Egg Experiment

Suggested Age / Grade Level	Curriculum Covered	Duration
9, 10, 11, 12	Osmosis Diffusion	Set up and activity 1.5hrs 2 days observation

Overview

Students will explore various cellular processes including osmosis and diffusion. This will be achieved using a de-shelled chicken egg as a giant cell.

Learning goals

Background Information

The membrane of the egg will follow the principles of diffusion. They will move through the membrane from the side where they are at a higher concentration to the side where they are at a lower concentration. This movement will continue until the concentration on both sides is the same. While random molecular motion will cause individual molecules to continue moving back and forth across the membrane, the overall concentration on each side will remain in equilibrium, with equal concentrations on both sides.

The egg's membrane is permeable to water. Movement of a solvent (such as water) across a semipermeable membrane from a less concentrated solution to a more concentrated one is called osmosis. When an egg is soaked in a solution that has a higher solute concentration (the relative amount of dissolved stuff) than the solute concentration inside the egg, water moves out of the egg and into the solution (see diagram below).

Key Terms

Osmosis, diffusion, membrane cells, transport, volume

Materials

- Several chicken eggs
- Large container, such as a wash basin or large bowl
- Vinegar
- Scale
- Pencil and notepaper (or similar) for recording information
- Several substances in which to soak or bury the de-shelled eggs, such as distilled water, dry salt or saltwater solutions, colored water, corn syrup, rubbing alcohol, cornstarch, or baking soda
- Containers to hold the soaking eggs
- Plastic wrap (not shown)
- Masking tape and marker for labeling containers
- Optional: nitrile or latex gloves for handling eggs, glass jars or other small objects to hold down floating eggs

Additional Setup Requirements

1. De-shell the eggs by placing them in a large container so that they touch as little as possible. Add vinegar to cover the eggs (see photo below), and cover the container. Allow the eggs to sit for 24 to 48 hours at room temperature. Note: Changing out the vinegar halfway through and replacing it with fresh vinegar will speed up the process.

2. The eggshells will leave residue in the vinegar bath (see photo below). Gently rinse the eggs in water to remove any traces of softened shell. Cover and refrigerate the de-shelled eggs until ready to be used. Note: Be sure to handle the de-shelled eggs gently. But despite your best efforts, some eggs will break. Try to keep them off carpeted areas, and soak several extra eggs, just in case.

3. Determine the treatments you'll be using on your eggs, and prepare the substances you'll need. You can make salt-water solutions by dissolving different amounts of table salt in containers of water (e.g. 100g, 200g, 300g of salt (NaCl) per liter). You can make solutions of food coloring by adding a few drops of each color into containers of water. Remember to label your containers as you work.

Procedure

Day 1

- Use a scale to find the mass of each de-shelled egg before treatment. Record the result on notepaper.
- Place one egg in a labeled container and cover it with your chosen treatment. (If the egg floats, you may use something to hold it down, such as a glass jar; see photo below.) Repeat for each of the remaining treatments. Be sure to set aside an untreated "control" egg. After taking its mass, cover the control egg with plastic wrap, and set it in a container alongside the treatment eggs.

Place the treatment containers somewhere they can sit for at least a day at room temperature. Observe any changes that occur in the eggs during the first hour or so of soaking and record your observations.

Day 2

Observe any changes in the color, size, or shape of your experimental eggs. Record your observations. Then, gently remove your sample eggs from their treatments to measure and record the mass of each one (see photo below). Remove the plastic wrap from the control egg and measure its mass too. Calculate the percentage change in mass for each egg by dividing the final mass by the starting mass and multiplying by one hundred percent.

In a separate bowl, carefully dissect the egg by piercing the membrane. Record your observations.

References

This activity has been adapted from Exploratorium Science Snacks
https://www.exploratorium.edu/snacks/naked-egg