

DECIPHERABLE DENSITY

Science Concept:

Density causes materials to separate.

Objectives:

The student will:

- describe how different densities can cause liquids to separate;
- infer the density of different liquids; and
- write a paragraph using correct spelling and punctuation.

GLEs Addressed:

Science

[7] SB1.1 The student demonstrates an understanding of the structure and properties of matter by using physical properties (i.e., density, boiling point, freezing point, conductivity) to differentiate among and/or separate materials (i.e., elements, compounds, and mixtures).

[7] SA1.1 The student demonstrates an understanding of the processes of science by asking questions, predicting, observing, describing, measuring, classifying, making generalizations, inferring, and communicating.

Writing

[7] W 3.2.2 The student writes for a variety of purposes and audiences by writing in a variety of nonfiction forms (e.g. letter, report, biography, and/or autobiography) to inform or describe

Vocabulary:

density - the state or quality of being dense, or having the component parts closely compacted together; in physics, measured by mass per unit volume

Materials:

- Clear plastic cups, 12-16 ounce-size (5 per group of students)
- Salt (about 2 pounds)
- Measuring spoon: tablespoon
- Measuring cups: 1/2 and 1 cup
- Red, blue, green, and yellow food coloring
- Clear, plastic straws (one per student)
- Pitchers, 1/2 gallon size, for preparing salt solutions (four)
- Large spoon
- Can of diet cola
- Can of regular cola
- Basin, 12-quart size
- Science journal (one per student)

Resources:

Spangler, S. (2009). Liquid layers - straw stack of color. Retrieved July 6, 2009, from Steve Spangler Science Making Science Fun website: <http://www.stevespanglerscience.com/content/experiment/liquid-layers-straw-stack-of-color>

Activity Preparation:

1. Fill four pitchers 3/4 full with water. Use food coloring to color each pitcher a different color – blue, red, green and yellow. Colors should be fairly dark, so add 15-20 drops of food coloring to each pitcher. Add 1/2 cup of salt to the blue water and stir. Add 1 cup of salt to the red water and stir. Add 1-1/2 cups of salt to the green water and stir. Add 2 cups of salt to the yellow water and stir. Not all of the salt will dissolve immediately. Over time the salt will completely dissolve.
2. Pour salt solutions into cups for student use, making sets of four for each group.
3. Fill a 12-quart basin with water.

Activity Procedure:

Please refer to the assessment task and scoring rubric located at the end of these instructions. Discuss the assessment descriptors with the class before teaching this lesson.

Gear Up**Process Skills: questioning, observing, predicting, and inferring**

1. Ask students to write what they know about density in their journal. After they have had time to complete the entry, ask students to share their ideas with the class. Record their comments on the board.
2. Show students the cans of cola. Ask them to predict what will happen to the cans when placed in the basin of water. (The containers of diet cola and regular cola must be the same size. Due to the different density of each soda, one can will sink, the other will float.) Ask students to consider what is happening and what the demonstration tells about the density of liquids.

Explore**Process Skills: observing, and questioning**

3. Distribute a set of blue, red, green and yellow liquid (see Activity Preparation), plus one empty cup and one straw to each group of students. Each of the colored liquids has a different density. The challenge is for the student to layer the different solutions in the straw. The solution with the highest density (yellow) stays at the bottom of the straw while the solution with the least amount of salt (and the lowest density) remains at the top. The secret to a successful layering is density and a steady hand. Students should diagram and label the colors of their straw in their journal.

Teacher Note: Refer to the *Steve Spangler Science Making Science Fun* website (<http://www.stevespanglerscience.com/content/experiment/liquid-layers-straw-stack-of-color>) for tips on how to make this a successful explore activity.

Generalize**Process Skills: questioning, describing, and classifying**

4. As a class, discuss the following:
 - a. Describe how the solutions are *alike*.
 - b. Describe how the solutions are *different*.
 - c. Why do you suppose the solutions are different?
 - d. Classify the liquids from highest density to the lowest density.
 - e. What happens if you don't use the right order for layering the colors?
 - f. What happens if you put a more dense liquid into a less dense liquid? Why?

Apply**Process Skills: questioning and inferring**

5. Ask students to consider the following then answer in their science journals:
 - a. Why do you not let go of a helium balloon?

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INSTRUCTIONS
Grade 7



- b. What does that tell you about the density of air compared to the density of helium?
- c. What materials can you think of that may be of the same shape and size but have different densities?

Sources:

(2009). June 25, 2009. from <http://www.factmonster.com/ce6/sci/A0815175.html>

Murck, Barbara (2008). *Visualizing Geology*. Hoboken, New Jersey: John Wiley & Sons, Inc.

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RUBRIC

Assessment Task:

Based on knowledge of separation of liquids with different density, students will explain the following scenario in at least a five-sentence paragraph that has correct spelling and punctuation:

Patty removes the Italian dressing from the refrigerator and exclaims that the salad dressing has gone bad because it has separated into two different layers. John explains to her that it's okay. John describes to Patty the physical property of density and why the liquids separated. What does John say to Patty? John could also describe another example where substances separate based on density.

Later, John and Patty are in their Alaska geography class and notice that the fresh water of the Yukon River empties into the salt water of the Bering Sea. They begin to wonder about the water in the region. Write in your journal what John and Patty conclude about how density relates to the layering of the fresh water at the mouth of the Yukon River with the salt water of the Bering Sea.

Rubric

Objective	GLE	Below Proficient	Proficient	Above Proficient
The student describes density.	[7] SB1.1	The student is unable to describe the physical property of density.	The student describes the physical property of density and describes one reason why the liquids in an Italian salad dressing separate.	The student describes the physical property of density and describes two reasons why different liquids in an Italian salad dressing separate. Describes another example where substances separate based on density.
The student infers what happens when fresh water from a river and salt water meet.	[7] SA1.1	The student does not make any inferences during the activity.	The student makes one inference about what happens at the mouth of a river where the fresh water meets salt water.	The student makes two or more inferences about what happens at the mouth of a river where the fresh water meets salt water.
The student writes how density may separate different materials.	[7] W3.2.2	The student does not attempt to write or writes four or fewer sentences.	The student writes a five-sentence paragraph that explains how density separates different materials, and uses correct spelling and punctuation.	The student writes a six- or more-sentence paragraph that explains how density will separate different materials using correct spelling and punctuation.

