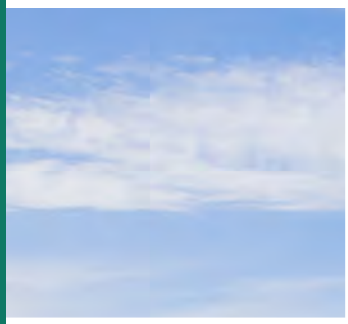
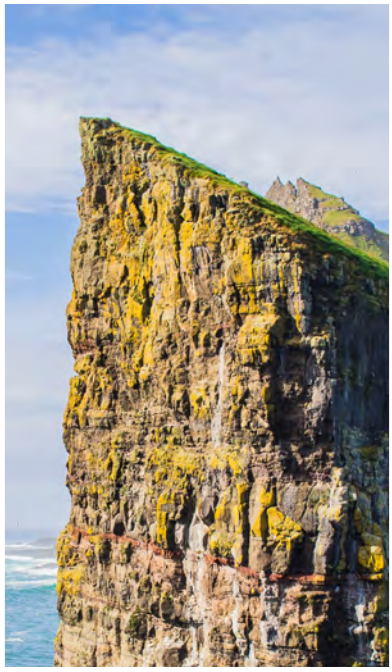
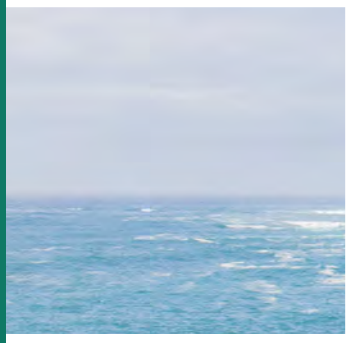
SCIENCE INSTRUCTOR'S GUIDE

Ages 11-14 | Grades 6-9

F EARTH AND SPACE SCIENCE







FUN FACT

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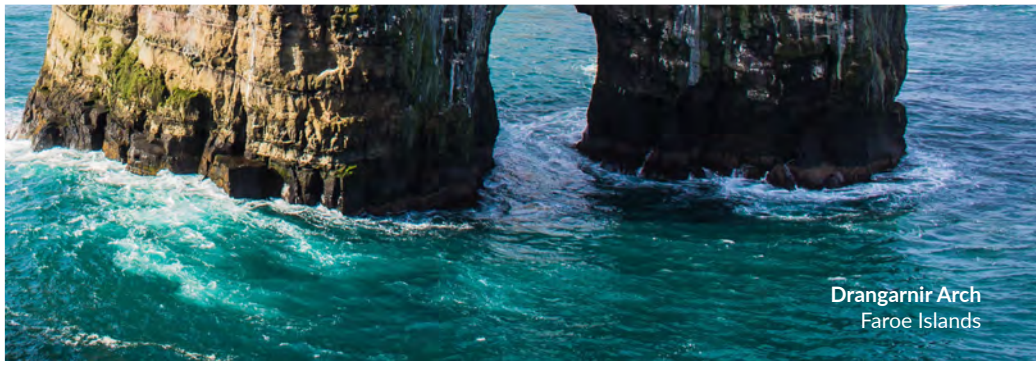

Drangarnir Arch
Faroe Islands

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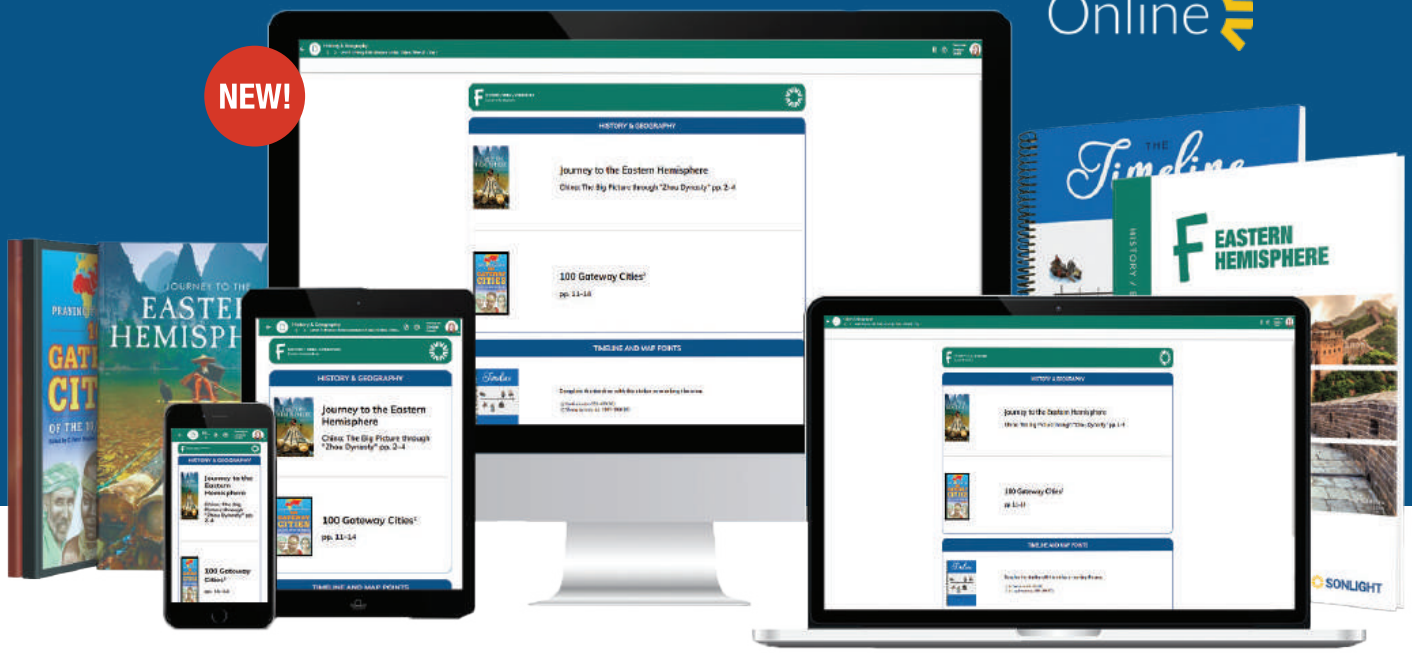

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SONLIGHT

Thank you for downloading this sample of Sonlight's Science F Instructor's Guide (what we affectionately refer to as an IG). In order to give you a full perspective on our Instructor's Guides, this sample will include parts from every section that is included in the full IG.

Here's a quick overview of what you'll find in this sample.

- A Quick Start Guide START HERE
- A 3-week Schedule
- Activity Sheets and Parent Answer Keys
- A Weekly Subject List

SONLIGHT'S "SECRET" COMES DOWN TO THIS:

We believe most children respond more positively to great literature than they do to textbooks. To properly use this sample to teach your student, you will need the books that are scheduled in it. We include all the books you will need when you purchase a package from sonlight.com.

Curriculum experts develop each IG to ensure that you have everything you need for your homeschool day. Every IG offers a customizable homeschool schedule, complete lesson plans, pertinent activities, and thoughtful questions to aid your students' comprehension. It includes handy teaching tips and pointers so you can homeschool with confidence all year long.

If you need any help using or customizing our IGs, please reach out to our experienced homeschool advisors at sonlight.com/advisors.

We hope you enjoy using this sample. For even more information about Sonlight's IGs, please visit: sonlight.com/ig. It would be our pleasure to serve you as you begin your homeschool journey.
If you like what you see in this sample, visit sonlight.com/science to order your Science package.

Blessings!

Sarita Holzmann,
Co-founder and president
of Sonlight Curriculum

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F

Ages 11–14
Grades 6–9

Science (5-Day)

Earth and Space Science

By the Sonlight Team

"I praise you because I am fearfully and wonderfully made; your works are wonderful, I know that full well."

Psalm 39:14 (NIV)

Sonlight Curriculum®Science F "Earth and Space Science" Instructor's Guide and Notes, 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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NOTE TO PURCHASER

Sonlight Curriculum, Ltd. is committed to providing the best homeschool resources on the market. This entails regular upgrades to our curriculum and to our Instructor's Guides. This guide is the 2025 Edition of the Sonlight Curriculum® Science F "Earth and Space Science." If you purchased it from a source other than Sonlight Curriculum, Ltd., you should know that it may not be the latest edition available.

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Table of Contents

INSTRUCTOR'S GUIDES

SCIENCE

Special features of Sonlight's Science Instructor's Guides:

1 COMPLETE, READY-TO-USE LESSON PLANS

All your science books and experiments are fully scheduled for the entire year. The IG provides the framework for what books to read and when, what experiments to do and what videos to watch. No need to create your own lesson plans!

2 DETAILED TEACHING NOTES

Notes explain each assignment and activity, point out fun facts about your reading, include question prompts, explanations, hands-on activities (beyond the experiments), and additional notes to enhance the reading and reinforce what your students are learning.

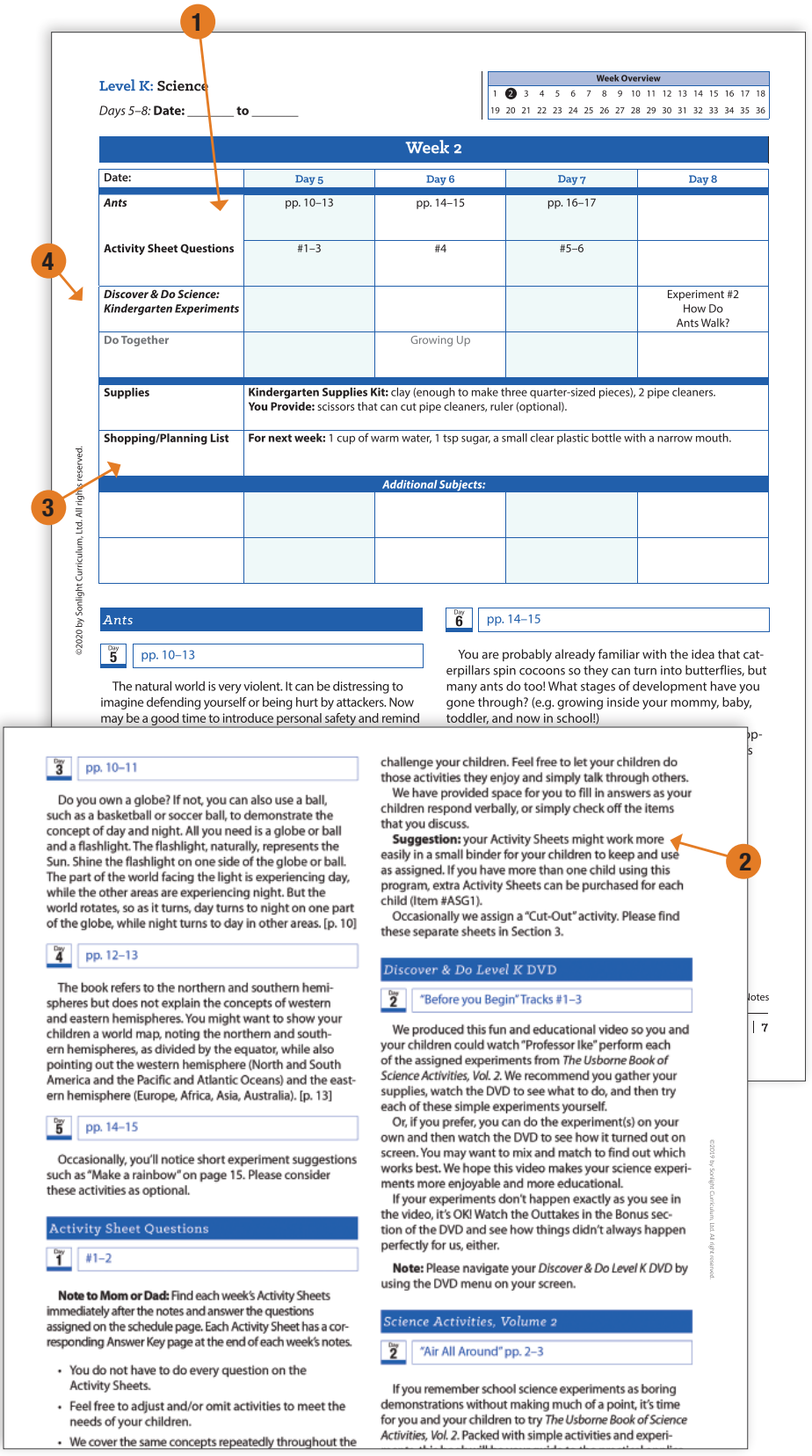
3 ORGANIZATIONAL TOOLS TO HELP YOU PLAN AHEAD

See at a glance the supplies you need for experiments this week and the following week. Know what supplies you'll find in the Sonlight Science Kits, and which household items you'll want to have ready.

