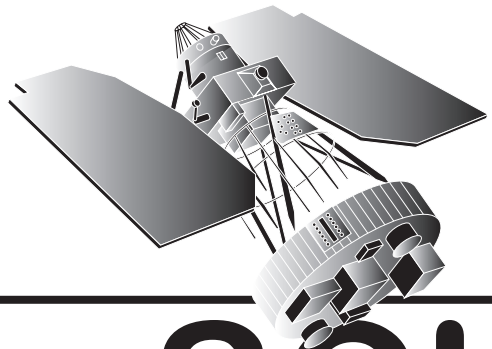

SCIENCE

Earth and Space

ANSWER KEY

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Contents

Preface

This answer key for *Science: Earth and Space*, First Edition (Copyright © 2009), was developed by the staff of Christian Liberty Press to help the instructor be as successful as possible in teaching this course. We have provided sample answers for the exercises required of students who are enrolled in Christian Liberty Academy School System (CLASS). CLASS requires its students to complete all the "Section Review" questions found at the end of each section within a given chapter and the "Chapter Review" sections at the end of the chapter. This key should be used by the instructor to review the student's daily work. In the "Section Review" sections, the student's answers should be the same for the short answer questions and close to the same for the longer responses (*Thought Provokers*). In the "Chapter Review" sections, students do not have to use the same wording in their answers, but they should give the same information. Some questions have more answers given than required and are marked by *Answers will vary*; students only need to give the required number of responses as stated.

May God grant you wisdom and diligence as you seek to teach your children the laws and realities of God's marvelous universe.

The Staff of Christian Liberty Press
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Text Key

Chapter 1: Introduction to Science

Section Review 1.1, page 5

1. "Science is the study of the matter and movement of God's physical creation" (page 1).
2. Pedology is the study of soil (page 1).
3. The six steps of the scientific method (page 2) are:
    1. State the problem.
    2. Gather information about the problem.
    3. Formulate a hypothesis.
    4. Test the hypothesis by experimentation.
    5. Record and analyze the experiment.
    6. State the conclusions.
4. A scientific law is a scientific theory that has never been proven false (page 2).
5. An **experimental group** is a group on which a test is performed, the group exposed to the variable being tested (page 2). A **control group** is a group used as a standard for comparison, a group exposed to the same constants but not exposed to the variable being tested (page 3).

Thought Provokers

1. Performing an experiment one time does not provide enough evidence to validate a conclusion because there may have been conditions or variables that had an effect on the experiment of which the scientist was not originally aware (page 3).
2. When studying matter, one must be specific as to which aspect of matter is being measured. Each of the terms refers to a different aspect of matter. **Atoms** are the basic units of matter. **Mass** is the amount of matter (the number of atoms and molecules) in an object. **Volume** is the amount of space the matter occupies. **Density** is how tightly packed the atoms and molecules are (page 4).

Section Review 1.2, page 11

1. Organic material (humus) and inorganic mineral material are the two kinds of material that make up soil (page 6).
2. Humus enriches the soil with nutrients (page 6).
3. Topsoil and subsoil are the top two layers of soil (page 6).
4. Weathering is the process by which rocks are broken down into soil (page 6).
5. The "combination of different sizes of mineral particles determines the texture of the soil." The "type of rock and the method of weathering determine the particle size and composition of mineral materials" (page 7).
6. Sand allows air and water into the soil (page 7).
7. Loam is a balanced mixture of sand, silt, clay, and humus (page 7).
8. Soil color can indicate the amount of organic matter and the types of minerals present in the soil (page 9).
9. The pH scale expresses the acidity or basicity of a substance. The value of 7 is neutral. Values less than 7 are acidic, and values greater than 7 are basic (page 10).

Section Review 1.3, page 17

1. Nitrogen, phosphorus, and potassium are the primary plant food elements (page 12).
2. Phosphorus in fertilizer is usually in the form of phosphates (page 12).
3. Nitrogen-fixing bacteria are bacteria that convert nitrogen into nitrogen compounds (page 13).
4. Nitrifying bacteria convert ammonia into nitrates (page 13).
5. Denitrifying bacteria put nitrogen back into the air (page 13).
6. Phosphorus promotes plant growth through energy transfer. It is essential for cell division and promotes maturation and fruit formation (page 14).
7. Potassium improves disease resistance, encourages root and fruit growth, and helps to regulate water balance in plants (page 15).

