# BEREAN EARTH SCIENCE Level 155





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## Science

Berean Earth Science Schedule Plus

By the Sonlight Team

Sonlight Curriculum<sup>®</sup> Science 155 "Berean Earth Science Schedule Plus," First Edition

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"Do to others what you would have them do to you" (Matthew 7:12).

"The worker is worth his keep" (Matthew 10:10).

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### 2 Schedule and Notes

Sonlight Curriculum<sup>®</sup> "Berean Earth Science" Schedule and Notes

### 3 Experiment Forms

Lab Write-Up Forms

### At a Glance

Our goal in teaching science to high school students is to make them aware of the amazing realities around them and how complex and detailed this world is in which we live. You may want to join your student in this adventure, offer support as needed, or allow him to work through this book on his own since it is written to the student. Many of the science concepts he has been exposed to in the past will now come into sharper focus with more detailed study in certain disciplines.

- "Discovering Design with Earth Science" includes a basic study in the field of Earth Science.
- It is a good place to start for students in high school.
- We stress mastery of concepts and vocabulary at this level.

Your student:

- Will be introduced to the earth's basic layout (crust, mantle, and core), minerals and rocks, plate tectonics, the Global Positioning System, fossils, the hydrologic cycle, weather patterns, the solar system, as well as other related topics, along with the corresponding vocabulary.
- Will have concepts reinforced through the experiments.

We include:

- Sample Experiment Forms to be used as you work through the scheduled labs.
- Weekly vocabulary lists.
- A weekly planning list to determine the lab materials needed for the coming week, as well as a look ahead to the needed items for the next week.

### An Overview of this Year's Studies

Each of the 16 modules is broken down into daily readings. Most modules are scheduled to be completed in two weeks, with four modules taking three weeks. It is important to read the introductory pages in the textbook and the Solution's Manual.

In each week's schedule, we have noted the science supplies needed from the **Berean Earth Science Supplies Kit** (155-01), **Geology Basics Kit** (155-10), and **Geology Testing Kit** (155-15).

To enable you to plan ahead, we will alert you to supplies we think you might need to purchase before you do the next week's experiments. We list these items the week before the experiment. We hope this feature will enable you to feel well-prepared and organized for your science adventure!

You will also find **Experiment Forms** at the back of this guide. Guidelines for how you might expect your student to use them are in this Introduction. You are welcome to copy these as needed for your family's use. Or you may prefer to come up with your own form.

### Testing

There is a test for each of the 16 modules throughout the year. Because of this, we have not scheduled any of the quarterly tests as this would have taken away some of the extra time given for some of the harder modules. You may add a quarterly test after every four modules, if you prefer. One way of scheduling would be to complete the three week modules in two weeks and placing a quarterly test after every fourth module.

While we do feel that the quarterly tests are a useful evaluation tool, we don't feel they are "required." Certainly the end-of-module study guide questions and tests are sufficient to determine your student's understanding of the material. If you are concerned about long-term retention, you may find the quarterly tests to be helpful.

### Vocabulary

There are many vocabulary words found in this course. It may be helpful to put them on flash cards as you work through the lessons each day. Then your children can review these cards each day before starting the next lesson. At the end of the module, when it is time to do the vocabulary in the study guide, the words already will be very familiar. Some additional words from the module were added to the vocabulary section in the schedule because they are terms your student may come across again in other courses, or are generally used vocabulary that may be helpful to know.

### **Corrections and Suggestions**

Since we at Sonlight Curriculum are constantly working to improve our product development, we would love it if we could get you to help us with this process.

Whenever you find an error anywhere in one of our Instructor's Guides, please check our updates page for the latest information at <u>www.sonlight.com/curriculum</u> <u>-updates</u>. Report new information by sending a short e-mail to: IGcorrections@sonlight.com. It would be helpful if the subject line of your e-mail indicated where the problem is. For instance, "Berean Earth Science Schedule Plus/Section Two/Week 1/Schedule."

If while going through our curriculum you think of any way we could improve our product, please e-mail your suggestions to: IGsuggestions@sonlight.com. If you know of a different book we should use, if you think we should read a book we assign at a different point in the year, or if you have any other ideas, please let us know.