4 WEEKLY ASSIGNMENTS AND ENGAGING ACTIVITIES

Simple, engaging experiments coordinate with your weekly reading. In levels K-E, these weekly experiments tie *directly* to that week's reading material for an even more linear progression from reading to doing. Experiments provide hands-on learning and reinforce and apply the concepts studied in the days previous so you can see your child's developing mastery of particular science concepts.

Most of the experiments can be done with common household items, but to minimize prep time, we've created a Science Supplies



Level K: Science

Days 5–8: **Date:** _____ **to** _____

Week Overview

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18
19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36

Week 2

Date:	Day 5	Day 6	Day 7	Day 8
Ants	pp. 10–13	pp. 14–15	pp. 16–17	
Activity Sheet Questions	#1–3	#4	#5–6	
Discover & Do Science: Kindergarten Experiments				Experiment #2 How Do Ants Walk?
Do Together		Growing Up		
Supplies	**Kindergarten Supplies Kit:** clay (enough to make three quarter-sized pieces), 2 pipe cleaners. **You Provide:** scissors that can cut pipe cleaners, ruler (optional).			
Shopping/Planning List	**For next week:** 1 cup of warm water, 1 tsp sugar, a small clear plastic bottle with a narrow mouth.			
Additional Subjects:				

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Ants

Day 5 pp. 10–13

The natural world is very violent. It can be distressing to imagine defending yourself or being hurt by attackers. Now may be a good time to introduce personal safety and remind

Day 6 pp. 14–15

You are probably already familiar with the idea that caterpillars spin cocoons so they can turn into butterflies, but many ants do too! What stages of development have you gone through? (e.g. growing inside your mommy, baby, toddler, and now in school!)

Day 3 pp. 10–11

Do you own a globe? If not, you can also use a ball, such as a basketball or soccer ball, to demonstrate the concept of day and night. All you need is a globe or ball and a flashlight. The flashlight, naturally, represents the Sun. Shine the flashlight on one side of the globe or ball. The part of the world facing the light is experiencing day, while the other areas are experiencing night. But the world rotates, so as it turns, day turns to night on one part of the globe, while night turns to day in other areas. [p. 10]

Day 4 pp. 12–13

The book refers to the northern and southern hemispheres but does not explain the concepts of western and eastern hemispheres. You might want to show your children a world map, noting the northern and southern hemispheres, as divided by the equator, while also pointing out the western hemisphere (North and South America and the Pacific and Atlantic Oceans) and the eastern hemisphere (Europe, Africa, Asia, Australia). [p. 13]

Day 5 pp. 14–15

Occasionally, you'll notice short experiment suggestions such as "Make a rainbow" on page 15. Please consider these activities as optional.

Activity Sheet Questions

Day 1 #1–2

Note to Mom or Dad: Find each week's Activity Sheets immediately after the notes and answer the questions assigned on the schedule page. Each Activity Sheet has a corresponding Answer Key page at the end of each week's notes.

- You do not have to do every question on the Activity Sheets.
- Feel free to adjust and/or omit activities to meet the needs of your children.
- We cover the same concepts repeatedly throughout the

challenge your children. Feel free to let your children do those activities they enjoy and simply talk through others.

We have provided space for you to fill in answers as your children respond verbally, or simply check off the items that you discuss.

Suggestion: your Activity Sheets might work more easily in a small binder for your children to keep and use as assigned. If you have more than one child using this program, extra Activity Sheets can be purchased for each child (Item #ASG1).

Occasionally we assign a "Cut-Out" activity. Please find these separate sheets in Section 3.

Discover & Do Level K DVD

Day 2 "Before you Begin" Tracks #1–3

We produced this fun and educational video so you and your children could watch "Professor Ike" perform each of the assigned experiments from *The Usborne Book of Science Activities, Vol. 2.* We recommend you gather your supplies, watch the DVD to see what to do, and then try each of these simple experiments yourself.

Or, if you prefer, you can do the experiment(s) on your own and then watch the DVD to see how it turned out on screen. You may want to mix and match to find out which works best. We hope this video makes your science experiments more enjoyable and more educational.

If your experiments don't happen exactly as you see in the video, it's OK! Watch the Outtakes in the Bonus section of the DVD and see how things didn't always happen perfectly for us, either.

Note: Please navigate your *Discover & Do Level K DVD* by using the DVD menu on your screen.

Science Activities, Volume 2

Day 2 "Air All Around" pp. 2–3

If you remember school science experiments as boring demonstrations without making much of a point, it's time for you and your children to try *The Usborne Book of Science Activities, Vol. 2.* Packed with simple activities and experi-

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1 2 3 4

Kit that includes many of the supplies you need to conduct each experiment. No planning necessary and minimal prep time!

Your children will relish the discoveries they make throughout the year. And you'll love that they are actively exploring STEM (Science, Technology, Engineering, Math) concepts, and making their learning stick.

Instructor's Guides K-J also include:

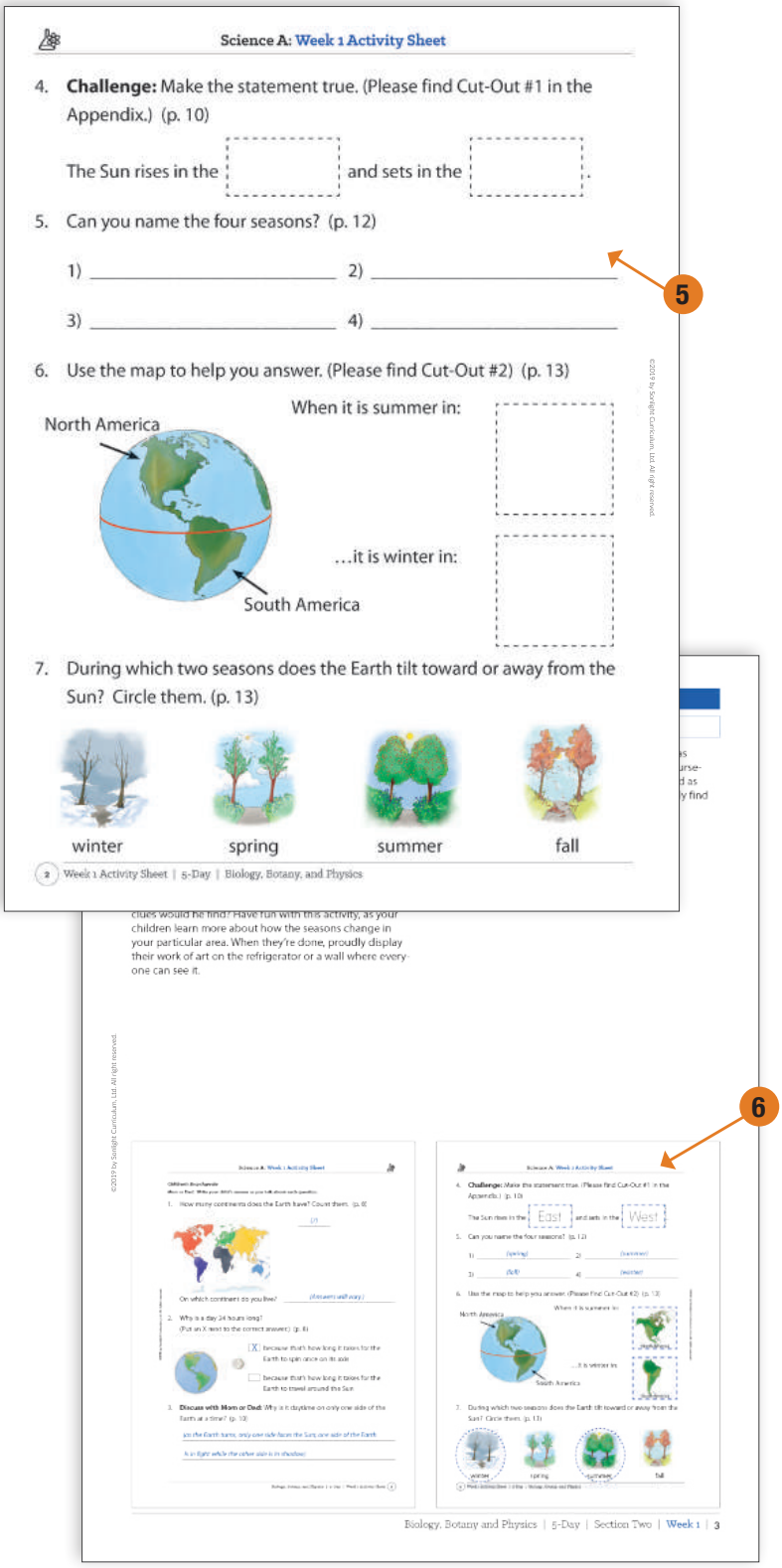
5 INTERACTIVE ACTIVITY SHEETS

Your Activity Sheets—with hundreds of activities, illustrations, charts, and pictures—help your children remember what they've learned. A variety of activity options coordinate with your students' science studies and draw on a range of skills and interests.

Activities progress with your children's abilities: from cutouts, matching, circle-the-answer, and dictation, to fill-in puzzles and sequencing analysis.

6 COMPLETE ANSWER KEYS

Separate Answer Keys mirror your Student Activity sheets for easy grading. No need to test—you have ongoing, reliable insight into your children's comprehension.



"I was hesitant to choose Sonlight just based on the cost compared to other curricula. But the ease of use is definitely worth the price for me, especially now that I'm navigating a toddler and two homeschoolers. We started using Sonlight just after I gave birth to my youngest. My husband was deployed and being able to just reach in the box and pretty much have everything ready … —I don't know how we could have continued schooling without that ease of use." —Kisha G, Livingston, TX

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Welcome!

In Science F, you will learn about the earth and space. We also include studies in Earth's systems, human activity, and engineering design.

Sonlight Science programs include introductory studies in a range of experimental sciences. The main point of all the reading, activities, and (if you choose) experiments is to introduce your children to the scientific method and the joy of discovery.

We want children to be *introduced* to a lot of different subjects, *intrigued* by the concepts and ideas, and *enticed* to come back to the same themes again in the future. Thus, you will find we follow a spiral pattern of education, touching on certain topics repeatedly this year and again in future years.

