

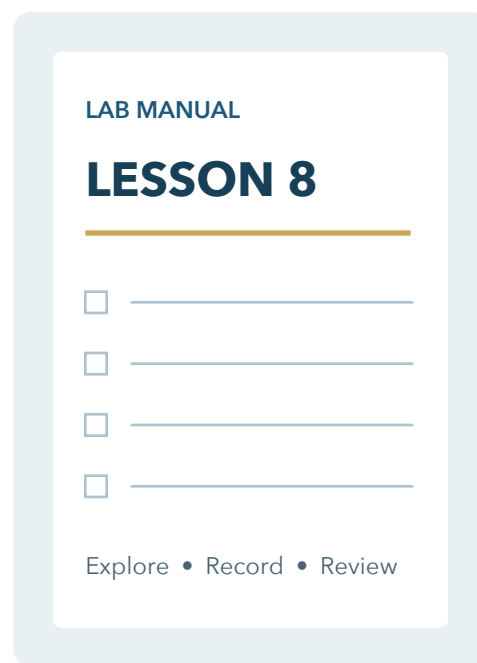
See a real lesson before you decide.

PHYSICS / LESSON 8

Slow Solids and Lively Liquids

See how familiar materials such as honey and water help explain states of matter.

Inside: selected Lab Manual pages with student notes, activities, and review work that accompany the Reader.



The printed Lab Manual is designed for use with the Student Reader, sold separately or together as a set. Experiment supplies are not included.

Easy for you. Fascinating for them. Grounded in truth.

Free PDF sample. No email address required. Share it with another homeschool family.

[Explore the Physics Printed Lab Manual](#)

[Compare all Physics course options](#)

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HOW TO USE THIS CURRICULUM

The main goal of elementary and middle-school science is to create joy in God’s creation and to prepare for next-level courses. Through reading and activities, students will become familiar with terms and processes that will equip them with skills needed for critical thinking in high school. They will understand the importance of a Christian worldview, observe the outside world through the lens of creation, and gain an understanding of a loving God who cares for us so greatly that He has designed life and the world to make sure all our needs are met and to show us the beauty in which we live.

This curriculum is designed for students in grades 4–8. However, it is easy to adjust expectations and adapt activities for younger or older students or to have siblings learn together. You’ll find suggestions for adaptation at the end of this section.

The *Student Reader* contains 32 lessons; each is designed to be completed in about 2–3 hours per week. We recommend splitting each lesson into 4 segments. Of course, this depends on the age and attention span of your students and the number of outside resources you use. If you teach science 4 times a week, plan for about 30–45 minutes each day. You have the freedom to choose what your students should complete in any week, according to your own schedule and plans.

Each lesson contains several components you’ll want to explore each week with your students. You’ll find a **vocabulary** section with words to define and a **Scripture Memory** section to help them hide God’s word in their hearts. Lessons also include a **Creation Corner** to point your students back to the unique creation designed by God for our care and enjoyment, as well as a **Meet the Physicist** section to introduce them to amazing scientists in the field of physics.

The Lab Manual

It is imperative that students use the *Lab Manual* with the *Student Reader*. The *Student Reader* contains information, but the *Lab Manual* reviews and reinforces the lesson material and encourages higher-level thinking as your students apply the information learned. The *Lab Manual* contains everything you'll need for recordkeeping; it provides a place for notes, sketches, research, and following the steps of the scientific method. You can easily adapt the *Lab Manual* to the age level and ability of your students.

Sketching: The goal of sketching is recordkeeping. Scientists frequently sketch and document their findings in their studies, and your students will do this throughout their educational journeys. However, if your students would rather find a picture or take a photo and tape or paste it in the *Lab Manual*, that can take the place of sketching. You're free to make a choice for each activity.

Suggested Daily Guide: A planning guide at the beginning of each lesson in the *Lab Manual* breaks down your week into 4–5 days. We recommend 4 shorter segments divided over a week rather than 1 longer session. The more frequently students are exposed to terms, concepts, and ideas, the easier it will be to retain information long-term.

Materials Needed: Students will need to have sketching tools available for almost every lesson. These include a pencil, colored pencils, a charcoal pencil, markers, etc. Students will also do research in almost every lesson. They'll need access to books, a science encyclopedia, and/or the internet (*with parental guidance*).

A complete list of all additional materials needed for the year is provided at the beginning of the *Lab Manual*. A list of materials is also provided in each lesson. Some of the materials are common items you'll have around your house; others will need to be purchased ahead of time from a science supply store or catalog. All experiments are designed to reinforce important lesson concepts and to prepare students for further study in science. It will be beneficial for you to familiarize yourself with the materials before each lesson.

You may notice that all the measurements in this book use the metric system. However, if you live in the U.S., Liberia, or Myanmar, you may be familiar only with the English or Imperial system. If so, this book is a great opportunity to become familiar with metric measurements! Virtually all scientists use the metric system, and it's important for aspiring scientists to be comfortable working with meters, liters, grams, and degrees Celsius. If your tools at home don't have metric measurements, we've included a conversion table in Appendix A for your convenience.

How to Begin

To begin each new lesson, read the text of the *Student Reader* to your students or have them read it themselves. For very young students, you might read it on your own and then discuss the information at their level.

