

Measuring Matter

Lesson Concept	Physical properties of matter, such as, length, mass, and volume can be measured using a ruler, balance, and graduated cylinder.
Link	Students know that the physical properties of matter are observable.
Time	Two class periods (2 hours)
Materials	<p><u>Whole class</u></p> <p>3 containers for liquid and colored water one container tall and narrow one container short and wide one container “just right”</p> <p>3 triple beam balances Measuring wheel Red, yellow, blue food coloring</p> <p><u>Per Group (groups of 4)</u></p> <p>tray 500 ml graduated cylinder 6 clear plastic cups Large containers filled with red colored water, yellow colored water, and blue colored water for students to use Disposable pipette or eye-dropper Meter stick</p> <p><u>Individual</u></p> <p>Lab directions/worksheet Science notebook Ruler</p>
Advance Preparation	<ol style="list-style-type: none">1. Mix the three large containers of colored water.2. Prepare lab group trays.3. Prepare demonstration container for the “Engage” section of the lesson.

4. Prepare copies of lab directions/worksheet for each student

Procedure:

Engage

(15 minutes) Physical properties of matter, such as, length (cm), mass (g), and volume (ml) can be measured. Liquids take the shape of their container and are measured in milliliters.

1. Day 1: Display the 3 containers of liquid (tall and narrow, short and wide, and “just right”) each with 240 ml of colored water. Each container actually has the same amount of liquid (i.e., 240 ml) but the three different shapes of container make it appear that some may contain more or less liquid.
2. Ask students which container has the most liquid. Discuss in lab groups and share out responses. Teacher will record student predictions.
3. Introduce a graduated cylinder. Explain to students how to accurately measure using a graduated cylinder: get at eye level to the liquid being measured within the graduated cylinder. Do not hold graduated cylinder in “your” hand, place on a level, flat surface.

Explore

(30 minutes) Physical properties of matter, such as, length, mass, and volume can be measured.

4. Distribute tray of materials to each lab group, including sheet of directions (See Measuring Volume). Emphasize the importance of accurately measuring and following directions. Students will follow procedures on the lab worksheet.
5. The final product should result in all 6 cups with the same amount of liquid (in milliliters) and arranged in a rainbow order (red, orange, yellow, green, blue, violet). Have students measure each cup of liquid using a graduated cylinder. Have students record their measurements on their worksheet.

Explain

(30 minutes) Liquids take the shape of the container. Scientists use standardized measurements and standardized tools with which to make those measurements. Measurement is a way to observe and quantify physical properties of matter.

6. Ask students: What if I had given you spoons to measure your liquids in this activity? ESR: It would be harder to measure. What if everyone had different sized spoons? ESR: The colors might not be consistent among groups. Use realia, such as, a giant spoon and a teaspoon to emphasize this point.
7. Ask students: Why do scientists use standardized measurements and tools for measurement? ESR: Scientists use standardized measures to be accurate and consistent. What state of matter were we working with earlier in the lesson? ESR: Liquid. What physical property were we measuring? ESR: Volume.

Extend (30 minutes) Physical properties of matter, such as, length and volume can be measured.

8. Day 2: Measuring Length: Give students various instruments with which to measure length, such as, rulers, meter stick, and measuring wheel. Clarify for students the difference between the metric system (International System of Units-

SI) and the United States Customary System of measurement. Direct students to measure using metric units, such as centimeters and milliliters on the ruler. Tape over the inches side to discourage students from using those units of measure, and eliminate possibility of confusion. Give students various objects to measure length: a textbook edge, a pencil, a pencil box, etc. Have students record objects and measurement in their science notebooks.

9. Demonstrate measurement for non-rectangular prism shape (example: marbles, rocks, golf balls, sets of old keys, little toys, bags of pennies) by using displacement. Measure out 200mL of water and note measurement. Add any object that will sink and note new measurement. Find the difference and record as volume of object. Have each group practice with a new amount of water and a different objects. Have students record their observations and measurements in their science notebooks.

Evaluate **(15 minutes) Physical properties of matter, such as, length, mass, and volume can be measured.**

10. In science notebooks, have student paste in the Measuring Volume lab worksheet. Have students draw a line of learning in their science notebooks just after the Measuring Volume lab worksheet. Direct students to ask students to describe and summarize what they noticed when they mixed the different colors of water. ESR: Students describe color changes and volume changes. The final product should result in all 6 cups with the same amount of liquid (in milliliters) and arranged in a rainbow order (red, orange, yellow, green, blue, violet).