Thought Provoker

Lightning "causes nitrogen and oxygen to form nitrates that are carried to the soil by rain." Nitrates are essential for plant growth, and therefore benefit man in the form of fruits and vegetables for our food (pages 12–13).

Section 1.4, page 20

1. "Impermeable" means "nonporous" (page 18).
2. When the pore spaces in the soil are completely filled with water, the soil and porous rock are saturated (page 18).

Note: It is likely that question 3 was meant to read: "Give the term that describes any water located below the soil's surface."

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3. Ground water is any collected water below the soil's surface. The water table is the upper surface of ground water (page 18).
4. The size and number of pores, and the amount of recent rainfall, are the two factors that determine the depth of the water table (page 18).
5. An aquifer is an amount of ground water collected in porous rock or a gravel-soil mixture. An aquifer is usually formed below or between layers of impermeable rock (page 18).
6. Capillarity (or capillary action) is the upward movement of water through a tiny space in response to surface tension (page 20).

Thought Provoker

Plants need air to be available to their roots. "If no air is available to the roots, the plant will suffocate. The roots of plants use oxygen from the air found in the pore spaces of soil" (page 17). If the pore spaces are full of water for too long, the plant will "drown."

Chapter 1 Review, pages 21–22

Define

1. **science:** the study of the matter and movement of God's physical creation (page 1)
2. **matter:** the substance of the physical world; anything that occupies space or has substance (page 1)
3. **pedology:** the study of soil (page 1)
4. **scientific method:** an organized way for scientists to gather and pursue scientific knowledge; hypothesizing, observing, and experimenting are the three main components (page 2)

5. **hypothesis:** a sensible explanation for an event of nature, formulated after gathering information and giving thought to the problem (page 2)
6. **constant:** a condition that is the same for both the control group and the experimental group during an experiment (page 3)

   variable: a condition that is present only in the experimental group during an experiment (page 3)
7. **atom:** the most basic unit of matter (page 4)

   molecule: atoms linked together in a group (page 4)
8. **mass:** the amount of matter (atoms and molecules) in an object (page 4)

   weight: the pull of gravity on an object (page 4)

   volume: the amount of space that matter takes up (page 4)

   density: how tightly packed the atoms and molecules are in an object (page 4)
9. **organic material:** component of soil that is derived from living organisms (humus) (page 6)

   mineral material: component of soil that is derived from nonliving matter (minerals and rocks) (page 6)
10. **weathering:** processes that break rock down into soil (page 6)
11. **bedrock:** layer of solid rock below the subsoil (page 6)
12. **loam:** a balanced mixture of sand, silt, clay, and humus (page 7)
13. **pH scale:** scale used to express the acidity or basicity of a substance (page 10)
14. **element:** substance composed of only one type of atom (page 12)

    compound: substance containing two or more elements bonded together (page 12)
15. **nitrogen-fixing bacteria:** bacteria that convert nitrogen into nitrogen compounds (page 13)
16. **pore space:** a space in the soil (page 17)
17. **ground water:** any collected water below the soil's surface (page 18)
18. **aquifer:** ground water collected in porous rock or gravel-soil mixture, usually formed below or between layers of impermeable rock (page 18)

    artesian well: a self-pumping well; a well drilled into an aquifer where the water is under pressure and will automatically rise to the surface (page 19)
19. **capillarity:** upward movement of water through a tiny space in response to surface tension (page 20)

Identify

1. hypothesizing, observing, experimenting (page 2)
2. recycling (page 6)
3. topsoil, subsoil (page 6)
4. nitrogen, phosphorus, potassium (page 12)
5. water table (page 18)

Explain

1. "After many experiments and observations are completed, scientists may use their conclusions to formulate a theory, a way of explaining an object or event by using a set of facts. If a theory has never been proven false, scientists will call it a law" (page 2).
2. *See pages 2 and 3 for a full explanation.*