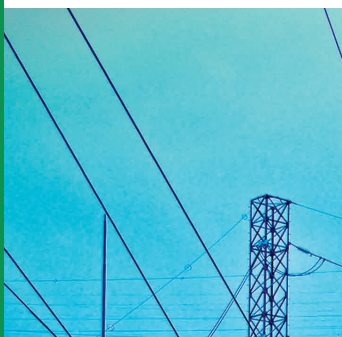


E ELECTRICITY, MAGNETISM, AND ASTRONOMY



FUN FACT
Jupiter has at least
50 moons.





Thank you for downloading this sample of Sonlight's Science E 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 Scope and Sequence of topics and skills your children will be developing throughout the school year

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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Science (4-Day)

Electricity, Magnetism, and Astronomy

By The Sonlight Team

*“The heavens declare the glory of God; the skies
proclaim the work of his hands.”*

Psalm 19:1 (NIV)

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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).

Published by

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Printed in the United States of America.

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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. No need to create your own plans.

2 Detailed Teaching Notes

Notes explain each assignment and activity, point out fun facts about your reading, and provide extra information about important topics so you get the most from your materials.

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 reading and provide hands-on learning. Sonlight's Science kits provide the key supplies . . . so you actually do the experiments.

Many experiments are intriguing, yet simple, activities—such as exploring taste buds using basic ingredients like lemon juice and sugar. Again, no planning necessary!

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

Science A					
Week 1					
Date:	Day 1	Day 2	Day 3	Day 4	Day 5
<i>Children's Encyclopedia</i>	pp. 8-9		pp. 10-11	pp. 12-13	pp. 14-15
Activity Sheet Questions	#1-2		#3-4	#5-7	#8-10
<i>Discover & Do Level K DVD</i>		"Before You Begin" Tracks #1-3			
<i>Science Activities, Vol. 2</i>		"Air All Around" pp. 2-3			
Do Together				The Seasons at Your House	
Supplies	You provide: sheets of paper, 8" x 10" cardboard for each player (optional: crayons, thread or string or yarn) bottle, bowl, water.				
Shopping/Planning List	For next week: feather from any bird, plate, 10" x 10" paper, pencil, scissors, crayons, needle, thread or string or yarn, two dish cloths, plastic bag, plate, salt, bowl, water, plastic wrap, sugar, food color, spoons, saucers, glass, plate, very warm water, long-necked bottle, deep bowl or bucket, large coin, ice cubes, plastic bag, rolling pin or hammer or rock, plastic bottle with cap.				
Additional Subjects:					

Children's Encyclopedia

Day 1 pp. 8-9

Let your children know how amazing it is that so many

Notice the "Internet links" box at the top of the page. It is not necessary to visit all these links as part of your reading, but if you'd like to, just follow the link listed in the book for supplemental online material.

The book mentions what the Earth is made of, but doesn't properly label the layers. The outer layer is called

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 demonstrations without making for you and your children to try *Science Activities, Vol. 2*. Packed with simple

ter is the layers shell and talk you'll be, but neither top

ential Notes
Week 1 | 1

TRY BEFORE YOU BUY!

Get a three-week sample of any Sonlight Instructor's Guide—FREE!
sonlight.com/samples

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 cut-outs, 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.

Science A: Week 1 Activity Sheet

4. **Challenge:** Make the statement true. (Please find Cut-Out #1 in the Appendix.) (p. 10)


The Sun rises in the and sets in the .

5. Can you name the four seasons? (p. 12)

1) _____ 2) _____
3) _____ 4) _____

6. Use the map to help you answer. (Please find Cut-Out #2) (p. 13)

North America




South America


When it is summer in:

...it is winter in:


7. During which two seasons does the Earth tilt toward or away from the Sun? Circle them. (p. 13)




winter



spring



summer



fall

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2 Week 1 Activity Sheet | 5-Day | Biology, Botany, and Physics

5

Do Together

4 The Seasons at Your House

Using a large piece of poster board, draw a line down the middle in each direction so as to divide it into four equal parts. Label the upper left corner "Spring," the upper right corner "Summer," the lower left corner "Fall," and the lower right corner "Winter." Now ask your children to use crayons, markers, paint, colored pencils, etc. to draw a picture of what each of the seasons looks like where you live. As they draw, discuss the seasons and what's different about each one. Ask them to think about how a stranger who just flew in from halfway around the world would be able to tell what season it is at any particular time. What clues would he find? Have fun with this activity, as your children learn more about how the seasons change in your particular area. When they're done, proudly display their work of art on the refrigerator or a wall where every one can see it.