This way, the basic *vocabulary* of science becomes ingrained not only in short-term, but also in long-term memory. "Oh, yeah. I vaguely remember hearing about pistils and stamens earlier this year," a child may say—late in the program. When the child studies biology again in future programs, the names and concepts will be vague, but recognizable, as the child gains deeper understanding. Please don't expect mastery of the vocabulary at this age. That will come in time.

We want our children to *remember* what they have learned because they can't help it; because they want to do so. We don't want them merely to *memorize* what they are supposed to learn so they can pass a test.

The science experiments in this package, although not larger than life, work well.

As you do the experiments and demonstrate care in reading and following directions and recording data your children learn to follow your lead. An attitude of success—"Sure. We can do this!"—rubs off as well. These characteristics cannot be taught simply by reading books; they have to be modeled.

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Evolution and the Age of the Earth

Two science-related issues require some special attention. The first has to do with evolution, while the second relates to the age of the earth.

Evolution

Some of the book selections in our science programs contain material supportive of evolution. Why do we include these books? First, we include them because the majority of the content in these resources is of high quality, offering visually and intellectually appealing material. Second, we don't take an isolationist approach to knowledge. The subject of evolution is not something we want to teach children to avoid or put down without adequate understanding. Third, as the dominant perspective in contemporary science, evolution deserves mention and attention, even from those who disagree with its arguments. With that said, we do our best to provide balanced perspectives in relation to any potentially divisive content such as evolution.

When it comes to evolution, there are a few important points to keep in mind. In particular, differences between *macroevolution* and *microevolution* are crucial. These terms are sometimes used to clarify what is meant by evolution. *Macroevolutionists* accept evolution as the overarching explanation for all life, believing that evolution is responsible for significant changes in life forms, such as a land-based mammal changing into an oceangoing mammal or dinosaurs allegedly evolving into birds. These supposed evolutionary changes are big, so the term *macro*, meaning something very large in scale, is used in reference to this kind of evolution.

Microevolution, however, refers to small changes within different kinds of life. This approach grants the reality of changes within kinds such as birds or dogs. Obviously, there are many kinds and sizes of birds and dogs, but despite the variations these creatures remain birds and dogs. As a result, someone can adhere to *microevolution* without granting all the beliefs of *macroevolutionists*, who tend to accept the basic underlying principles of Darwinian evolution.

Religious objections to evolution tend to stem from the accusation that *macroevolution* leaves God out of the picture, instead leaving the entire process of the emergence and development of life to chance and time. Of course, this means that evolution is undirected by any sort of intelligence, while Christianity, for instance, believes in the reality of the existence of God as Creator. In other words, one approach to evolution is based on a worldview known as *naturalism*, while another is based on *theism*.

Naturalism here does not refer to enjoying nature, as in being a naturalist, but in a worldview that denies the existence of anything beyond the material world. In other words, anything supernatural, such as the existence of God, is rejected by naturalists.

Theistic evolutionists accept the existence of God, but view Him as being active in the process of evolution. Christian theistic evolutionists may appeal to scripture supporting God's active involvement in His creation (such as 1 Corinthians 8:6, Hebrews 1:3, etc.). In areas where a naturalist sees random processes and events, the theistic evolutionist argues that God is actively involved in directing matters.

Theism accepts that there is more to reality than the material world. There is a supernatural world and God exists as a personal being, active in His creation. By definition, naturalism excludes God. Christian theists who reject *macroevolution* and theistic evolution argue that God is Creator and Designer, having made all life without resorting to any macroevolutionary processes.

Scientific objections to *macroevolution* include, for instance, allegations that the fossil record lacks transitional forms, that genetic mutations are commonly harmful, not helpful, and claims that life shows signs of intelligent design.

One goal we have at Sonlight is to present fair and balanced perspectives on issues, including science and evolution. As a result, some of the materials we choose to utilize will at times present evolutionary points of view, while other selections will not. As the parent, we encourage you to provide guidance for your children on these topics. In our assessment, it's better for your children to have some exposure to controversial topics at home, with intelligent and caring guidance, rather than have them be surprised by ideas they will eventually encounter anyway.

The Age of the Earth

Another issue that will come up in the course of studying science has to do with questions about the age of the earth. Secular books in some of our science programs will at times refer to "millions" or "billions" of years. For Christians who hold to a young earth perspective, believing the earth may only be several thousand years old rather than billions, such phrasings pose a problem.

We suggest two solutions. First, whenever you encounter "millions" or "billions" in a science book, feel free to rephrase the sentences in question with phrases such as "a long time," "a very long time," or variations of this phrasing. Second, you may wish to state that although the book uses millions and billions of years, there are other perspectives on the age of the earth and the age of the universe.

If your children ask why there is disagreement on the age of the earth and/or universe, you can explain that not everyone interprets the data in the same way. In addition, not everyone employs the same research methods or believes in the same data. Young earth creationists, for example, include their interpretation of the Bible as a primary source of data. Those who hold to an old earth tend either to ignore the Bible (if they are non-Christian) or interpret the biblical creation account in such a way that allows for an old earth without diminishing essential Christian doctrine. The Bible, from this old earth perspective, may be a supplementary witness regarding the question of the age of the earth, but traditional interpretations of it in reference to the age of the earth need to remain open to reinterpretation.

You may also wish to add, "We aren't sure about how old the earth is, but I happen to believe … " Then state your position on the matter.

Our goal here is not to present a definitive position on the age of the earth or to present nuanced arguments for each side in the debate, but to leave it to you, as the parent, to discuss with your children as you see fit.

Discussion and disagreement about the age of the earth leads to another important point: is a particular view of the age of the earth an essential Christian doctrine? Sometimes nonessential beliefs can lead to problems with essential beliefs, so this point needs to be approached carefully and thoughtfully. In general, however, we do well to follow the maxim, "In essentials unity, in nonessentials liberty, and in all things charity." In other words, we should foster Christian unity on essentials, rather than division about nonessentials.

Student Activity Sheets

After the notes for each week, you will find Activity Sheets to reinforce what you are teaching and engage your students. The questions coordinate with what you are reading and each activity is assigned on the schedule page.

It is not necessary to complete every activity provided. These are merely suggestions and you, as the teacher, can determine which are best suited for your children. You will find a variety of activities included in the Activity Sheets that are designed to draw on different skills and interests.

We have also included corresponding Instructions and Answer Key pages for all activities. You may want to file the Activity Sheets in a separate binder for your students' use.

Note: If you might reuse your Instructor's Guide and Student Activity Sheets in the future (for a younger child, for instance), we strongly suggest that you purchase an extra set of Activity Sheets when you buy the Instructor's Guide. That way, even if we update our Instructor's Guides, you will have matching Activity Sheets when you need them. Please contact us if you are looking for Activity Sheets from the past.

A Practical Suggestion for Experiments

Please be aware that some of your books may imply that an experiment will knock your socks off: the results will be "bigger than life." The reality, we've found, is rarely so exciting. Often what you should be looking for is a very small change. The experiments suggested in your books are basic ideas. Try them, improve them! If you figure something out that works better than the instructions in your book, please tell us! Some experiments work every time, some may take several tries. Even the most famous scientists have had to try the same (or similar) experiments over and over. If an experiment does not work the first time, please try again.

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Supplementary Websites

We know that there are times throughout our curriculum when we simply cannot cover all the material on a given subject. In these instances we will provide internet search instructions for you to find more information. Please use caution and your own discretion as you look at different internet sites. We highly recommend that you as the parent and teacher look before allowing your student to do the search with you or on their own. We hope you find this helpful!

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.

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If, while going through our curriculum, you think of any way we could improve our product, please e-mail your suggestions to: IGsuggestions@sonlight. 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.

Summary

We hope that you enjoy your adventure this year and that it helps you learn more about the world we live in. If we can be of any assistance, please do not hesitate to e-mail us at main@sonlight.com, call us at (303) 730-6292, or better yet, join our Sonlight Connections Community (sonlight.com/connections), where you can chat with others who are going through this same program. You can ask questions, learn new ideas, share with others what you have learned, problem-solve, or just talk. Happy exploring! ■

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Section Two

Schedule and Notes

Science F

Days 1–5: **Date:** _____ **to** _____

Week Overview																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

Week 1

Date:	Day 1	Day 2	Day 3	Day 4	Day 5
Eyewitness: Universe	pp. 6–9	pp. 10–11, 16–17	pp. 18–19 N		
Activity Sheet Questions	#1–3	#4–8	#9–11		
Explanatorium of the Earth			pp. 14–15 N		
Activity Sheet Questions			#12–15		
Evolution: The Grand Experiment	pp. 2–3	pp. 4–5	pp. 6–8 N		
Water Cycles					pp. 6–8 N
Discover & Do: Level F Science Experiments				#1: What Causes the Earth to Wobble?	
Optional: Do Together	How Big?	Live-Look			
Supplies N	**Level F Supplies Kit:** 3″x5″ index card, 72″ kite string, ½ stick clay[1], wooden dowel rod, masking tape, plastic thumbtack, 11″ x 17″ white paper **Paper Packet:** What Causes the Earth to Wobble? Experiment Sheet **You provide:** cardboard box at least 11″ x 17″ on one side, hole punch, ruler, scissors, pencil, colored markers				
Shopping/Planning List	**For next week:** scissors, clear tape, colored pencils				
Additional Subjects:					

1. Note: Keep your clay, you will use the full stick throughout the year.

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N Note to Teachers

Eyewitness: Universe

Day 1 — pp. 6–9

Where exactly is this somewhat mysterious, famous landmark on page 6? Stonehenge stands in England, about one hour and 45 minutes from London, on Salisbury Plain in Wiltshire.

Page 6 also mentions the Apollo astronauts of the 1960s and '70s who were the first to see the whole of the Earth from space during their journey to the moon. The National Aeronautics and Space Administration's (NASA) Apollo program included nine missions to the moon from 1968 to 1972. Twenty-four astronauts participated in NASA's Apollo program. Twelve walked on the moon. Twelve flew to the moon without landing or having the opportunity for a moon walk.

Please note that we do not schedule all of the pages within this book. Feel free to review any pages that we do not schedule and include them if you feel it is beneficial for your lessons and conversations.

Day 2 — pp. 10–11, 16–17

Pages 16-17 of today's reading refers to three telescopes. What do you imagine a person might do during his or her lifetime that would cause people to agree to name a telescope in his or her honor? Learn about these telescopes named after an astronomer, a businessman, and a government official who became the administrator of NASA.

Edwin Hubble, who lived from 1889-1953, was an American astronomer. His work includes the discovery that there are galaxies that exist beyond The Milky Way.

William Myron Keck, who lived from 1880-1964, was an American businessman and philanthropist. He became the founder of Superior Oil Company (now part of ExxonMobil) and the founder of the W.M. Keck Foundation. Established in 1954, the foundation supported research in science, engineering, and medicine. The foundation provided $70 million dollars for the Keck 1 telescope in 1985. More contributions allowed for the development of Keck II, which started in 1991. These two telescopes, also known as the twin Keck telescopes, are pictured on p. 16.

James E. Webb, who lived from 1906-1992, was an American government official and the administrator of NASA during the Mercury, Gemini, and Apollo programs from 1961- 1968. He had worked in Washington D.C. during the Roosevelt and Truman administrations. President John F. Kennedy appointed him to the position of administrator of NASA.

Day 3 — pp. 18–19

Note to Teachers: Under the "How it all began" heading on p. 19, there is a reference to 4.6 billion years ago. See our note in the introduction about "Evolution and the Age of the Earth."