- Students should write down information they think is important in the **Student Notes** section of the *Lab Manual*. Remember that what they think is important might be different from what you think is important; that's completely acceptable at this age.
- Each lesson includes **Scripture Memory** because learning about God's Word is essential to understanding His character and His plan. Scripture memory cards are also included in the back of the *Lab Manual*. You can print them to aid in memorization or post them in your school area. They can also be used as flash cards for review throughout the school year.
- The **Define It** section of the *Lab Manual* provides a place for students to define the vocabulary words from each lesson.
- The **Write It** section of the *Lab Manual* is a guided review of the lesson's key concepts. Students will define words, answer questions, and sketch diagrams. They can compare what they determined was important when they read the lesson to the material reviewed in this section and add to their notes if needed.
- The **Apply It** section of the *Lab Manual* takes learning to the next level. It includes a variety of activities as well as labs—with an emphasis on following the steps of the scientific method—and a complete, step-by-step guide to writing a lab report (a necessity for high school and college). When students write their conclusions, they can choose which questions to answer; it could be all of the questions provided, some of them, or some of their own. It can be tempting to eliminate these activities to save time; however, we strongly advise using them to prepare for higher-level learning.
- The **Research It** section of the *Lab Manual* allows for further study. Students will use books, encyclopedias, and/or the internet (*with parental guidance*) to learn more about a topic. Younger students can write a couple of sentences or sketch a picture about what they learned. Older students can write 2–3 paragraphs about the researched topic.
- The **Review It** section of the *Lab Manual* provides a **quiz** on odd-numbered weeks and a **crossword puzzle** on even-numbered weeks. In addition, **semester tests** are included after lessons 16 and 32. You can use these components as tests, as another review, or not at all. Each quiz is worth 10 points, and a grade can be calculated by multiplying the number of correct answers by 10. Semester test grades can be calculated by dividing the number of points earned by the number of points possible, then multiplying that answer by 100.

Suggested grading scale:

A = 90–100

B = 80–89

C = 70–79

D = 60–69

F = 59 and below

- Last, you’ll want to allow time for **outside reading**, perusing pictures, and researching topics of interest. We recommend that students keep track of important information in the blank pages in the back of the *Lab Manual*.

The *Lab Manual* will serve as an excellent reminder and record of what your students have accomplished and learned this year in science! It is also a great way to observe growth in their abilities from year to year.

As with the *Student Reader*, teachers may choose to adapt the *Lab Manual* for students of different ages and abilities. Younger students may answer the “Write It” sections orally, while older students may write their answers in complete sentences. Students of all ages will enjoy the “Apply It” experiments; the lab reports can be adapted as needed. A flexible approach to the curriculum will make learning successful for all ages.

Elementary and middle-school science is about discovery, following the model of other scientists, and taking joy in the journey. Have fun with it yourself, and your enthusiasm will carry over to your students!

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
- ☐ 3 rocks approximately the size of ping-pong balls or golf balls
- ☐ water
- ☐ 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

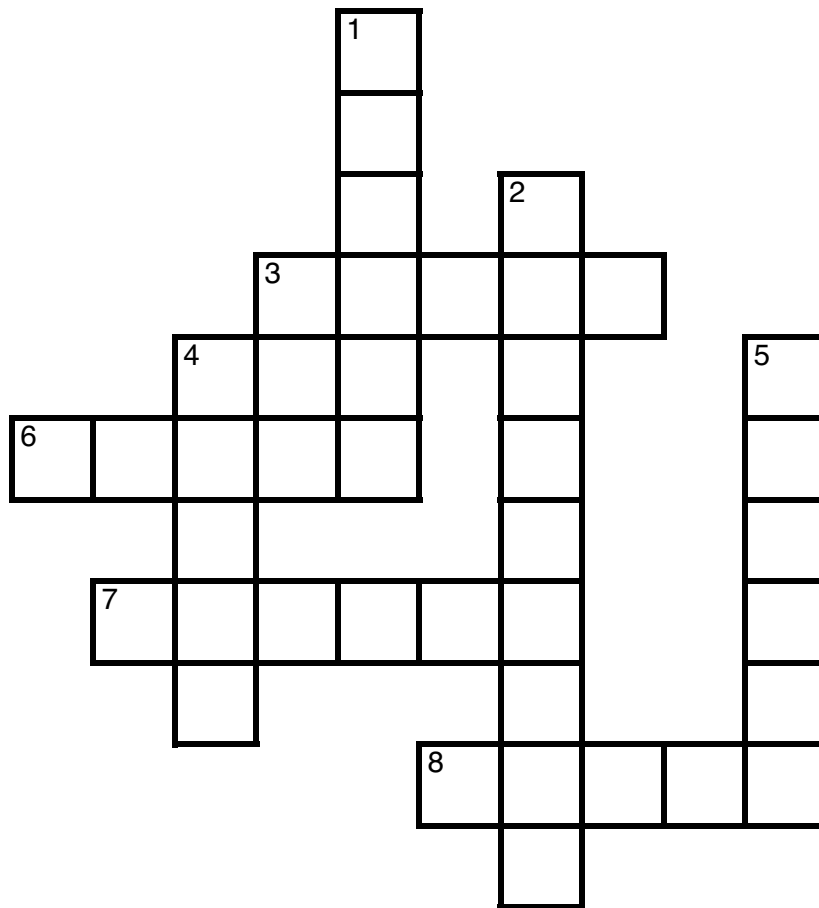
Were you surprised by how easy it is to determine the volume of a solid that has an unusual shape? Could this technique be used to figure out the volume of a person? Explain how you would do that.

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

Keep the discovery going.

You have seen selected pages from the Physics Lab Manual. The full printed manual gives your child a place for notes, activities, experiments, and review work throughout the course.

What else will I need?

Use the Lab Manual with the Physics Student Reader. You can buy the Reader separately or choose the Reader-and-Manual set. Experiment supplies are not included.

Less time preparing. More time discovering.

Explore the course and choose the books that fit your family.

[**Shop the Physics Printed Lab Manual**](#)

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Teaching the Curiosities of Creation

Created by Karri Iverson, homeschool mom of five and science educator.