Supplies

All You Provide

Note to Mom or Dad: When supplies are listed as "We provide," they are materials found in your course-specific (ASK) Supplies Kit. When supplies are listed as "You provide," they are materials you can generally find around your home. ■


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Science A: Week 1 Activity Sheet

Children's Profile

4. How many continents does the Earth have? Count them. (p. 6)

/



On which continent do you live? (Answers will vary.)

2. Why is a day 24 hours long? (Put an X next to the correct answer.) (p. 8)

Because that's how long it takes for the Earth to spin once on its axis.

Because that's how long it takes for the Earth to travel around the Sun.

3. Discuss with Mom or Dad: Why is it daytime on only one side of the Earth at a time? (p. 10)

On the Earth here, only one side faces the Sun, one side of the Earth is in light while the other side is in shadow.

Biology, Botany and Physics | 5-Day | Week 1 | 3

Science A: Week 1 Activity Sheet

4. **Challenge:** Make the statement true. (Please find Cut-Out #1 in the Appendix.) (p. 10)

The Sun rises in the East and sets in the West.

5. Can you name the four seasons? (p. 12)

1) Spring 2) Summer
3) Fall 4) Winter

6. Use the map to help you answer. (Please find Cut-Out #2) (p. 13)


North America

When it is summer in:


...it is winter in:

South America


7. During which two seasons does the Earth tilt toward or away from the Sun? Circle them. (p. 13)




winter



spring



summer



fall

© 1 Week Activity Sheet | 5-Day | Biology, Botany and Physics

6



“Sonlight keeps our family learning together,” shares Mackenzie B of Morrystown, AZ. “The beautifully illustrated books captures the attention of a wide age range of children and makes homeschooling more enjoyable for the parent as well. With Sonlight’s grab-and-go Instructor’s Guides, it’s so easy for Dad to do a quick lesson before bed. Sonlight is the perfect family curriculum.” Here, Dad is reading a science book to Corbin (6, Science B), Eden (2) and Ebban (6 months).

In Science E, you will learn about historical and mechanical technology, optics, astronomy and microscopy, electricity and magnetism, and aeronautics/astronautics.

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. And so you will find we follow a spiral pattern of education, touching on certain topics repeatedly this year and again in future years.

In this way the basic *vocabulary* of science becomes ingrained not only in short-term, but also 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. 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, recording data, and such, your children learn to follow your lead. An attitude of success—“Sure. We can do this!”—rubs off as well. These behaviors cannot be taught simply by reading books; they have to be modeled.

One quick note before you begin: The experiments don’t coordinate with the other science reading. We have not found any single book that coordinates great information and exciting illustrations (as found in the majority of our science books) with great hands-on activities and experiments. We believe we have selected the best cluster of books for both interest and excitement, but know up front: the science reading will not match the experiments.

My Downloads

Find extra schedule pages, new user information (how to use a Sonlight guide) and further helpful information specific to the guide you have purchased from Sonlight on our website: www.sonlight.com. Go to Your Account and select the Downloads section to find all of the downloads for your guide.

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.

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 world view known as *naturalism*, while another is based on *theism*.

Naturalism here does not refer to enjoying nature, as in being a naturalist, but to a world view 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.

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 a 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

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, when 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.

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.