If you had the opportunity to name a planet, what name would you choose? The Romans looked to the stories of mythology for inspiration for their choices. In ancient Roman days, only five planets could be seen in the night sky.

- **Mercury**: named for the storied messenger of the gods
- **Venus**: for the Roman goddess of love and beauty
- **Mars**: for the Roman god of War
- **Jupiter**: for the king of the Roman gods
- **Saturn**: for the god of agriculture

The other "known" planet at the time was Earth, of course. Rather than being named for a Greek or Roman god, the name Earth comes from a word for the soil or the ground. Most languages have some word for Earth. The translation of the Bible into English marks one of the first recorded uses of the name Earth. "God called the dry land Earth…" [Genesis 1:10].

The earliest known telescope originated in the Netherlands in 1608. With this invention, the discovery of Uranus and Neptune became possible. The astronomer who discovered Uranus in 1781, first wanted to name the new planet after King George III. A German astronomer recommended the name Uranus. Unlike the five planets seen by the ancient Greeks and Romans, Uranus was named by more modern astronomers. They did like the idea of keeping with the mythological names used by their star-gazing peers from history, so they named Uranus after Ouranos, the Greek god of the sky. The name was not used widely until the 1800s.

Years later, the planet we know as Neptune was found in 1846 by a German astronomer with help from French and British astronomers. Some wanted to use the French astronomer's name, but once again, the planet got its name from mythology, from the Roman god of the sea.

In 1930, an astronomer from Kansas discovered what would become known as Pluto while studying the sky at an observatory in Arizona. Pluto was known as Planet X until a former librarian from the library at the University of Oxford was reading about the new discovery to his 11-year-old granddaughter during breakfast one morning. The grandfather asked the 11-year-old what she thought the planet should be named. She suggested the name Pluto, after the god of the underworld.

Pluto was considered a planet for 76 years. In 2006 a newly proposed definition of the word "planet" excluded Pluto, downgrading its status—returning the planetary count to eight. By the summer of 2024 the decision to redefine the word "planet" was widely debated.

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Changes in the definition were debated while others pointed to the mistake in ever trying to put definitive requirements on planets. Planetary scientists tend to look at the question differently than astronomers do. With recent, new information from Pluto, more questions about the classification continued during the summer of 2024.

Activity Sheet Questions

Day 1 | #1–3

Note to Teachers: Find each week's Activity Sheets immediately after the notes and have your students answer the questions assigned on the schedule page. Each Activity Sheet has a corresponding Answer Key page at the end of each week's notes.

Your students do not have to do every question on the Activity Sheet. Feel free to adjust and/or omit activities to meet the needs of your students. We cover the same concepts repeatedly throughout the year (and years to come!) to enable students to learn "naturally" through repetition and practice over time.

We have provided a variety of activities to interest and challenge your students. Feel free to let your students do those activities that they enjoy and simply talk through others.

Any question marked **Challenge** or **Critical Thinking** will be just that—a challenge for your students or a chance for them to think beyond the page. While we believe the material covered in the challenge questions is worthwhile for your students to know, it may not be specifically explained in their reading assignment. As always, if you think any question is too difficult for your students, please feel free to skip it.

Explanatorium of the Earth

Day 3 | pp. 14–15

Note to Teachers: Under the "Orbits" heading on p. 15, there is a reference to 4.6 billion years ago. Also, under the "Saturn" heading on p. 15, there is a reference to "millions of years." See our note in the introduction about "Evolution and the Age of the Earth."

Evolution: The Grand Experiment

Day 3 | pp. 6–8

Reading the Bible's Words About Creation and Our Creator

Note to Teachers: Pages 6 and 7 ask the questions, "Do you believe in evolution?" and "What do you think?" Would your answers be on the "Con" side or the "Pro" side? If you have not read the creation account from Genesis recently, take time to read the beginning in Genesis 1. Also, read Romans 1:18-25. What do the passages say about creation and the Creator?

We add this title to the study of geology and earth because much of the current thinking follows an evolutionary belief system. We read this title over the course of the year in small chunks to offset the evolutionary mindset. Enjoy this work that offers an opposite worldview and thinking.

Water Cycles

Day 5 | pp. 6–8

Note to Teachers: Under the "Shaping the land" heading on p. 7 there is a reference to "over millions of years." See our note in the introduction about "Evolution and the Age of the Earth." (p. 7)

Check the Source!—There will be more information about Groundwater, briefly mentioned on p. 8, on pp. 30-31. One large supply of groundwater is found in the Sparta aquifer. The Sparta aquifer extends to at least seven states! If you live in Texas, Louisiana, Mississippi, Alabama, Arkansas, Tennessee, Missouri, or Kentucky, check out maps of the Sparta aquifer to see how your state's groundwater is impacted by this large aquifer. If you live in another state, search online to see what you can learn about the source of your groundwater.

Optional: Do Together

Note to Teacher: Over the course of this program we will provide ideas for fun activities to do with your students each week. In general, we will try to make the activities actually "active": performing additional research on a particular topic, watching a video, playing a game, getting outside, or some other type of "hands-on" activity that seeks to apply what your students have been learning in a meaningful way.

Take our ideas for what they are—mere suggestions—and don't feel enslaved to them. If your students don't want to do a particular activity or have a different, better idea, by all means ditch ours and go with theirs!

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Day 1 How Big?

Now that your students have had an introduction to the universe, help them get an idea of the relative sizes of objects in the solar system. Ask them to name 6-7 objects in the universe as you jot them down. Some examples from the book include planets, moons, the sun, galaxies, telescopes/space probes, and stars. Now ask them to think about the relative sizes of each of these objects. Discuss those that they can see with their naked eye and those that they cannot. Now work together to put the objects in order by size. Which are smallest? Which are biggest? As we are just beginning our study of astronomy, your students may not have all the answers today, but generally speaking, our list of objects would be organized as such (smallest to biggest): telescopes/space probes, moons, planets, the sun and other stars, and galaxies.

Day 2 Live-Look

Take some time today to explore photos taken by the Hubble Space Telescope and the James Webb Space Telescope (JWST). hubblesite.org includes several awe-inspiring photos taken by the Hubble Space Telescope and access to a "live-look" at what is being seen by the Hubble. webb.nasa.gov offers access to incredible photos taken by the JWST with explanations describing what is being viewed.

Supplies

Note to Teacher: When supplies are listed as **Physical Science Supplies Kit**, they are materials found in your course-specific kit of supplies. When supplies are listed as **You provide**, they are materials you can generally find around your home. We also provide a list of materials that will be needed for the following week, to help you prepare in advance.

Shipping Restrictions

Due to strict import regulations, it is illegal to ship biological matter to certain countries (including New Zealand and Australia). If you requested your science supplies to be shipped to a country with such restrictions, we have removed that kit from your order and reduced your charge accordingly. ■

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Science F: Week 1 Activity Sheet

Eyewitness: Universe

1. Fill in the blanks (not all of the words will be used): (pp. 6-7)

2,500	**universe**	**5,000**	**earth**
astronomy	**solar system**		**astrology**

People have studied the _(universe)_ for at least _(5,000)_ years through the science of _(astronomy)_.

2. Check all that are true: (pp. 6-7)

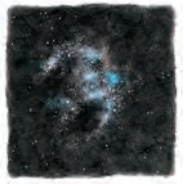
- [ ] We know all that there is to know about the universe.
- [x] The universe is everything that exists today, in the past, and in the future.
- [x] Stonehenge may have been used to mark the positions of the sun and moon during the year.
- [ ] Ptolemy believed the sun was the center of the universe.

3. Match the astronomers to their contributions: (pp. 6-7)

Isaac Newton	discovered that planets orbit the sun in ellipses, rather than circles
Johannes Kepler	plotted the distribution of stars and thought our galaxy was lens-shaped
Edwin Hubble	found that gravity was a force that kept planets in the sun's orbit
Nicolaus Copernicus	discovered the Andromeda galaxy, the first galaxy outside the Milky Way
William Herschel	theorized a sun-centered universe where planets make circular orbits around the sun

4. Check all the true statements about how the universe works: (pp. 10-11)

- [x] It is made up of matter and energy (in the form of light and other radiation)
- [x] Gravity is the force that holds the universe together
- [x] Magnetism is the force that makes objects attract or repel each other
- [ ] The smaller the body, the greater its gravitational attraction
- [x] An atom is the basic unit of matter



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Science F: Week 1 Activity Sheet

5. Fill in the blanks (not all of the words will be used): (pp. 10-11)

negative	**matter**	**protons**	**electrons**
subatomic particles	**no**		**rotate**
nucleus	**neutrons**		**positive**
quarks	**orbit**		**molecules**

Atoms are made up of smaller _(subatomic particles)_. The three main particles are _(protons)_, _(neutrons)_, and _(electrons)_. Protons have a _(positive)_ charge and neutrons have _(no)_ charge and both are found inside an atom's _(nucleus)_. Electrons have a _(negative)_ charge and _(orbit)_ the nucleus. Protons and neutrons are made up of smaller particles called _(quarks)_.

6. Circle **True** or **False** : The many kinds of radiation differ in wavelength. Visible light is radiation that our eyes see as colors from violet to red. (pp. 10-11)

7. The first scientist to turn a telescope on the skies in 1609 was: _(Galileo Galilei)_ (pp. 16-17)

8. Number the steps to describe how a light reflecting telescope works: (pp. 16-17)

_(2)_ Light hits a large, curved primary mirror that gathers and focuses light
_(3)_ The light is reflected back along the telescope tube onto a flat secondary mirror
_(4)_ The light is reflected into an eyepiece near the front of the tube
_(1)_ Light rays from celestial bodies travel through the tube

9. Number the order of the planets in the solar system, starting nearest to the sun and moving outward: (pp. 18-19)

_(3)_ Earth
_(5)_ Jupiter
_(1)_ Mercury
_(6)_ Saturn
_(4)_ Mars
_(7)_ Uranus
_(2)_ Venus
_(8)_ Neptune

10. Circle **True** or **False** : The planets move in circular orbits around the sun. (pp. 18-19)

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Science F: Week 1 Activity Sheet

11. Match the term to the definition: (pp. 18-19)

Comets	lumps of rocks and sometimes metal
Kuiper Belt	a world massive enough to pull itself into a spherical shape that orbits the sun
Asteroids	a region beyond Neptune filled with icy bodies
Moon	celestial bodies that orbit all the planets (except Mercury and Venus)
Planet	icy bodies that form a vast sphere called the Oort Cloud

Explanatorium of the Earth

12. Which four planets are balls of rock and metal? (pp. 14-15)

_____(Mercury)_____ _____(Venus)_____

_____(Earth)_____ _____(Mars)_____

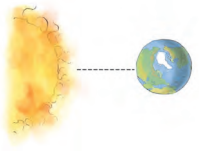
13. Which planets are giant spinning globes of hydrogen and helium? (pp. 14-15)

_____(Jupiter)_____ _____(Saturn)_____

_____(Uranus)_____ _____(Neptune)_____

14. How long does it take for light to travel from the sun's surface to the earth? (Circle the correct answer) (pp. 14-15)

eight minutes **365 days** **one month** **two years**



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Science F: Week 1 Activity Sheet

15. Fill in the blanks (not all of the words will be used): (pp. 14-15)

Kuiper	**feet**	**meters**
miles	**Mercury**	**Jupiter**
Mars	**irregular**	**Earth**
asteroid		**regular**

Asteroids are giant rocks that can be a few _____(feet)_____ long to hundreds of _____(miles)_____ wide. They have _____(irregular)_____ shapes and are found in the _____(asteroid)_____ belt, between the orbits of _____(Mars)_____ and _____(Jupiter)_____.

