Lab: Under the Sea: A Density Aquarium!

FOR THE TEACHER

Summary
In this lab, students will create a density aquarium. They will develop a written response comparing and contrasting the densities of the various objects within the aquarium. This lab is designed for students to work in groups after they have an understanding of density and other physical properties.

Grade Level
Elementary School

NGSS Alignment
This lab will help prepare your students to meet the performance expectations in the following standards:

- **5-PS1-3**: Make observations and measurements to identify materials based on their properties.
- **Scientific and Engineering Practices**:
  - Analyzing and Interpreting Data
  - Engaging in Argument from Evidence

Objectives
By the end of this lab, students should be able to

- Create a density aquarium.
- Write evidence based claims to compare and contrast the densities of liquids and objects.

Chemistry Topics
This lab supports students’ understanding of

- Density
- Physical Properties
- Observations

Time
**Teacher Preparation**: 10-15 minutes
**Lesson**: 60 minutes

Materials (per group)

- 1 clear, medium-sized, plastic container (example: Tupperware)
- **Aquarium rocks** of various sizes
- **7-8 Plastic sea animal toys** (some of these should sink and some will float)
- Water (fill each plastic container approximately 2/3)
- 100ml Vegetable oil
- Beaker or small plastic cup
- Blue food coloring
- Popsicle stick/stirrers

Safety

- Always wear safety goggles when handling chemicals in the lab.
- Students should wash their hands thoroughly before leaving the lab.
- When students complete the lab, instruct them how to clean up their materials and dispose of any chemicals.
Teacher Notes

- Students should already have a working knowledge of physical properties, including density. In order for them to be successful in this lab, they should be able to answer the pre-lab questions independently before they begin.
- While this lab was designed for students to complete in groups, this could also be completed as a teacher demonstration, especially if there are not enough resources for all students to complete the activity.
- If none of the plastic sea animals float, you may want to include other materials, such as fake leaves, that will not sink.
- Procedures:
  o Begin the lesson with a quick review of physical properties: mass, volume, density, texture, hardness, etc.
  o After your introduction, students should be able to complete the pre-lab questions independently.
  o Review activity procedures for students. Water can be added by the teacher and the oil should be pre-measured for students and placed into a beaker/plastic cup for students to add into the water. The exact measurement of oil is not important for this activity.
  o Students should follow the given procedures to create their density aquariums.
  o As students draw their observation diagram, ensure that they are using specific labels and details so that their diagrams accurately reflect their aquarium.

FOR THE STUDENT

Lesson

Under the Sea: A Density Aquarium!

Background
In this activity, you will create a density aquarium using various liquids and objects. You will then use evidence from your density aquarium to compare and contrast the densities of the various liquids and objects.

Prelab Questions
1. What is density?
2. How can you tell that an object or liquid is less dense than another object or liquid?
3. How can you tell that an object or liquid is denser than another object or liquid?

Objective
You will create a density aquarium and write evidence based claims that compare and contrast the densities of objects and liquids.

Materials
- 1 clear, medium-sized, plastic container
- Aquarium rocks of various sizes
- Plastic sea animal toys
- Water
- Vegetable Oil
- Blue food coloring
Safety
- Always wear safety goggles when handling chemicals in the lab.
- Wash your hands thoroughly before leaving the lab.
- Follow the teacher’s instructions for cleanup of materials and disposal of chemicals.

Procedure
1. Answer the pre-lab questions independently.
2. Review the materials needed to ensure you have all supplies.
3. Make your aquarium:
   a. Fill the bottom of your aquarium (the plastic container) with the aquarium rocks provided by your teacher.
   b. Fill the aquarium 2/3 of the way with water.
   c. Add 4 drops of blue food coloring to the aquarium. Mix with your Popsicle stick/stirrer.
   d. Slowly pour the beaker of vegetable oil into the aquarium.
   e. Slowly drop in the plastic sea animals or any other objects provided by your teacher.
4. Observe the various liquids and objects in your aquarium. Draw a detailed observation diagram (in color!) in the space below. Label all components.
5. Answer the analysis questions in complete sentences.

Observation Diagram
*Remember, science diagrams are detailed, with colors and labels!*

Analysis
1. What liquid is the least dense in your density aquarium? What evidence can you use to support your claim?

2. What object is the densest in your density aquarium? What evidence can you use to support your claim?

3. Use the following sentence frame to compare/contrast the densities of two liquids or objects:
   ________________ is more/less (circle one) dense than _________________. My evidence to support this claim is ____________________________
   ____________________________

4. Using the frame from question 3, write another density claim, using different objects/liquids. What evidence can you use to support this claim?

Real World Application:
Unfortunately at times there are oil spills into the ocean from ships or from locations where oil is being drilled. This can cause a lot of serious damage to the ocean ecosystem. Based on what you learned about the density of oil and water, how can this information help to more easily clean up an ocean if there is an oil spill?