Beads in a Bottle

The **Science and Technology Concepts for Middle School (STCMS)** by Smithsonian has a total of 9 units that cover the NGSS Performance Expectations for Middle School Science.

During the Carolina Science workshop: ***What Does High-Quality Science Instruction Look Like? Practical Walkthrough Tools for District Leaders (K–12)*** we feature part of Lesson 1 from STCMS Matter and Its Interactions.

In this lesson, students investigate some characteristics of matter. The lesson serves as a **pre-assessment** of students' current ideas about matter. Students rotate through a circuit of stations to conduct eight short investigations in which they observe, record, and analyze some of the physical and chemical properties of matter. They describe behaviors of matter and begin to form explanations of the phenomena they observe. They go on to use these observations as the basis for analyzing cause-and-effect relationships and describing patterns in matter. The process reveals their current skills, knowledge, and misconceptions relevant to many of the Next Generation Science Standards (NGSS) performance expectations to which the unit is aligned.

To use this investigation as an opening phenomenon and assess students' current thinking about density, obtain the following materials and follow the instructions:

Products used to prepare the Beads in a Bottle:

Bottle, Plastic, 2 oz, with Cap, Pack of 9 | Carolina Biological Supply

Bead, Solar Energy, Box of 250 | Carolina Biological Supply

Bead, Green Pony, 9 mm, Pack of 150 | Carolina Biological Supply

Isopropyl Alcohol, 91%, 16 oz | Carolina Biological Supply

Salt, Kosher, 3-lb Box | Carolina Biological Supply

Water

Investigation 1.6 can be performed on a lab table or desk. Follow these steps to prepare for the investigation:

1. Create a paper funnel by cutting 1 cm off the end of a paper cone cup. You will use this funnel in the following step.
2. Use the paper funnel to add 5 scoops (5.5 g) of kosher salt to a bottle.

   Note: Kosher salt must be used in this investigation. Table salt may not be used as a substitute because it often contains anticaking agents that will cloud the solution when water is added.
3. Prepare a salt brine by adding 25 mL of water to the kosher salt in the bottle. Cap the bottle and shake it several times.
4. Remove the cap. Add 5 green beads and 5 UV beads to the bottle.
5. Use 91% isopropyl alcohol (2-propanol) to fill the remaining space in the bottle (about 35 mL).

   Note: Large amounts of air remaining in the bottle may cause bubbles to adhere to the beads and prevent them from settling as expected in the bottle.
6. Shake the bottle. If prepared correctly, the green beads should sink to the bottom and the UV beads should rise to the top. After about 1 minute, the alcohol and salt brine will separate, and the beads will move to the interface between the layers.

Investigation 1.6

Beads in a Bottle

Materials

For you

- Science notebook
- Safety goggles

For your group

- 1 Bottle containing beads

Procedure

1. At this station, you and your group will determine if mixing results in the formation of a new substance.
2. Look at the contents of the bottle. Sketch a picture of the bottle in your science notebook. Together with your group, discuss what you know about the substances in the bottle. Record your responses in your science notebook.
3. How many different substances do you think are in the bottle? What evidence do you have to support this claim? Discuss these questions with your group and record your responses in your science notebook.
4. Shake the bottle two times and observe it for one minute. Record your observations in your science notebook.
5. Once again, shake the bottle two times and observe it. Sketch pictures in your science notebook to document how the bottle changes after shaking.
6. Using your observations, what additional things do you know about the substances in the bottle now that you have shaken it?
7. Do you think the number of substances in the bottle is different after you shook it? What evidence do you have to support this claim?
8. Restore the station to its original condition for the next group.



Figure 1.7

How many different substances do you think are in the bottle?

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