the spoon with soap and water.
4. Pour approximately 200 mL of tap water into a large beaker. Label the beaker with labeling tape and a permanent marker.
5. Using the spoon, gently place the egg in the beaker.
6. Clean up your area.
7. Store your beaker where you did on the first day.
8. Make sure to record the information on the control egg in a table.

DAY THREE

1. Gently get your egg from the beaker with your spoon and a paper towel. Gently pat the egg dry with the paper towel.
2. Find the mass of the egg on the triple beam balance. Record the mass in the appropriate data table in the Results section of this lab. Observe what happened to the appearance of the egg and write your observations in the table.
3. Pour the water down the drain and wash the beaker and the spoon with soap and water. Place the egg in the trashcan.
4. Clean up your area.
5. Make sure to record the information on the control egg in a table.

Results: (make tables like these with a ruler and leave plenty of room for observations)

Table 1: Effect of Different Solutions on Egg Mass

| Day | Egg Mass (grams) | Where was the egg before you found the mass? | General Observations |
|-----|------------------|--|----------------------|
| 1 | | vinegar solution | |
| 2 | | corn syrup | |
| 3 | | tap water | |

Table 2: Egg Mass in Vinegar Over Time (control egg)

| Day | Egg Mass (grams) | Where was the egg before you found the mass? | General Observations |
|-----|------------------|--|----------------------|
| 1 | | vinegar solution | |
| 2 | | vinegar solution | |

| | | | |
|---|--|------------------|--|
| 3 | | vinegar solution | |
|---|--|------------------|--|

Assessment Criteria:

1. The student must produce a written lab report according to a standard format.
2. The student must complete data tables and answer analysis questions about the experiment.

Note: criteria will vary depending on the level of detail you desire.

Recommended Lesson Plan Review Date:

Review Comments:

Check Web site.

An Egg-cellent Osmosis Experiment: Procedures

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An Egg-cellent Osmosis Experiment: Results

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