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Eyewitness: Universe

1. Fill in the blanks (not all of the words will be used): (pp. 6-7)

2,500	**universe**	**5,000**	**earth**
astronomy	**solar system**		**astrology**

People have studied the _____ for at least _____ years through the science of _____.

2. Check all that are true: (pp. 6-7)

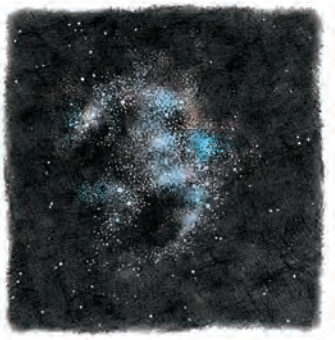
- ☐ We know all that there is to know about the universe.
- ☐ The universe is everything that exists today, in the past, and in the future.
- ☐ Stonehenge may have been used to mark the positions of the sun and moon during the year.
- ☐ Ptolemy believed the sun was the center of the universe.

3. Match the astronomers to their contributions: (pp. 6-7)

Isaac Newton •	• discovered that planets orbit the sun in ellipses, rather than circles
Johannes Kepler •	• plotted the distribution of stars and thought our galaxy was lens-shaped
Edwin Hubble •	• found that gravity was a force that kept planets in the sun's orbit
Nicolaus Copernicus •	• discovered the Andromeda galaxy, the first galaxy outside the Milky Way
William Herschel •	• theorized a sun-centered universe where planets make circular orbits around the sun

4. Check all the true statements about how the universe works: (pp. 10-11)

- ☐ It is made up of matter and energy (in the form of light and other radiation)
- ☐ Gravity is the force that holds the universe together
- ☐ Magnetism is the force that makes objects attract or repel each other
- ☐ The smaller the body, the greater its gravitational attraction
- ☐ An atom is the basic unit of matter



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5. Fill in the blanks (not all of the words will be used): (pp. 10-11)

negative	**matter**	**protons**	**electrons**
subatomic particles		**no**	**rotate**
nucleus		**neutrons**	**positive**
quarks		**orbit**	**molecules**

Atoms are made up of smaller _____ _____. The three main particles are _____, _____, and _____. Protons have a _____ charge and neutrons have _____charge and both are found inside an atom's _____. Electrons have a _____ charge and _____ the nucleus. Protons and neutrons are made up of smaller particles called _____ .

6. Circle **True** or **False** : The many kinds of radiation differ in wavelength. Visible light is radiation that our eyes see as colors from violet to red. (pp. 10-11)

7. The first scientist to turn a telescope on the skies in 1609 was: _____ _____ (pp. 16-17)

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9. Number the order of the planets in the solar system, starting nearest to the sun and moving outward: (pp. 18-19)

_____ Earth

_____ Jupiter

_____ Mercury

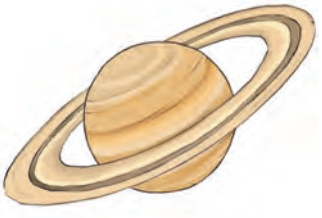
_____ Saturn

_____ Mars

_____ Uranus

_____ Venus

_____ Neptune



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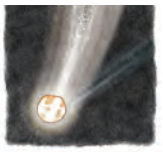


Comets	•	•	lumps of rocks and sometimes metal
Kuiper Belt	•	•	a world massive enough to pull itself into a spherical shape that orbits the sun
Asteroids	•	•	a region beyond Neptune filled with icy bodies
Moon	•	•	celestial bodies that orbit all the planets (except Mercury and Venus)
Planet	•	•	icy bodies that form a vast sphere called the Oort Cloud

Explanatorium of the Earth

12. Which four planets are balls of rock and metal? (pp. 14-15)

_____ _____

_____ _____

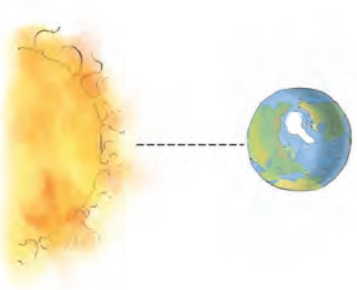
13. Which planets are giant spinning globes of hydrogen and helium? (pp. 14-15)

_____ _____

_____ _____

14. How long does it take for light to travel from the sun's surface to the earth? (Circle the correct answer) (pp. 14-15)

eight minutes **365 days** **one month** **two years**



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15. Fill in the blanks (not all of the words will be used): (pp. 14-15)

Kuiper	**feet**	**meters**
miles	**Mercury**	**Jupiter**
Mars	**irregular**	**Earth**
asteroid		**regular**

Asteroids are giant rocks that can be a few _____ long to hundreds of _____ wide. They have _____ shapes and are found in the _____ belt, between the orbits of _____ and _____.

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Science F

Days 6–10: **Date:** _____ **to** _____

Week Overview																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

Week 2

Date:	Day 6	Day 7	Day 8	Day 9	Day 10
Eyewitness: Universe	pp. 20–21	pp. 22–23	pp. 24–27 N		
Activity Sheet Questions	#1–3	#7–9	#13–15		
Explanatorium of the Earth	pp. 16–19	pp. 20–23 N			
Activity Sheet Questions	#4–6	#10–12			
Evolution: The Grand Experiment	pp. 9–10	chap. 2, pp. 11–14	pp. 15–16		
Water Cycles					pp. 9–11 N
Discover & Do: Level F Science Experiments				#2: Why Do the Tides Change?	
Optional: Do Together	A Season for All Time?	Battle of the Bulges			
Supplies	**Level F Supplies Kit:** brad (paper fastener), plastic thumbtack, ping pong ball, clay **Paper Packet:** Why Do the Tides Change? Experiment Sheet, Tide Model Cut-Outs **You provide:** scissors, clear tape, colored pencils				
Shopping/Planning List	**For next week:** scissors, ruler or tape measure with centimeters, yard stick or meter stick, a location with 3 meters (10 feet) of space, such as a wall, hallway, sidewalk, etc.				
Additional Subjects:					

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N Note to Teachers

Eyewitness: Universe

Day 6 | pp. 20–21

Under the heading "High-energy sun" in the middle of p. 21 we read about the way the sun radiates ultraviolet rays. Both sunburns and tans are an indication that the sun's rays have damaged the skin. Both are reactions to too much exposure to ultraviolet (UV) rays.

Factors that affect the UV radiation's intensity are the time of day, the season of the year, the latitude of your location (distance from the Equator), the cloud cover, and the ozone level.

Day 7 | pp. 22–23

After reading about the tug-of-war of tides described on pp. 22-23, talk through any safety precautions you have taken while at the beach. Do you have a favorite beach with resources for planning for these daily changes? If you have worked around the tides without communicating those details to your students, today is a great day to make your science learning coincide with practical knowledge that can help your students in a memorable way! Connect the dots between what you read today and any background experience or future plans!

Day 8 | pp. 24–27

Note to Teachers: Under "The cratered surface" heading on p. 26 there is a reference to "billions of years ago." See our note in the introduction about "Evolution and the Age of the Earth."

To Discuss After You Read

Q: If an Olympic event was held for the planets' orbits around the sun, use pp. 24-25 to find which planet would win?
A: *Mercury*

Q: How long is its trip around the sun?
A: *88 days*

Q: Which planet would take last place?
A: *Neptune*

Q: Where would it clock in with its orbit around the sun?
A: *165 years*

Q: Which planet is so hostile that people could not survive one minute there, according to the top of p. 27?
A: *Venus*

Explanatorium of the Earth

Day 6 | pp. 16–19

Genesis 1: 5,14 (ESV)

> 5 God called the light Day, and the darkness he called Night. And there was evening and there was morning, the first day.
>
> 14 And God said, "Let there be lights in the expanse of the heavens to separate the day from the night. And let them be for signs and for seasons, and for days and years,"

Psalm 74:16-17 (ESV)

> 16 Yours is the day, yours also the night; you have established the heavenly lights and the sun.
>
> 17 You have fixed all the boundaries of the earth; you have made summer and winter.

Jeremiah 33 & Proverbs 8

God speaks in Jeremiah 33:25 of "the fixed order of heaven and earth…" Proverbs 8:22-31 goes back to the beginning when the Lord began His work, before the beginning of the earth. These verses tell us that God established the heavens, made firm the skies above, established the fountains of the deep, "assigned to the sea its limit, so that the waters might not transgress his command…"

Page 16 is packed with details of day and night. The rotation of Earth and its 23.5° tilt cause the difference in the amount of daylight hours in various places. Page 17 adds details about the sun rising in the east and setting in the west. Leap year is explained in the section "Days and Years." A 2004 earthquake at the North Pole shortened a day by 2.7 microseconds! Did you know that rockets are launched near the Equator for extra speed? Different places on Earth move at different speeds because Earth is a sphere. Take in these details and see how many of our daily realities could easily escape our attention!

Pages 18 and 19 are a wealth of information about changes brought about by the seasons. Dig in to see what you can learn!

Day 7 | pp. 20–23

Note to Teachers: At the bottom of p. 23 there is a reference to "more than 3 billion years ago." See our note in the introduction about "Evolution and the Age of the Earth."

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Evolution: The Grand Experiment

Day 7 | chap. 2, pp. 11–14

Your book documents Dr. Jan Baptista von Helmont's "proof" of spontaneous generation that was later discredited. Not much background is given about Dr von Helmont, but he is credited with inventing the word "gas." He was the first to identify various gases, including carbon dioxide!

Water Cycles

Day 10 | pp. 9–11

Note to Teachers: Under the "Why is the sea salty?" heading on p. 9, there is a statement worded this way: "Billions of years ago water dissolved salt from the rocks of the Young Earth..." See our note in the introduction about "Evolution and the Age of the Earth."

Page 9 briefly mentions comets. One of the best ways for students to understand the interesting nature of comets is to get some specifics about comets that made an appearance in recent history and those that might become visible in the coming year. See what you can find about Comet 13P/Olbers that made an appearance in the summer of 2024 after not being seen in the night sky since September of 1956! A quick search should give you information about when you might see the next comet in the coming months! With parental supervision, check out the Sky Tonight app, when you know a comet might be seen with the naked eye or with binoculars!

Optional: Do Together

Day 6 | A Season for All Time?

Do your students have a favorite season? Discuss with them why that season is their favorite. Do they love a certain activity associated with that season, like swimming or skiing? Or maybe they prefer a particular weather type? Talk with them about all the things that happen during that season, like holidays or other family traditions.

Now, discuss with your students what Earth's position in space is like during that season. Perhaps they can model the Earth's position using a flashlight or lamp and a ball, remembering that Earth is tilted on its axis while it rotates and orbits the sun. Feel free to use the book to help with this demonstration. Another option would be to try to draw the Earth's position during that season in relation to the sun.

Day 7 | Battle of the Bulges

Who knew that the tides were so complicated? To help illustrate how tides work "globally," do some internet research and try to find a video on tidal bulges. This will make it easier to understand how those bulges work and how the Earth moves through those bulges over the course of a day. Did your students realize that this how tides work? Do they have a better sense of tides now? Can they explain how tides work to you? ■

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Science F: Week 2 Activity Sheet

Eyewitness: Universe

1. Check all that are true about the sun: (pp. 20-21)

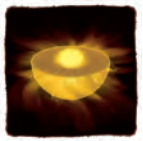
- [x] It is a star
- [x] It is a great ball of incandescent gases
- [ ] It has tiny sunspots that quickly come and go
- [x] It is over 100 times wider than Earth
- [x] A majority of our planet's ecosystem depends on it

2. Fill in the blanks (not all of the words will be used): (pp. 20-21)

prominences	**planets**	**cooler**	**days**
moons	**warmer**	**weeks**	**dark patches**

Sunspots are _(dark patches)_ on the sun, about 2700 degrees F _(cooler)_ than the sun's surface, that can persist for _(weeks)_ and grow to the size of _(planets)_.