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### the subheading and read the paragraph preceding the experiment. All those things will help you write a more

informative title.

### Materials

**Ouestion/Title** 

List those materials that help you identify the experiment.

How to Use the Experiment Forms

This usually comes directly from the title of the experi-

pieces together when you get to the inference at the end.

If the title isn't revealing enough, make sure you read the

experiment carefully all the way through. Then look at

ment/lab title at the top of the experiment in the book. It may help to put it into a question so you can fit the

### Method

Briefly write down what is to be done during this experiment. It does not need to restate each step as listed in the book, as you should know what the experiment involves. If there are several parts to the procedure, write each down. **For example:** If you are to hold a comb just above small pieces of aluminum foil first without pulling the comb through your hair and then again after pulling the comb through your hair, write both parts down. Do not skip a part of the procedure even if you know nothing will happen.

### Hypothesis

A hypothesis is an educated guess. Often you know what should happen after reading the experiment. Still, write down what you expect to happen. You do not need to write "why" because that will come later.

Do not add inference to your hypothesis. For instance: "The steady stream of water will bend toward the charged comb because the partial positive charges are attracted to the negative charge in the comb whereas the steady stream of oil will not bend because it is a purely covalent compound ..."

Instead write down just what you expect to see.

"The steady stream of water will bend toward the charged comb, however there will be no change in the steady stream of oil."

### **Observation**

Be detailed. Write down what you see in more than general terms.

For instance: to say something bubbled is not enough. That statement can cover small bubbles forming in a substance to bubbling so rapidly and violently it comes to the top of the beaker and spills over! So, you shouldn't use the same description for both of these scenarios. It is important to be detailed in your descriptions. "The toilet bowl cleaner quickly foamed approximately halfway up the beaker where it stayed as it continued to react with the eggshell." –Or– "Once the yeast was added and the beaker swirled, then the reaction included large bubbles which rose quickly until they hit the watch glass and still pushed out of the spout to the outside of the beaker. Much of the yeast could still be seen sitting on the top of the bubbles."

### Inference

This is the heart of the experiment. So far you wrote down what you were looking for (question), what you used (materials), what you did (procedure), what you expected to happen (hypothesis), and what actually did happen (observation/data). Now it is time to write up what you learned. This is not a place to say "... it is just as I expected" Or "... my hypothesis was correct." Write what you actually learned by tying your question and hypothesis together and then looking at your data.

Often you will find the information just following the experiment. The authors are careful to help you see what you should have learned. But sometimes you have to remind yourself what you were looking for. And you need to be complete.

To say that the yeast sped up the reaction, but nothing more, is not enough. Yeast doesn't necessarily cause every reaction it joins to speed up. You should mention that the yeast was the catalyst that sped up the decomposition of hydrogen peroxide while it didn't get used up in the process. This type of information an oftentimes be found in the title of the particular experiment.

The point of an experiment is to demonstrate and reinforce a concept you have learned in a particular section of your Earth Science book. Take advantage of spending the time to see what you are supposed to be learning from each experiment. If you remember your experiments, you can refer back to them when reviewing the concepts. Remember the experiments are not put there for something to do, but rather to apply what you have learned in the written word by seeing it in action. ■

Week 1—Chapter 1						
Date:	<b>Day 1</b> 1	<b>Day 2</b> 2	<b>Day 3</b> 3	<b>Day 4</b> 4	<b>Day 5</b> ₅	
Discovering Design with Earth Science	pp. 1–3 N	pp. 4–6 (Through Comprehension Check)	pp. 6–11 N	pp. 12–16 (Through Comprehension Check)	pp. 16–21 (Through Comprehension Check)	
Comprehension Check	1.1−1.2 ℕ	1.3–1.5	1.6–1.8	1.9–1.11	1.12–1.14	
Experiments	Exp. 1.1	Exp. 1.2				
Vocabulary <sup>1</sup>						
Supplies <sup>2</sup>	<ul> <li>Exp. 1.1</li> <li>Berean Earth Science Supplies Kit (155-05): modeling clay, toothpick, aluminum foil</li> <li>You Provide: 5 sheets plain paper, tape, any books of different thickness, flat table or desk as long as four of the sheets of paper end-to-end</li> <li>Exp. 1.2</li> <li>Berean Earth Science Supplies Kit (155-05): 1 tablespoon dry active yeast</li> <li>You Provide: hydrogen peroxide, water, 2 snack-sized plastic zipper bags, 2 quart-sized plastic zipper bags, measuring cup, tablespoon, space where you can get messy</li> </ul>					
Shopping/Planning List	<b>Exp. 1.3</b> – <b>You Provide:</b> 8 M&M candies (two each of four different colors), water, ice, pan, bowl of similar volume to the pan, two metal or ceramic plates that can sit on top of the pan or bowl, large serving spoon, stove					
Other Notes						

