

Red, Green, and Blue Mystery Liquids! Hypothesis or Inference?

ELIZABETH BAILEY
Bay District Schools

Description

Students are actively involved in the scientific method and inquiry as they form quick hypotheses based upon a teacher set of mystery liquids. Students will determine they need to make additional observations of the liquids to test their initial hypotheses and form inferences. Students may extend the lesson and inquiry processes as they design their own density experiment using liquids they decide upon and bring from home.

Standards

Florida Sunshine State Standards

SC.A.1.3.1.8.1

The student determines the physical properties of matter that can be observed without altering the substance (for example, mass, volume, boiling point, density).

SC.H.1.3.2.8.1

The student extends and refines use of systematic, scientific processes to develop and test hypotheses.

Florida Process Standards

Critical and Creative Thinkers

04 Florida students use creative thinking skills to generate new ideas, make the best decision, recognize and solve problems through reasoning, interpret symbolic data, and develop efficient techniques for lifelong learning.

Materials

- Red, green, and blue liquids, prepared by the teacher
- Mineral oil
- Water
- Paper towels
- Student lab trays (one per group)
- Small Petri dishes (three per lab group)
- Small clear cups (one per group)
- Mystery Liquids Data Sheets (one per student)(See attached file.)
- Student journals
- Student science notebooks
- Pencils

Preparations

1. Prepare the red, green, and blue liquids and place each in a separate, clear two-liter bottle.
2. Place students in lab groups of two or three students.
3. Prepare lab trays with three empty small Petri dishes, one small clear plastic cup 2/3 full of water and 1/2 full of mineral oil, and paper towels.
4. Gather all needed materials and place them on a cart or demonstration table where they are easily accessible.

5. Copy one Mystery Liquids Data Sheet for each student in the class. See attached file.

Procedures

Important Note: Goggles should be worn at all times.

The blue liquid is Dawn dishwashing liquid and students note that it has physical properties of feeling slippery, thick, and heavy. It sinks to the bottom in the mineral oil and water system.

The green liquid has a strong odor, and students must use a wafting motion to observe this physical property. It is a very thin liquid that students should conclude is less dense. This liquid rises to the top of the mineral oil and water system. It is green rubbing alcohol.

The red liquid is colored water, and it will go to the middle of the mineral oil and water system.

1. As students enter the room, they observe three separate two-liter bottles. One bottle has a green liquid, one has a red liquid, and one has a blue liquid. Open a discussion with the students discussing their hypothesis of each of the three liquids. Students determine they are using background knowledge of liquids that are the same color, since the teacher is only showing them the two-liter bottle with the liquid.
2. Explain to the students that they have made hypotheses and need to turn them into inferences. Define an inference as a logical conclusion based upon your observations. Ask students, "What is missing?" The students should explain that they need to make further observations.
3. Pour a small amount of the blue liquid in a small Petri dish for each group. The students have two minutes to list their observations in the data chart provided. They then will have one minute to share their observations with their lab group and then the class. The teacher leads a classroom discussion of the physical properties of the liquid.
4. Give the students a small clear cup that has mineral oil and water in it. Tell the students to list their observations in the data chart provided. You now lead a classroom discussion of the physical properties and student observations of the mineral oil and water.
5. Allow students time to apply their knowledge from step #3 and #4 to make inferences as to what the mystery blue liquid is and where it will layer out in the mineral oil and water system.
6. Direct the students to pour the blue liquid into the mineral oil and water and record where it went and why in the data sheet provided. Explain to the students what the blue liquid is and inquire how the density of the blue liquid effects the location in the mineral oil and water system.
7. Repeat steps #3 and #5 for the green liquid and the red liquid.
8. Direct the students record the words *hypothesis* and *inference* in their two-column notes in their journals and list two examples of a hypothesis and an inference.

Assessments

Students begin the lab with observational hypotheses and conclude with written conclusions (evidence) in their individual lab reports that analyze and explain the location of the three mystery liquids (criteria) based upon their inferences (scientific process skill).

Students discuss in lab groups (think, pare, share)(evidence) how the physical properties determine the density of each mystery liquid. They conclude how this affects the location of the mystery liquids by observation in the mineral oil and water system (criteria). The teacher will facilitate the group discussions (evidence), checking for knowledge of density and physical properties.

Students define in their science journals (evidence) the difference between a hypothesis and inference (criteria). An example could be that the thickness (viscosity) of the blue liquid caused one to infer that it was dishwashing liquid. Students write two examples (evidence) of a hypothesis and an inference (criteria) in their science journal (scientific process skills). Students will design a follow-up experiment on density using their knowledge gained from the experiment. Their experiments should answer questions they had while performing the mystery liquids.

Students conclude that a hypothesis is an educated guess based on background knowledge. An inference is a logical conclusion based upon your observations. To infer, one has to make observations. Students also determine that the density of the liquid or how heavy or thick it is will determine the location it goes to in the mineral oil and water system.

Extensions

The teacher can extend the lesson with student lab groups, designing their own density experiments based upon their knowledge gained and questions and answers that arose during the mystery liquids lab. Each student experiment should begin with a question from the the initial mystery liquids lab. Follow-up labs can result from student-designed labs to further investigate the properties of matter.

Mystery Liquids Data Sheet

Hypothesis Observations Inference

*Mineral Oil
and Water*

Blue Liquid

Green Liquid

Red Liquid