3. Check all that are true about the corona: (pp. 20-21)



- [x] It is an atmosphere of gases surrounding the sun
- [ ] It is hotter than the sun's core
- [x] It gives off a steady stream of tiny, charged particles called the solar wind
- [x] Solar wind from the corona hits Earth's magnetic field, which deflects most of it into space
- [x] During a total eclipse, the moon blocks the sun's surface, allowing us to see the corona's white atmosphere which extends millions of miles into space

Explanatorium of the Earth

4. Fill in the blanks (not all of the words will be used): (pp. 16-17)

eastward	**zero**		**westward**
24	**pole**		**axis**
23	**366.24**	**56**	**365**

Earth rotates _(eastward)_ on an imaginary line called an _(axis)_. Because earth's axis is tilted, sunlight hours vary from place to place, from as little as _(0)_ hours to _(24)_ hours a day. A day lasts 24 hours but the Earth takes _(23)_ hours, _(56)_ minutes, and 4 seconds to rotate once. Earth rotates _(366.24)_ times a year, even though there are only _(365)_ days.

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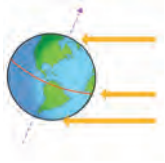
Science F: Week 2 Activity Sheet

5. Why does the sky look blue during daylight hours? (pp. 16-17) _(sample answer: The sun's light is scattered by Earth's air molecules. White light is a mix of all the colors of the rainbow, but since blue light scatters more easily than other colors, it makes the sky look blue.)_

6. What causes different seasons on earth? (pp. 18-19)



- [ ] The earth gets closer to or further away from the sun
- [ ] The moon's orbit around the Earth creates seasonal changes
- [x] The Earth's axis of rotation is tilted at 23.5 degrees, causing the northern and southern hemispheres to lean towards the Sun at different times per year
- [ ] The degree of heat and light from the sun changes through the year

Eyewitness: Universe

7. What causes the moon to shine? (pp. 22-23) _(the moon has no light of its own but shines by reflecting light from the sun.)_

8. Circle the correct answer: Neil Armstrong and Buzz Aldrin are known for the following historical event: (pp. 22-23)

first people to walk on the moon **the first people to develop a computer**

9. Mark the correct answer: Which phase is the moon in when we cannot see it at night? (pp. 22-23)

- [x] New moon
- [ ] First quarter
- [ ] Last quarter
- [ ] Waxing gibbous

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Science F: Week 2 Activity Sheet

Explanatorium of the Earth

10. Match the correct term to its description: (pp. 20-21)

solar eclipse	When Earth casts a shadow on the moon
lunar eclipse	When the moon passes between the earth and the sun, blocking the sun's light, and casting a shadow on the earth

11. Fill in the blanks (not all of the words will be used): (pp. 20-21)

sun	**annular**	**total**	**brighter**
moon	**closer**	**further away**	**corona**
earth	**wider**		**partial**

During a ___*(total)*___ solar eclipse, the _____*(moon)*_____ blocks the sun's light. The sun and moon appear to be the same size in our sky and align almost perfectly because the _____*(sun)*_____ is 400 times _____*(wider)*_____ than the moon, and 400 times _____*(further away)*_____. The sun's disk disappears, but the _____*(corona)*_____ becomes visible around the moon.

12. Check all statements that are true about tides. (pp. 22-23)

- [ ] Spring tides are lower due to the sun, moon, and earth lining up.
- [x] The moon's gravity pulls on earth and creates tides.
- [x] The moon's gravitational pull is strong because it is close to the earth.
- [ ] Earth's tides cause a trough in the ocean.
- [x] A tidal bore occurs when tide waters flow into a river mouth.
- [x] Earth experiences two high and low tides each day.

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Science F: Week 2 Activity Sheet

Eyewitness: Universe

13. Circle **True** or **False** : Jupiter contains more matter than all the other planets put together. (pp. 24-25)

14. Circle the correct answer: The planets circle the sun near a flat plane called …. (pp. 24-25)

the plane of the ecliptic **the plane of the rotation**

15. Mark the phrases that describe Mercury or Venus with an M or V: (pp. 26-27)

(M) Small planet with a hard outer crust, rocky mantle, and iron core

(M) Has a very thin atmosphere

(V) Has a very dense atmosphere

(V) Same size as earth but a hostile planet with high temperatures, carbon dioxide atmosphere, and sulfuric acid clouds

(V) Shaped by volcanoes which may still be active today

(M) Cratered landscape resulting from meteorites

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Eyewitness: Universe

1. Check all that are true about the sun: (pp. 20-21)

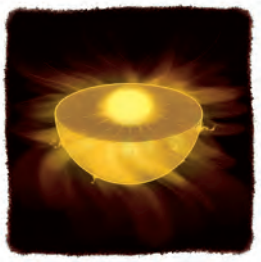
- ☐ It is a star
- ☐ It is a great ball of incandescent gases
- ☐ It has tiny sunspots that quickly come and go
- ☐ It is over 100 times wider than Earth
- ☐ A majority of our planet's ecosystem depends on it

2. Fill in the blanks (not all of the words will be used): (pp. 20-21)

prominences	**planets**	**cooler**	**days**
moons	**warmer**	**weeks**	**dark patches**

Sunspots are _____on the sun, about 2700 degrees F _____ than the sun's surface, that can persist for _____ and grow to the size of _____.

3. Check all that are true about the corona: (pp. 20-21)



- ☐ It is an atmosphere of gases surrounding the sun
- ☐ It is hotter than the sun's core
- ☐ It gives off a steady stream of tiny, charged particles called the solar wind
- ☐ Solar wind from the corona hits Earth's magnetic field, which deflects most of it into space
- ☐ During a total eclipse, the moon blocks the sun's surface, allowing us to see the corona's white atmosphere which extends millions of miles into space

Explanatorium of the Earth

4. Fill in the blanks (not all of the words will be used): (pp. 16-17)

eastward		**zero**	**westward**
24		**pole**	**axis**
23	**366.24**	**56**	**365**

Earth rotates _____ on an imaginary line called an _____ . Because earth's axis is tilted, sunlight hours vary from place to place, from as little as _____ hours to _ _____ hours a day. A day lasts 24 hours but the Earth takes _____ hours, _____ minutes, and 4 seconds to rotate once. Earth rotates _____ times a year, even though there are only _____ days.

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_____

_____

_____

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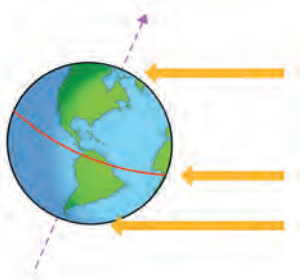

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_____

_____

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Explanatorium of the Earth

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Science F

Days 11–15: **Date:** _____ **to** _____

Week Overview																	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36

Week 3

Date:	Day 11	Day 12	Day 13	Day 14	Day 15
Eyewitness: Universe	pp. 28–31 N	pp. 32–35 N	pp. 36–41 N		
Activity Sheet Questions	#1–4	#5–9	#10–15		
Evolution: The Grand Experiment	pp. 17–18	pp. 19–22	chap. 3, pp. 23		
Water Cycles					pp. 12–15
Discover & Do: Level F Science Experiments				#3: How Do Celestial Distances Compare?	
Optional: Do Together		Astronomic Mnemonic	Planetary Travel Agency		
Supplies	**Level F Supplies Kit:** toothpicks, clay (1/2 stick), binder clips, masking tape **Paper Packet:** How Do Celestial Distances Compare? Experiment Sheet, Planet Labels Cut-Out Sheet **You provide:** scissors, ruler or tape measure with centimeters, yard stick or meter stick, a location with 3 meters (10 feet) of space, such as a wall, hallway, sidewalk, etc.				
Shopping/Planning List	**For next week:** permanent marker, ruler, helper				
Additional Subjects:					

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N Note to Teachers

Eyewitness: Universe

Day 11 | pp. 28–31

Notes to Teachers: On p. 31, under the "On top of the world" heading, there is a reference to "25 million years ago." See our note in the introduction about "Evolution and the Age of the Earth."

Please correct the date on p. 28 of your book in the Eyewitness box at the top of the page. You only need to change the two to a three. According to multiple sources, Inge Lehmann's discovery was in 1936 rather than 1926.

The life of Inge Lehmann, the scientist who discovered Earth has a solid inner core, is full of fascinating details. Her parents were both born to prominent citizens in Denmark. Her father was a well-known psychologist while her mother was a housewife. She had one sister. Inge was inquisitive as a child, but she was often sick so that her parents tried to shield her from overexertion in her schoolwork. Inge, however, showed an early interest in mathematics and an early ability to understand at a level beyond what was typical for her age. One story tells of Inge at a social event at age 11 and she solved quadratic equations with older boys during what was supposed to be a social event.

Her school was started by the Jewish aunt of Neils Bohr, who was awarded the Nobel Prize for Physics in 1922. His aunt was named Hanna Adler. Adler was one of the first women to earn a master's degree in physics from the University of Copenhagen. She had visited the U.S. to learn about educational methods and practices. She returned to Denmark with enthusiasm and started a co-ed school where boys and girls were taught the same curriculum and extra-curricular activities without discrimination that was common in other schools of the time. The boys learned to cook and sew while the girls played football. During World War II, Adler was one of the Jewish citizens who was arrested in 1943 and held in a camp at 84 years of age. Dozens of her students, including Inge, wrote letters requesting her release. Thankfully, the requests of her students were granted!

Inge studied mathematics but was often bored with her classes and was disappointed in later experiences as a student and in her early career. After her early education with the novel approach to education in Hanna Adler's school, Inge was disappointed by the discriminations she found at university and in career opportunities. It took her 10 or more years to finish her college degree.

As a teenager she experienced an earthquake while sitting with her family on a Sunday morning. It was not a strong earthquake, but they detected and discussed the movements. It was her only encounter with an earthquake until she worked as a seismologist two decades later! In her early career, she took a job in an insurance company in actuarial work before becoming an actuarial assistant at a university. This work helped her to hone her computational skills that would help in later achievements. She then began to study seismology with a professor who first explained to her that the make-up of Earth's core could be determined using data from earthquakes! Inge visited seismic stations in other countries, learning to analyze data. As she studied, she earned her master's degree at age 40!

She began to take leadership roles that required her to run seismographic observatories. She did research along with her job and made mathematical models to test her theories. After retiring from her job in her 60s she took more time for her research, traveling to the U.S. and Canada for extended visits. She made discoveries and cited observations that have not been fully explained yet by scientists. Her work was more recognized in the U.S. where she was awarded doctorates and honors for her work. Inge wrote her last scientific article at age 99 and lived to the age of 104, three months before what would have been her 105th birthday! She had a remarkable journey and said near the end of her life that she was content and that her life was full of victories and good memories!

Day 12 | pp. 32–35

Note to Teachers: At the bottom of p. 33, under the "Callisto" heading, there is a reference to "billion of years." See our note in the introduction about "Evolution and the Age of the Earth."