**Day 1 Note** D: Question #1 of each Chapter Review is to define the terms that are centered in the text of each chapter. We recommend that you complete this as you read instead of waiting until you reach the chapter review by choosing one of the following options:

- Define these words on a separate paper as you get to them in the chapter and study them daily.
- Highlight these words in the vocabulary section of this schedule and study them *daily*.

**Comprehension Check Note I**: The answers for the Comprehension Check questions are at the end of each chapter, before the Chapter Review questions.

**Day 3 Note I**: Anything in a pink box in the text is to be memorized and will also be found in the vocabulary section of this schedule.

1. Define Vocabulary terms and names found in each day's reading, then place a check in the box.

2. The Berean Earth Science Supplies Kit (155-05); Geology Testing Kit (155-15), and Geology Basics Kit (155-10) are items you can purchase from <u>Sonlight.com</u>. When supplies are listed as "You provide" they are materials you can generally find around your home.

### **Vocabulary** | Terms and Names

### Introduction

**Oblate spheroid:** A shape that is not a perfect sphere; the earth takes on this shape because of its rotation around its axis. [p. 1]

### Chemicals

**Chemicals:** Any substance that has a particular composition. [p. 4]

Atoms: The basic building blocks of chemicals. [p. 4]

**Chemical bonds:** Attachments between atoms that hold them together. [p. 4]

**Molecules:** Name given to chemicals made up of atoms joined together by chemical bonds. [p. 4]

**Chemical reaction:** A process in which chemical bonds are made or broken. [p. 4]

**Chemical formula:** The name of a molecule that uses only abbreviations for the atoms and subscripts to indicate the number of each atom that is present. [p. 5]

**Element:** A substance whose atoms are all of the same type. [p. 6]

### lt's Just a Phase

Phases: Different forms of matter. [p. 6]

- **Solid:** Phase of matter formed by freezing the substance
- Liquid: Phase of matter formed by melting the substance
- Gas: Phase of matter formed by boiling the substance

**Freezing:** Lowering the temperature of a liquid until the solid phase of matter is reached. [p. 6]

**Melting:** Raising the temperature of a solid until the liquid phase of matter is reached. [p. 6]

**Boil:** To reach the temperature at which bubbles form. [p. 6]

**Condensing:** Changing a gas to a liquid by lowering the temperature of the gas. [p. 6]

### Units

**Meters:** A unit of measurement for distance that is part of the metric system and is abbreviated with the letter "m." [pp. 7–8]

### The Metric System

**Metric system:** The units of measurements that are used by scientists so that they can easily compare results with each other. [p. 8]

Matter: Any substance that takes up space. [p. 8]

Mass: A measure of how much matter is in an object. [p. 8]

Gram: The metric unit for mass. [p. 9]

Second: The metric unit for time. [p. 9]

### Prefixes used in the metric system: [pp. 9-10]

- Milli: One thousandth (0.001)
- Kilo: One thousand (1,000)
- **Centi:** One tenth (0.01)

### Math With Units

**Area:** A measure of how much space exists within the boundaries of a 2–dimensional shape. [p. 10]

 $A = (length) \times (width)$ 

### Volume

**Volume:** A measure of how much total space an object takes up. [p. 12]

 $Volume = (length) \times (width) \times (height)$ 

**Derived unit:** A unit of measurement produced by the mathematical combination of simpler units. [p. 13]

Liter: A metric unit for volume. [p. 13]

**Cubic centimeter:** The unit resulting from multiplying length, width, and height, all in centimeters, to calculate volume. [p. 13]

**Converting Between Metric Units** 

**Factor–label method:** A method using conversion relationships to convert a measurement in one unit to a measurement in a different unit. [p. 14]