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

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

Science E—Science Supplies


ESK (Science Supplies Kit) Item	Week(s) Used
3"x5" index cards	5, 9, 12, 17, 23, 30, 31, 33
aluminum foil	1, 2, 3, 4, 5, 16, 18, 21, 23, 24, 25, 35
balloon	34
bare copper wire	14, 16
clay (plasticine, model dough, etc.)	13, 14, 15, 16
clothespins	6, 13, 14, 15, 24, 25, 33, 35
D-cell battery	11, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25
flashlight bulbs	18, 19, 20, 21, 22, 23, 24, 25, 36
insulated wire	3, 4, 11
iron filings	2, 10
magnets	1, 2, 3, 4, 5, 6, 8, 10, 12, 13, 16, 17
masking tape (sticky tape, adhesive tape, etc.)	2, 3, 4, 5, 6, 8, 9, 10, 11, 12, 13, 17, 18, 20, 21, 23, 24, 25, 30, 33, 34, 35
nail, steel 2 ³ / ₈ "	10, 11, 22, 23
paper clips	1, 2, 3, 4, 5, 6, 7, 14, 20, 22, 23, 24, 25
plastic cups	5, 6, 8
rubber bands	16, 22, 23, 24
steel wool	10, 22, 30, 31, 33, 34
straight pins	1, 2, 3, 4, 5, 8, 10, 12, 31
straws	30
Styrofoam cups	3, 14
toothpicks	22
washers	1, 2, 10, 11, 22

Science E

Days 1–4: 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
Electricity and Magnetism	p. 3	pp. 4-5	pp. 6-7	
Activity Sheet Questions	#1-2	#3-7	#8-13	
Optional Experiments in Electricity and Magnetism			“Testing for static charges”	
Discover & Do Level 4 DVD			Optional: Tracks #32, 33	Science with Magnets Tracks Introduction, #35
TOPS #33: Magnetism				#1 “Is It Magnetic?”
Do Together			Bending Water	Energy Survey
Supplies for Optional Experiments in Electricity and Magnetism	You provide: running tap water, plastic ruler, sweater, wooden spoon, coin.			
Shopping/Planning List for Optional Experiments	For next week: running tap water, plastic ruler, sweater, wooden spoon, coin, bar magnet, 2 thick pieces of paper (regular weight), bowl of water, cork.			
Supplies 	We provide: ESK—aluminum foil, straight pins, paper clips, washers, magnets. You provide: thread, copper pennies.			
Shopping/Planning List	For next week: scissors, thread, pencil.			
Additional Subjects:				

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Electricity and Magnetism

Day 2	pp. 4–5
-----------------	---------

As the book notes, the origin of the word “watt” is James Watt (1736–1819), a Scottish scientist. Watt coined the term *horsepower* in reference to the power of an engine. Horsepower is still used today to refer to how much power car engines have, for example.

In recent years LED bulbs have garnered some attention. LED (light-emitting diode) bulbs are much more energy efficient than traditional incandescent bulbs, but currently they cost a lot more than regular bulbs.

Photosynthesis is the term for what the book describes as plants transferring “light energy into food...”[pp. 4–5]

On “millions of years” see our note in the Introduction.

The bicycle is probably the most energy-efficient means of self-powered transportation around, with some estimates claiming it is more than ninety percent efficient. This means that ninety percent or more of the energy of the person riding the bike makes it go.

 Parental Notes

Some Basic Concepts of Electricity

Your book includes basic definitions of some of the terms scientists use when speaking of electricity, but it fails to illustrate the terms.

When thinking about current electricity (electricity moving through a wire), think of it in the same way that you think of water moving through a hose.

Electric potential or voltage is the same thing as electrical pressure. Electrical potential, or voltage, is similar to water flowing from a higher to a lower level.

What happens if you have a water tank, full of water, with a bottom twenty feet below its top and with a hose attached to a spigot at its base? If the hose is open, will water come out of it slowly or quickly? (*quickly*) Will it have a lot of force behind it or will it barely glug onto the ground? (*The water will have a large pressure behind it.*)

What if the base of the tank is only two inches below the top of the water? (*The water will have very little pressure behind it.*)

What happens when you have low water pressure? The water barely glugs out of the hose. But if you have high pressure? The water shoots out with great force!

When talking about water, we have pressure (pounds per square inch), volume (gallons or liters), and flow (gallons or liters *per minute*). Physicists talk about electric potential or voltage (i.e., *pressure*; measured in *volts*), wattage, and amperage or amps (*flow*, or what physicists call *current*—the *rate or volume per hour*; measured in amperes).

Use the illustration of water in a garden hose to think through how you can increase or decrease pressure at the nozzle end; how you can increase or decrease flow; etc.

