

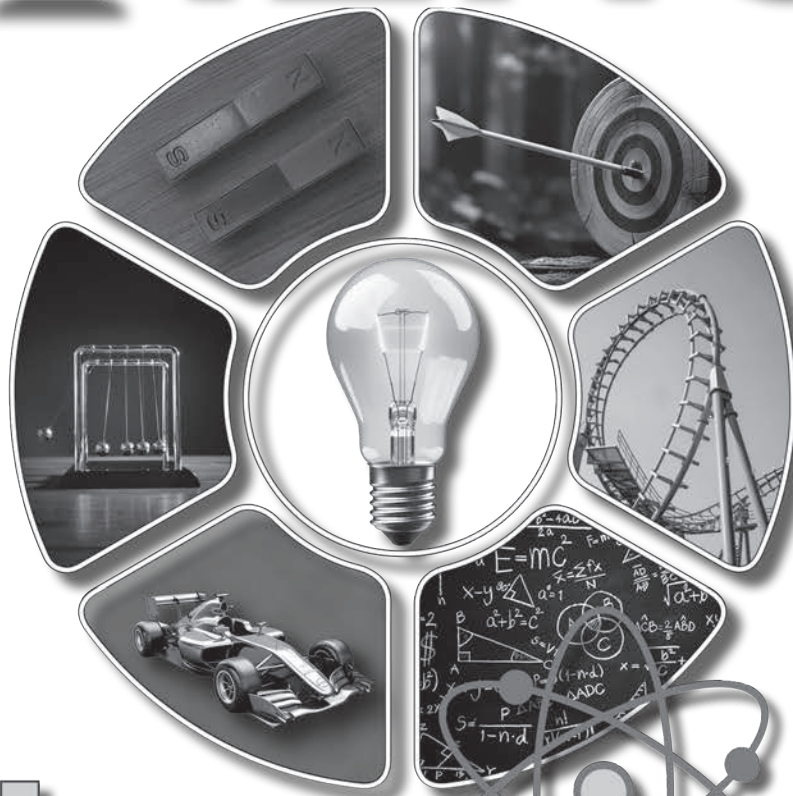
THE MYSTERY OF SCIENCE



Physics Lab Manual

Karri J. Iverson

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Lesson 8: Slow Solids and Lively Liquids

Goal: To understand the differences between solids and liquids based upon their shape, molecular movement, and volume.

Materials Needed

- ☐ measuring cup with metric markings (milliliters or ml) that will measure at least 500 ml
- ☐ water
- ☐ 3 rocks approximately the size of ping-pong balls or golf balls
- ☐ laundry marking pen or crayons

Suggested Daily Guide

Day 1:

- Read through the “Define It” terms and “Write It” questions.
- Read the lesson in your *Student Reader*.
- Work on Scripture memory.

Day 2:

- Read through the lesson again.
- Write the definitions or say them out loud.
- Complete the “Write It” section.
- Work on Scripture memory.

Day 3:

- Complete the “Apply It” section.
- Work on Scripture memory.
- Record the physicist’s information in Appendix B.

Day 4:

- Complete the “Research It” section.
- Work on Scripture memory.
- Complete the “Review It” section.

Scripture Memory

John 7:38: “The one who believes in Me, as the Scripture said, ‘From his innermost being will flow rivers of living water.’”

Write It

Give 5 examples of liquids and 5 examples of solids, remembering our definitions for each.

Liquids

1. _____
2. _____
3. _____
4. _____
5. _____

Solids

1. _____
2. _____
3. _____
4. _____
5. _____

Apply It

Lab: Measuring Volume

Materials Needed

- ☐ measuring cup with metric markings (milliliters or ml) that will measure at least 500 ml
- ☐ water
- ☐ 3 rocks approximately the size of ping-pong balls or golf balls
- ☐ laundry marking pen or crayons



Observation and Question

We can easily measure a brick and figure its volume, but not every object is that easy to calculate. For example, a golf ball or any other sphere is round, so we can't use the formula $L \times W \times H$, but it can be calculated using a special formula. What things can you think of that might not be measured so easily? What do you know about a solid's shape?



Hypothesis

If we want to know the volume of something like a rock with an irregular shape, the calculation can get complicated. Even if the shape of the rock is very irregular, it is still a solid and therefore has a definite shape. In this activity, we are going to measure the volume of rocks indirectly as a method of determining the volume of irregularly shaped objects. How do you think this will work?



Experiment

1. Using the crayon or laundry marker, mark each rock with a different letter (*A*, *B*, or *C*).
2. Fill the measuring cup with exactly 300 ml of water.
3. Add the rock marked *A*, then record the measuring cup reading in the “Rock Measurement” table in the “Data and Analysis” section. It is sometimes necessary to interpolate (or read between the lines) when measuring.
4. Remove rock *A*, letting all the water drip back into the measuring cup.
5. Check to be sure the water level returns to the 300 ml mark. If it doesn’t, then carefully add a little more water until it is exactly 300 ml.
6. Repeat using the rocks marked *B*, then *C*.
7. Record the readings in the table.