**Conversion relationship:** A statement using numbers that shows how two units of measurement compare to each other. [p. 14]

Converting between Unit Systems

**Imperial units:** Measurement units defined by Great Britain in 1825. [p. 16]

**Rounding down:** Dropping a digit and all those that follow so that your answer will have a certain number of digits; this is done when the digit after the last one you want to keep is 0-4. [p. 17]

**Rounding up:** Adding one to the last digit that you will keep in your answer because the following digit is 5–9. ■

Date:	Day 1 6	Day 2 7	Day 3 8	Day 4 9	Day 5
Discovering Design with Earth Science	pp. 21–24 (Through Comprehension Check)	pp. 24–28	Chapter 1 Review #2–11 Study	Chapter 1 Review #12–20 Study	Chapter 1 Test
Comprehension Check	1.15	1.16–1.19			
Experiments	Exp. 1.3				
Vocabulary					
Supplies	Exp. 1.3 You Provide: 8 M&M candies (two each of four different colors), water, ice, pan, bowl of similar volume to the pan, two metal or ceramic plates that can sit on top of the pan or bowl, large serving spoon, stove				
Shopping/Planning List	<ul> <li>Exp. 2.1 – You Provide: funnel, a place to dig, two plastic water bottles (500 mL) one with a lid, hand spade or spoon to dig with, paper towel, water</li> <li>Exp. 2.2 – You Provide: raw potato, sharp knife, cutting board, paper towels, tall glass, water</li> <li>Exp. 2.3 – You Provide: water, 3 plastic water bottles, 1/2 cup measuring cup, 1/4 cup measuring cup, tape, scissors</li> <li>Exp. 2.4 – You Provide: small glass, hammer, white vinegar, hard surface</li> <li>Exp. 2.5 – You Provide: water, 1 cup measuring cup, 1/4 cup measuring cup, spoon, freezer-safe bowl</li> </ul>				
			5 1. 1		

### Vocabulary | Terms and Names

It's Not the Heat

**Heat:** Energy that is exchanged because of a difference in temperature or a change in phase. [p. 21]

**Temperature:** A measure of the energy associated with the random motion of a substance's molecules. [p. 23]

### Measuring Temperature

**Thermometers:** Instruments used to measure temperature. [p. 24]

Measuring Density

Density: a substance's mass per unit of volume. [p. 25]

$$D = \frac{m}{v}$$

Measuring Concentration

**Concentration:** The amount of a substance in a defined volume. [p. 27]

**Percent (%):** Commonly used unit to measure concentration. [p. 28] ■

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		Week 3—Ch	apter 2			
Date:	Day 1 11	Day 2 12	Day 3 13	Day 4 14	Day 5	1
Discovering Design with Earth Science	рр. 35–39	pp.40–42 (Through Compre- hension Check)	pp. 42–45	pp.46–48	pp. 49–51 (Through Exp. 2.5)	
Comprehension Check	2.1–2.4	2.5	2.6	2.7–2.8		
Experiments		Exp. 2.1	Exp. 2.1, 2.2	Exp. 2.3	Exp. 2.4, 2.5	
Vocabulary						
	<ul> <li>Geology Testing Kit (155-15): magnifying glass</li> <li>You Provide: funnel, a place to dig, two plastic water bottles (500mL) one with a lid, hand spade or spoon to dig with, paper towel, water</li> <li>Exp. 2.2</li> <li>You Provide: raw potato, sharp knife, cutting board, paper towels, tall glass, water</li> <li>Exp. 2.3</li> <li>Berean Earth Science Supplies Kit (155-05): coffee filters, silt, sand, clay</li> <li>You Provide: water, 3 plastic water bottles, 1/2 cup measuring cup, 1/4 cup measuring cup, tape, scissors</li> <li>Exp. 2.4</li> <li>Berean Earth Science Supplies Kit (155-05): 5″x5″ aluminum foil</li> <li>Geology Basics Kit (155-10): limestone</li> <li>You Provide: small glass, hammer, white vinegar, hard surface</li> <li>Exp. 2.5</li> <li>Berean Earth Science Supplies Kit (155-05): Styrofoam cup, 5-inch balloon (small), ¾ cup plaster of Paris</li> <li>You Provide: water, 1 cup measuring cup, 1/4 cup measuring cup, spoon, freezer-safe bowl</li> </ul>					
Shopping/Planning List	There are no experir	nents next week.				
		Other No	tes			