Day 13 | pp. 36–41

Note to Teachers: On p. 39, in the caption about the picture of Asteroid Ida near the middle of the page, there is a reference to "millions of years ago." See our note in the introduction about "Evolution and the Age of the Earth."

In March of 1977 a team discovered the rings of Uranus. More rings were discovered in later years. Many years before 1977, back in 1789, William Herschel reported an observation of rings for this planet he had discovered. In 1781, Herschel (mentioned on p. 36 of today's reading) discovered the planet that would later be named Uranus. Though he discovered the planet, astronomers today disagree about whether he could have seen the rings. Years later, credit went to the team who discovered the rings in 1977. Do you think Herschel would have mentioned rings if they did not exist? Could they have possibly been brighter or in some way more visible when he was studying space? Either way, it is interesting to realize that scientists come to different conclusions about such matters!

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Evolution: The Grand Experiment

Day 12 | pp. 19–22

More Than Spontaneous Generation

Chapter 2 focuses on Louis Pasteur's work disproving spontaneous generation, but this French chemist also became one of the important founders of medical microbiology. At age 15 Pasteur was recognized for his artistic abilities in drawing and painting. Later he studied science and made many contributions throughout his life that still affect the world today!

He was the father of five, but sadly, only two of the five children lived beyond childhood. Throughout his career, Pasteur thought critically and carefully solved practical problems. In his research, he observed closely and was not afraid to challenge assumptions or accepted ideas. His work with disproving incorrect perceptions regarding spontaneous generation is on a longer list of accomplishments. Pasteur made significant contributions to science, medicine, and technology. He discovered that microorganisms cause both fermentation and disease. He implemented the heating process that came to be known as pasteurization. He developed vaccines for combating anthrax and rabies. He solved practical problems in various areas of science, medicine, and technology. He was awarded the Legion of Honour, France's highest decoration prior to his death in 1895.

Water Cycles

Day 15 | pp. 12–15

Page 14 mentions that floods happen more and more often. Look back at history to learn more about flooding in the U.S. and around the world. Some of the worst floods in the U.S. were:

- the flood that followed the Galveston Hurricane of 1900 that caused 8,000 deaths,
- the Florida hurricane and flood of Lake Okeechobee in 1928 that killed 2,500-3000 people,
- the Johnstown, Pennsylvania flood of 1889 that took more than 2,200 lives,
- the South Carolina hurricane that affected the Sea Islands near Savannah in 1893 and caused more than 2,000 deaths,
- and the flooding of Hurricane Katrina when the levees failed in South Louisiana in 2005 taking the lives of 1,833 people. This event was the costliest hurricane in our country's history, displacing many survivors.

Zooming out to look at the most catastrophic floods worldwide,

- the Johnstown, Pennsylvania flood of 1889 makes this list as well. The sheer amount of water hitting this community all at once made this event especially destructive. Once the investigation was complete, it became clear that the problem was caused by a dam that was not well-maintained.
- Another deadly event occurred in the summer of 1931 in Central China and was partially related to human error as well. As many as 3.7 million died after floods attributed to more than average rainfall and inadequate dikes. Some of these deaths occurred after the flood when there was a shortage of food (famine) and disease as an aftermath to the flooding.
- As far back as 1362 parts of Europe were hit by the "Grote Mandrenke"—a flood known as the Great Drowning of Men. Between 25,000 and 100,000 people lost their lives. Whole islands and as many as 60 parishes disappeared completely into the ocean. The coastline changed, and a shallow bay was formed on the North Sea! It affected England, the Netherlands, Germany, and Denmark!
- In June 1938 during the Second Sino-Japanese War, Chinese soldiers destroyed dikes in the Yellow River intentionally. The flood and its aftermath took the lives of 800,000 people and displaced 4 million people in China.

Catastrophic floods had great impacts on:

- the Indus River Valley in 1841,
- Greenville, Mississippi in 1927,
- Florence, Italy in 1966,
- And England and Wales in 1607.

Page 15 refers to ice-dwelling animals that make their home where there are large icebergs in Antarctica. Small, orangish, and shrimp-like, amphipods have been found deep in the ice. Crustaceans called "sea fleas," fish, marine worms, octopus, sea cucumbers, mollusks, sea stars, and never-before-seen animals that look like sponges have also been found very deep in the ice of Antarctica.

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Optional: Do Together

Day 12 Astronomic Mnemonic

As your students learn about each planet in our solar system, it may be useful to memorize their order in relation to the sun. One fantastic memorization tool is a mnemonic device using the first letter of each word to make a sentence that is easy to remember. In the case of the order of the planets, the first letters of each are MVEMJSUN. The common mnemonic using these letters is **M**y **V**ery **E**ducated **M**other **J**ust **S**erved **U**s **N**achos, but challenge your students to have fun with this and come up with their own sentence that will help them remember the order of the planets. Perhaps **M**ike **V**ery **E**agerly **M**ade **J**elly **S**andwiches **U**ntil **N**oon?

Day 13 Planetary Travel Agency

Now that your students have learned about each planet, they are ready to plan a planetary voyage! Have your students choose their favorite planet other than Earth. Why is that planet their favorite? What can they tell you about that planet? How would they describe it? On a piece of paper, have them design a "travel brochure" for that planet. How would they encourage people to visit that planet? What special, if not realistic, equipment would they use to visit that planet? What would they see on their voyage? What would they do? Encourage them to use their imagination to entice travelers to visit their favorite planet! ■

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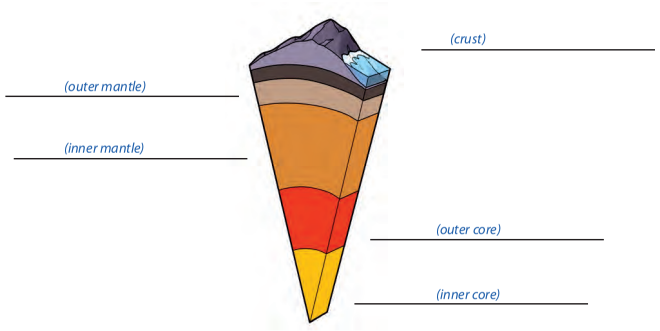
Science F: Week 3 Activity Sheet

Eyewitness: Universe

1. Label the parts of the earth's layered structure: (pp. 28-29)



2. Oceans cover more than _____ % of Earth's surface: (pp. 28-29)

50 **60** **70** **80**

3. Fill in the blanks (not all of the words will be used): (pp. 28-29)

solar wind	**aurora**	**enigma**
trade winds	**magnetosphere**	**troposphere**

A protective barrier around the Earth called the _____(magnetosphere)_____ shields it from the sun's radiation. Most of the _____(solar wind)_____ gets trapped by this barrier, but sometimes charged particles will pass through and create a beautiful light display called an _____(aurora)_____.

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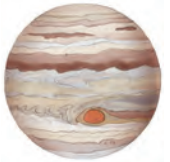
Science F: Week 3 Activity Sheet

4. Check all that are true about Mars: (pp. 30-31)

- [x] It is the most similar planet to Earth, but half the size, with seasons, an atmosphere, and polar ice caps.
- [ ] It has a protective magnetic field like Earth does.
- [x] Its surface has been explored more than any other planet besides Earth.
- [x] It has two small moons, Phobos and Deimos.
- [x] The largest of four volcanoes near its equator, Olympus Mons is almost three times higher than Mount Everest and has a crater 56 miles long.

5. Mark all the true statements of Jupiter: (pp. 32-33)



- [x] It is a gas giant, more massive than all the other planets put together.
- [x] Its hydrogen and helium atmosphere covers an ocean of liquid hydrogen.
- [x] It has been orbited by two space probes - *Galileo* in 1995 and *Juno* in 2016.
- [ ] It has a Great Red Spot which is a frozen iron lake.
- [x] Galileo Galilei was one of the first to see Jupiter's four largest moons.

6. Match the names of these moons to their description: (pp. 32-33)

Europa	Colorful moon covered with sulfur from its many volcanoes
Ganymede	Has an icy surface covered with craters
Io	The biggest moon in the solar system with icy surface
Callisto	Grooves and ridges crisscross its frozen surface which covers a deep ocean of water

7. Circle **True** or **False** : Saturn is mainly composed of hydrogen and helium with a rocky core, and is so light that it would float on water. (pp. 34-35)

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Science F: Week 3 Activity Sheet

8. Fill in the blanks (not all of the words will be used): (pp. 34-35)

liquid	**sixth**	**tilted**	**clouds**
storms	**gases**	**straight**	**second**
high		**slow**	

Saturn is the _____(sixth)_____ planet from the sun and the _____(second)_____ largest planet. Its axis is _____(tilted)_____ so we see its rings at various angles while it orbits the sun. The bands in Saturn's atmosphere are streams of _____(gases)_____ which travel at _____(high)_____ speeds in opposite directions, creating _____(storms)_____.

9. Match the name of these moons to their unique characteristics: (pp. 34-35)

Enceladus	the second largest moon in the solar system (after Ganymede) and bigger than Mercury, with cold conditions
Titan	has the brightest surface of any object in the solar system, and is covered in fresh snow

10. Circle the correct answer: Which astronomer discovered Uranus in 1781? (pp. 36-37)

Edwin Hubble **Carl Sagan** **(William Herschel)**

11. What causes some regions of Uranus to experience winter for up to 21 years during its orbit around the sun? (pp. 36-37)

- ☐ Its many moons impact the level of sunlight it receives
- ☒ Its axis is tipped over at an extreme angle of 98 degrees and it has a slow orbital speed around the sun (84 years)
- ☐ The methane atmosphere affects the seasons
- ☐ The warm oceans beneath the cold gas atmosphere create extreme temperature changes

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Science F: Week 3 Activity Sheet

12. Fill in the blanks (not all of the words will be used): (pp. 36-37)

methane	**larger**	**Triton**	**billion**
storm	**clouds**	**million**	**nitrogen**
frozen	**smaller**		**geysers**

Neptune is 1 _____(billion)_____ miles from Uranus, and slightly _____(smaller)_____. Its atmosphere has bright _____(clouds)_____ and dark _____(storm)_____ regions. Neptune is bluer than Uranus because it contains more _____(methane)_____. The largest of its 14 moons is _____(Triton)_____ which is covered with _____(frozen)_____ gases but has active _____(geysers)_____ inside that spurt nitrogen gas and dust.

