

Lesson Plan

Assessment
Cross-curricular

Quest., observation, lab report

Big Ideas

- Cells are the basis of life.
- Cells organize into tissues, tissues into organs, organs into organ systems, and organ systems into organisms.
- Healthy cells contribute to healthy organisms.

Learning Goals

- Develop a hypothesis and design an experiment to change the volume of gummy bears.
- Understand the processes of diffusion and osmosis and their importance to cells.
- Follow safety procedures for handling apparatus and materials.

Specific Expectations:

- 2.1** follow established safety procedures for handling apparatus and materials
- 2.4** use scientific inquiry/experimentation skills to investigate the processes of osmosis and diffusion
- 2.5** use appropriate science and technology vocabulary, including organelle, diffusion, osmosis, cell theory, selective permeability, membrane, stage, and eyepiece, in oral and written communication
- 2.6** use a variety of forms to communicate with different audiences and for a variety of purposes
- 3.2** identify structures and organelles in cells, including the nucleus, cell membrane, cell wall, chloroplasts, vacuole, mitochondria, and cytoplasm, and explain the basic functions of each
- 3.4** explain the processes of diffusion and osmosis and their roles within a cell

Description:

In this lesson students will develop a hypothesis and design an experiment to change the volume of gummy bears. They will understand the process of diffusion and osmosis and their importance to cells.

Materials/Resources:

Picture of wrinkled finger
 How Credible is Your Information Source
 Worksheet
 Diffusion and Osmosis Websites
 Assessment Rubric – Lab Report

For each group: petri dishes, gummy bears, rulers, beakers, graduated cylinders, stirring rods, salt, sugar, vegetable oil, vinegar, corn syrup, distilled water, tap water
Teacher demo: egg, vinegar, and above materials for diffusion.
Safety Notes: wear safety goggles and glove

Introduction

It is not necessary for students to know about osmosis or diffusion to do this lesson. Allow for three days, but there should be at least a one- to two-day separation between the time students set up their experiments and do analysis. Remind students not to eat anything in a science lab.

Students will be doing an Internet search, and it is a great opportunity to talk about how accurate and/or useful information is on the Internet. Note especially how the theory as to why our fingers wrinkle in water has changed since 2013 or so.

Show students a picture of wrinkled fingers (See Link). Ask the students if they have experience with this, and get them to explain what they think is happening. Write some suggestions on the board. Then, ask the students to do an Internet search for the answer. They will fill out the handout (How Credible is Your Information Source? (See Link) Ask question: **Why do your fingers wrinkle in water?**), evaluating 2 sites they found. Discuss possible answers once students have done an initial search. Discuss freshwater versus saltwater. Students will hand in the worksheet.

Next, have students fill out a second handout (How Credible is Your Information Source? See Link. Ask question: **What are diffusion and osmosis?**) while searching for two sites about diffusion and osmosis. (Have some back-up sites available for struggling students. (See Link)

Action

Show students an egg (de-shelled previously in vinegar). Ask the students what they think the egg might represent (a cell). You can decide if you would rather do this activity with de-shelled eggs or gummy bears. Gummy bears are less fragile or messy. Having your own eggs could make a good teacher demo after the experiments are finished.

Explain to the students that their challenge is to change the volume of the gummy bears (or egg) without touching them. Students will be in groups and they will be randomly given the opportunity to either increase or decrease the volume. Provide the students with the list of possible supplies, or show them what they have available for their experiments.

Students will formulate their hypothesis based on their particular challenge, and design an experiment to test their hypothesis. The experimental designs will be submitted at the end of the period in order for the teacher to review them before experiment day.

The following day, students will revise their experimental design, and get approval from the teacher before they start their experiment. The experiment needs to be left for at least one or two days to observe results, so it is best to set up the experiment on a Friday for observations on a Monday.

After observing and measuring the results of their experiment, students will present their findings. They will describe their experiment and results in a short presentation and lab write up. Make sure students relate the experiment to society and the environment. Students will be assessed on their experimental design and their presentation (See Lab Report Assessment Rubric Link).

Consolidation/Extension

Conclude with a discussion of what happened to the gummy bears (eggs), and why the students think this happened.

Ask them what worked and what did not work in their experiment. Were they surprised by their results? Did groups have similar results doing different things or different results doing similar things? Why could this happen? What were some problems? What would they change?

What caused the change in volume? (Water – mention movement from higher concentration of a solute to lower concentration of a solute. Some vocabulary: concentration gradient, hypertonic, hypotonic, isotonic.) What is the difference between diffusion and osmosis? (Osmosis is diffusion of water)

Why is it important for our cells to be able to do this? What are some problems associated with this?

Give the students some examples of diffusion in every day life. Have students draw a 3 to 4 panel comic strip to explain what is happening. You are not limited to the ideas below.

- Helium balloon will deflate a little bit every day, because helium atoms diffuse out of the balloon through its wall
- Carbon dioxide bubbles in soft drinks diffuse out of your soda, leaving your soda flat
- A sugar cube in a glass of water that is not stirred will dissolve slowly and the sugar molecules will distribute over the water by diffusion
- A wilted carrot or celery made firm again by soaking in water

Students can look at diffusion through a plastic sandwich bag and discuss the permeability of the cell membrane. In this case, the iodine is small enough to pass through the plastic, not the water molecules or the starch molecules. Look up Iodine Diffusion Lab.