### Vocabulary | Terms and Names

### Introduction

**Lines of latitude:** Imaginary lines that wrap around the earth going east to west. [p. 35]

**Equator:** The middle line of latitude. [p. 35]

**Lines of longitude:** Imaginary lines that run from the north pole to the south pole. [p. 35]

**Prime meridian:** The line of longitude that runs through Greenwich, England and is measured 0 degrees. [p. 35]

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### **Spheres Within Spheres**

**Atmosphere:** The collection of gases that surround a planet. [p. 36]

Geosphere: The solid components of the earth. [p. 36]

**Hydrosphere:** All the water on the earth, regardless of its phase. [p. 37]

### The Geosphere

**Crust:** The outer layer of the geosphere; the only layer that has been directly studied. [p. 37]

**Mantle:** The thickest layer of the geosphere, located directly underneath the crust. [p. 37]

**Plastic rock:** Term used to describe the mantle because its consistency is between that of a solid and a liquid. [p. 38]

**Outer core:** The liquid layer underneath the mantle. [p. 38]

**Inner core:** The solid layer underneath the outer core. [p. 38]

### **But Wait A Minute**

**Seismologists:** Scientists who study vibrations caused by earthquakes, explosions, and other high–energy events. [p. 39]

**Seismic waves:** Waves produced by high–energy events that travel all the way through the earth. [p. 39]

### **Crusty and Dirty**

**Soil:** The material that is on the top of the earth's crust. [p. 40]

**Soil horizons:** Layers of soil that are found in the earth's crust. [p. 40]

**O-horizon:** The soil horizon found at the very top of the earth's crust; contains matter that is or was found in living things. [p. 40]

**Organic:** Describes matter that is part of or comes from living creatures. [p. 40]

**A-horizon:** The soil horizon found directly under the O-horizon; contains a mixture of organic material and minerals. [p. 40]

**Mineral:** A naturally–occurring, inorganic substance usually found in rock that has its own chemical and physical properties, such as crystal structure, color, and hardness. [p. 40]

**Topsoil:** Another name for the A-horizon because it is the topmost horizon that contains both organic and inorganic matter; where plants get most of their nutrients. [p. 41]

**E-horizon:** The soil horizon found below the A-horizon that is important for draining the soil. [p. 41]

**B-horizon:** The soil horizon found below the E-horizon (or below the A-horizon if no E-horizon is present) that contains both organic and inorganic matter. [p. 41]

Subsoil: Another name for the B-horizon. [p. 41]

**C-horizon:** The soil horizon that is the last layer of soil, consisting of broken rocks. [p. 41]

Bedrock: The layer below all the soil horizon layers. [p. 41]

### Components of Topsoil

**Humus:** Material in the soil that is made up of things that were once alive but are now dead and have decayed away. [p. 43]

**Water-soluble:** Describes things that are able to be dissolved in water. [p. 43]

### Particle Sizes in Soil

### Standard classification scheme of soil particles: [p. 46]

- **Sand:** The largest soil particles with a diameter of 0.05–2 mm
- Silt: The middle-sized soil particles with a diameter of 0.002-0.05 mm
- **Clay:** The smallest soil particles with a diameter of less than 0.002

**Percolation:** The movement of water through the pores in soil or rock. [p. 48]

**Loam:** An easily–crumbled mixture of sand, silt, and clay. [p. 48]

But Where Does Soil Come From?

**Physical weathering:** The process by which physical forces break down rocks. [p. 50]

**Chemical weathering:** The process by which chemical reactions break down rocks. [p. 50] ■

Date:
Experiment: #
Title/Purpose:
Supplies:
Procedure:
Hypothesis:

Data/Observation	
Inference: (What was learned)	

\_\_\_\_\_

\_\_\_\_

\_\_\_\_

\_\_\_\_\_

### Date:

### Experiment: #

Purpose (from the introduction):

Supplies:

### **Observation/Data:**

(what happened)

### **Conclusion:**

(what was learned)

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