13. Match the term to its description: (pp. 38-39)

Meteorite	smaller icy body that orbits the sun on the edge of the solar system
Meteor	a meteoroid that enters Earth's atmosphere and hits the ground
Comet	a large rocky body that orbits the sun
Meteoroid	a meteoroid that enters Earth's atmosphere and burns up before reaching the ground ("shooting star")
Asteroid	small rocky chunks of asteroids or comets that travel through space

14. Circle the correct answers to complete this statement: The largest asteroid is **Pluto** / **(Ceres)**. It is less than **(1/3)** / **3/4** the size of the Earth's moon. (p. 38-39)

15. Check all that are true about comets: (pp. 40-41)

- ☒ They are huge chunks of icy debris on the edge of the solar system
- ☒ They remain invisible until traveling closer to the sun where they begin to glow, forming large heads and tails
- ☒ Their tails can stretch for millions of miles
- ☒ They orbit the sun just like planets, but from any direction
- ☒ Comet Hale-Bopp of 1997 is the brightest comet of recent decades
- ☒ Most come from the Oort Cloud and Kuiper Belt
- ☐ Comets are solid ice and firmly held together

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Eyewitness: Universe

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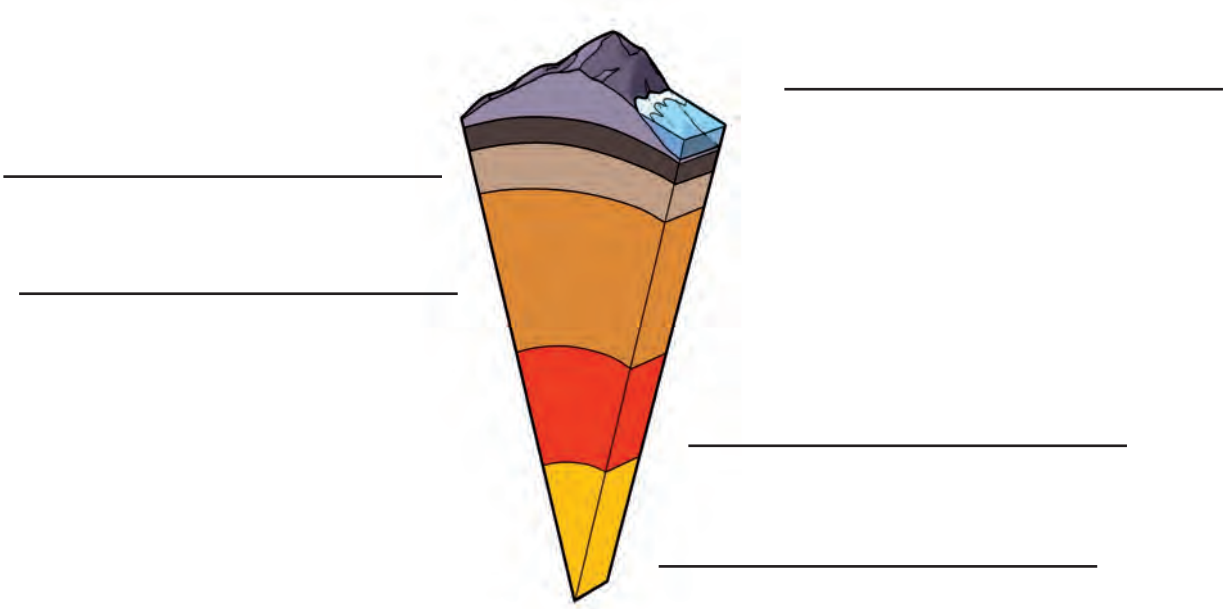

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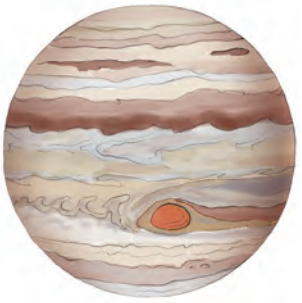
- ☐ The largest of four volcanoes near its equator, Olympus Mons is almost three times higher than Mount Everest and has a crater 56 miles long.

5. Mark all the true statements of Jupiter: (pp. 32-33)



- ☐ It is a gas giant, more massive than all the other planets put together.
- ☐ Its hydrogen and helium atmosphere covers an ocean of liquid hydrogen.
- ☐ It has been orbited by two space probes - *Galileo* in 1995 and *Juno* in 2016.
- ☐ It has a Great Red Spot which is a frozen iron lake.
- ☐ Galileo Galilei was one of the first to see Jupiter's four largest moons.

6. Match the names of these moons to their description: (pp. 32-33)

Europa •	• Colorful moon covered with sulfur from its many volcanoes
Ganymede •	• Has an icy surface covered with craters
Io •	• The biggest moon in the solar system with icy surface
Callisto •	• Grooves and ridges crisscross its frozen surface which covers a deep ocean of water

7. Circle **True** or **False** : Saturn is mainly composed of hydrogen and helium with a rocky core, and is so light that it would float on water. (pp. 34-35)

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8. Fill in the blanks (not all of the words will be used): (pp. 34-35)

liquid	**sixth**	**tilted**	**clouds**
storms	**gases**	**straight**	**second**
high		**slow**	

Saturn is the _____ planet from the sun and the _____ largest planet. Its axis is _____ so we see its rings at various angles while it orbits the sun. The bands in Saturn's atmosphere are streams of _____ which travel at _____ speeds in opposite directions, creating _____.

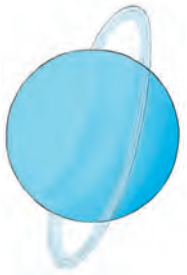
9. Match the name of these moons to their unique characteristics: (pp. 34-35)

Enceladus •	• the second largest moon in the solar system (after Ganymede) and bigger than Mercury, with cold conditions
Titan •	• has the brightest surface of any object in the solar system, and is covered in fresh snow

10. Circle the correct answer: Which astronomer discovered Uranus in 1781? (pp. 36-37)

Edwin Hubble **Carl Sagan** **William Herschel**

11. What causes some regions of Uranus to experience winter for up to 21 years during its orbit around the sun? (pp. 36-37)



- ☐ Its many moons impact the level of sunlight it receives
- ☐ Its axis is tipped over at an extreme angle of 98 degrees and it has a slow orbital speed around the sun (84 years)
- ☐ The methane atmosphere affects the seasons
- ☐ The warm oceans beneath the cold gas atmosphere create extreme temperature changes

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12. Fill in the blanks (not all of the words will be used): (pp. 36-37)

methane	**larger**	**Triton**	**billion**
storm	**clouds**	**million**	**nitrogen**
frozen	**smaller**		**geysers**

Neptune is 1 _____ miles from Uranus, and slightly _____. Its atmosphere has bright _____ and dark _____ regions. Neptune is bluer than Uranus because it contains more _____. The largest of its 14 moons is _____ which is covered with _____ gases but has active _____ inside that spurt nitrogen gas and dust.

13. Match the term to its description: (pp. 38-39)

Meteorite •	• smaller icy body that orbits the sun on the edge of the solar system
Meteor •	• a meteoroid that enters Earth's atmosphere and hits the ground
Comet •	• a large rocky body that orbits the sun
Meteoroid •	• a meteoroid that enters Earth's atmosphere and burns up before reaching the ground ("shooting star")
Asteroid •	• small rocky chunks of asteroids or comets that travel through space

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14. Circle the correct answers to complete this statement: The largest asteroid is **Pluto** / **Ceres** . It is less than **1/3** / **3/4** the size of the Earth's moon. (p. 38-39)

15. Check all that are true about comets: (pp. 40-41)

- ☐ They are huge chunks of icy debris on the edge of the solar system
- ☐ They remain invisible until traveling closer to the sun where they begin to glow, forming large heads and tails
- ☐ Their tails can stretch for millions of miles
- ☐ They orbit the sun just like planets, but from any direction
- ☐ Comet Hale-Bopp of 1997 is the brightest comet of recent decades
- ☐ Most come from the Oort Cloud and Kuiper Belt
- ☐ Comets are solid ice and firmly held together

Appendix 1: Earth and Space Science—Weekly Subject List

Week	Subject
1	history of astronomy; our place in universe; scales; matter/forces/energy in the universe; exploring space; solar system; what is water?
2	Sun, Moon, Mercury, Venus; day and night, seasons; eclipses, tides; where is water, cycles
3	Earth, Mars, Jupiter, Saturn, Uranus, Neptune; asteroids, meteors, comets; power of water
4	star distance, brightness, types, clusters, nebulae; star birth, death, supernova, neutron star, exoplanet, black holes; Milky Way, Magellanic Clouds; history of oceans on earth
5	types of galaxies, active galaxies; star maps, timeline of astronomy; current vs. previous models of solar system/universe; cloud formation, types of clouds
6	Greek beliefs of universe: Aristotle, Ptolemy, Archimedes; Galileo tests gravity on tower of Pisa, creates thermoscope, geometric compass; the ideas of Copernicus, Tycho, and Kepler; Galileo creates telescope, discovers Jupiter's moons, observes sunspots; hurricanes, snow
7	Galileo's issues from other scientists and church, importance of observing and measuring; Inquisition and fallout, Newton builds upon Galileo, Galileo uses pendulum to make clock; inside earth; rivers, waterfalls
8	earth's magnetism, aurora; tectonic plates, theories; plates boundaries, continental drift; groundwater, hot springs
9	volcanoes; how volcanoes erupt, types of volcanoes; how lava flows, volcanoes around the world; caves, volcanic islands
10	volcanic rocks, pyroclastic flows; calderas, hot spots; atolls, geysers; glaciers
11	supervolcanoes, earthquakes; seismic waves, tsunamis; how landscapes form; ocean currents - surface and deep
12	mountains rise, top 10 longest mountain ranges; rift valleys; weathering, erosion; waves, coastal erosion
13	landslides; sand dunes; glaciers; icebergs; tides, deep sea vents
14	rivers, top 10 longest rivers; riverbends, waterfalls; floods; how cells use water
15	canyons, top 10 deepest canyons; groundwater, top 10 largest lakes; caves, top 10 longest caves; how plants use water, animals using water to hunt or collect food
16	deltas and estuaries; how coastlines change, ocean waves; rock cycle; how human bodies use water, dehydration
17	igneous rock, igneous intrusions, igneous rock examples; metamorphic rock, examples; sedimentary rock, examples; water for desert animals and plants, thirst
18	soil; minerals, mineral examples; crystals and their properties; animal adaptations for life in water
19	glowing minerals, pigments; gemstones, diamonds, gemstone examples; natural elements, biominerals/ ocean zones
20	general causes of weather, varied climate; Sun's energy, affects on Earth; atmosphere; jellyfish, fluke
21	greenhouse gases; greenhouse effect, CO_2 levels, methane; evidence of global warming; composition of air; Climate change intro to reasons [greenhouse effect, CO_2 levels, past climates, methane levels, melting glaciers]; periwinkle, water flea
22	climate zones, topics, temperate; polar, tundra, local climates; hot, cold, wet, and dry climates; crab, mayfly

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Week	Subject
23	water cycle, ocean currents, El Nino; air temperature, currents, pressure; wind, jet streams, Coriolis effect; ocean currents; air pressure; wind, beauford scale, prevailing winds; starfish, manatee
24	weather fronts; tornadoes, hurricanes, thunderstorms; orca, elephant seal
25	floods, droughts, monsoons; cloud formation; types of clouds; dust storms; murrelet, shark
26	rain, rainbows; hail, snow; dew, fog, mist; eel, tetra
27	frost; studying weather, instruments; forecasting; lightning; clown fish, anglerfish
28	evidence of past climates: fossils; evidence past climates: rocks, trees, pollen, ice; natural climate change; fossil formation, fossil examples; ichthyosaur (extinct), sea snake
29	gradual climate change, astronomically, earth wobble, aerosols, CO2 and oceans; ice ages, glaciers, ice shelf; how living things live in climates, growing human population, CFCs; newts, frogs
30	solutions: alternative energy, saving energy, recycling; what could happen to climate in the future; disagreements to climate change; coral polyps, zooxanthellae, kelp
31	Intro, 4 R's, waste; trash statistics, decomposition, closed-loop and linear life cycles; Great Pacific Garbage Patch, organic and inorganic; human use of water
32	archaeologist and middens, epidemics, industrialization, consumerism; landfills; oil spills; hydropower, irrigation
33	disposing of hazardous materials; reduce; sustainability; reduce; composting; water at home
34	reuse; recycle; you can make a difference; cleaning water
35	intro to biomes, tundra; boreal forest, temperate forest; temperate grassland, deserts; water in skyscrapers
36	tropical rainforest, tropical grassland; mountain life, arid scrublands; wetlands, ocean life, human impact; water in space station

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