Data and Analysis

Rock Measurement			
Rock Sample	Water-Level Measurement (without rock)	Water-Level Measurement (with rock)	Volume of Rock Sample <i>(Subtract 300 from the measurement with the rock.)</i>
Rock A	300 ml		
Rock B	300 ml		
Rock C	300 ml		



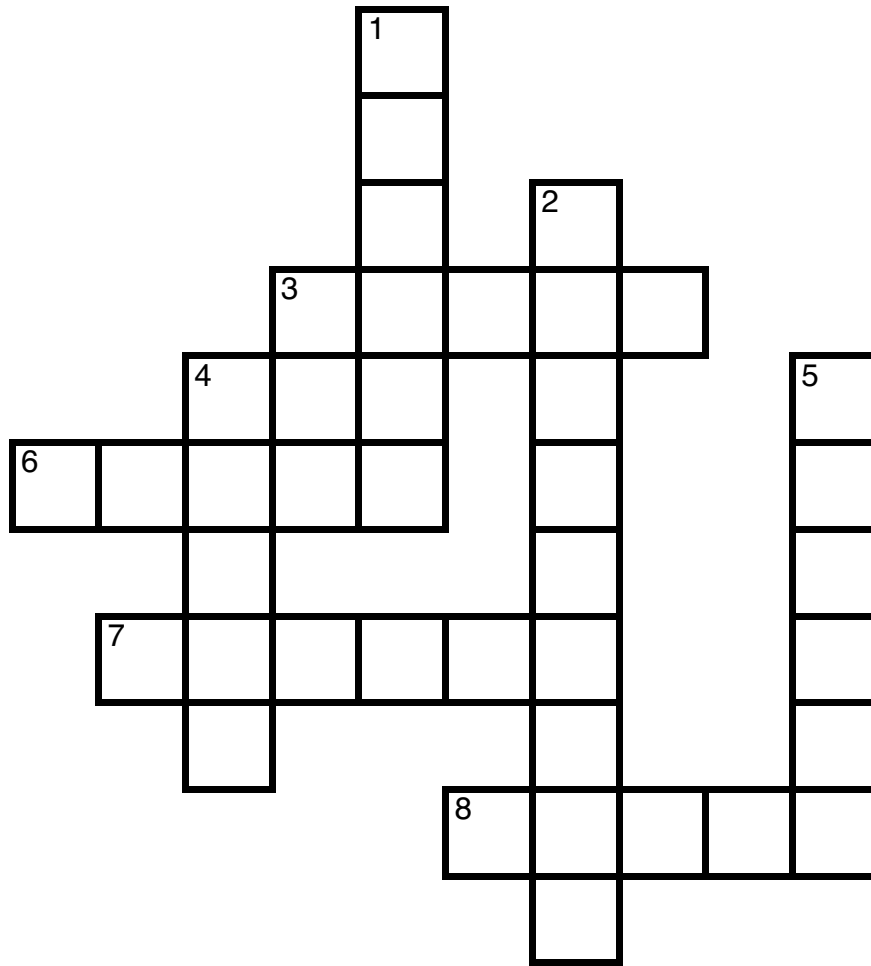
Conclusion

Were you surprised by how easy it is to determine the volume of a solid that has an unusual shape? Could this technique be used to figure out the volume of a person? Explain how you would do that.

Research It

BMI stands for “body mass index.” It is one way for doctors to determine a person’s physical fitness. What is used to determine a person’s BMI? How is this formula different from hydrostatic weighing? Which do you think would be more accurate? Write a short paragraph about your findings.

Review It



Across

3. An ancient measure of length
6. What liquids cannot keep
7. Goes with length and width
8. The state with the least energy

Down

1. What a solid definitely has
2. What happens with the molecules of a solid
4. A liquid we drink to survive
5. Always takes the shape of its container

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APPENDIX F: ANSWER KEY

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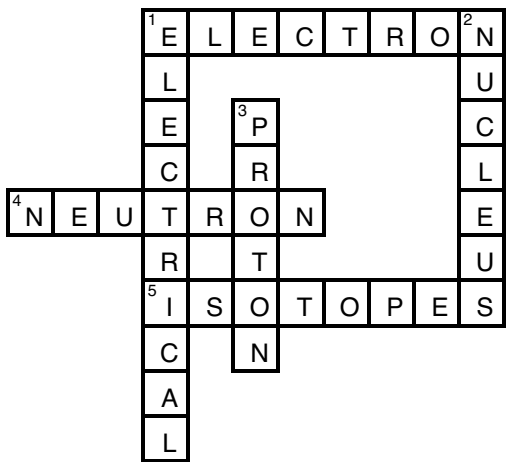
Lesson 5

1. 15
2. 98
3. Atoms
4. Elements
5. Latin
6. molecule
7. characteristics
8. Au
9. O
10. N

Lesson 7

1. a
2. a
3. c
4. b
5. a
6. c
7. a
8. a
9. c
10. a

Lesson 6



Lesson 8