Day
3

pp. 6–7

Note that our scientific understanding of something as basic as the atom can change over time as our knowledge grows. Ideally, science corrects itself as progress is made. For example, the geocentric view of the solar system gave way to the heliocentric view, with the Sun at the center and planets rotating around it. In Charles Darwin's day the simple cell was thought of as truly simple – maybe just a blob of information. But now we know that the so-called simple cell is actually quite complex. In addition, we've discarded the perspective that the Earth is flat, coming to understand that it is round.

In the realm of biology, Darwinian evolution is seen as the explanation for how life is the way it is, having radically changed or evolved over long periods of time. But some scientists question the theory of macroevolution, pointing out what they believe are some key problems with it, such as a lack of transitional forms in the fossil record, evidence of design or what is sometimes referred to as specified complexity or irreducible complexity in biological systems, and more.

History, however, demonstrates that significant scientific change in reference to a well-established idea usually takes a lot of time. While macroevolution is currently the dominant scientific explanation of life, there may come a day when it is replaced or itself "evolved" into a newer

theory. The overall point here is that science can change. Every theory should be open to correction if there is enough evidence to challenge it. [p. 7]

Activity Sheet Questions

Day
1

#1–2

Activity Sheets are included after the notes and are assigned on each schedule page. Each Activity Sheet has a corresponding Answer Key page following these schedule pages.

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 year (and years to come!) to enable students to learn "naturally" through repetition and practice over time.

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

Please don't expect your children to write the answers until they gain considerable proficiency at handwriting. We have provided a variety of activities to interest and challenge your children. Feel free to let your children do those activities that 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.

Remember: This program is designed for you to use to meet your children's needs. It is not meant to use you!

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 # ESG1).

Occasionally we assign a "cut-out" activity. These are separate sheets you will find in the back of this guide.

Discover & Do Level 4 DVD

Day
4

Science with Magnets Tracks Introduction, #35

We produced this fun and educational video so you and your children could watch "Professor Justin" perform each of the assigned experiments from the *TOPS* science activity books, and *The Complete Book of the Microscope*. 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 what 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.

We're excited about all the content featured on our *Discover & Do Level 4* DVD! You may notice, however, that not all the tracks are scheduled. Since creating the DVD we've added some amazing science books to our Instructor's Guide, but we've also removed a few resources that used to coincide with the "Science with Light" and the "Science in Motion" sections on the disc. You and your children are welcome to view the unscheduled tracks (#1-10; #59-65) for fun, but consider them optional.

Please navigate your *Discover & Do Level 4 DVD* by using the DVD menu on your screen.

Do Together

Day
3

Bending Water

Bring your children's reading assignment to life today by helping them bend water with the power of static electricity! You'll need a source of tap water, a plastic ruler, a wooden spoon, a coin, and a nice scratchy wool sweater, if you have one!

Ask your children to turn on a tap slowly until they have a steady, thin flow of water. Now, let them take turns trying to bend the water with the power of static electricity. Test each item (ruler, wooden spoon, coin) by first rubbing it on a sweater and then moving it slowly toward the flow of water. When it gets close to the water, the static electricity charge should draw the water (bend it) toward the item.

Which items worked the best? Why do your children think the results turned out as they did? Were they impressed with the effect of the static electricity on the water? Why or why not? If they're up for it, challenge them to find and test additional items. Can they find any that work better than the plastic ruler or wooden spoon?

Day
4

Energy Survey

As your children begin to read *Electricity and Magnetism*, help them get an understanding of how very practical their studies will be. Just walk around the house with them, discussing all the things that use energy.

What types of energy do you use at home? Electricity? Battery power? Natural gas? Propane? There are many different sources of power. Talk about each of them. Discuss their relative benefits and drawbacks.

Take some time to discuss energy conservation. Does your family take special steps to conserve energy? If so, what do you do? Do your children have any ideas about other steps you could take to conserve even more energy? Turning off lights when they're not in use? Switching off televisions and radios when no one is using them? Taking shorter showers? Talk about why it's important to conserve energy—both financially and environmentally.

Supplies

Note to Mom or Dad: When supplies are listed as "We provide:" they are materials found in your Science E Supplies Kit (ESK). When supplies are listed as "You provide;" they are materials you can generally find around your home. ■



Science E: Week 1 Activity Sheet

Electricity and Magnetism

1. What form of electricity do we use? (p. 3)

current electricity

static electricity



2. What type of electricity is found naturally? Give two examples. (p. 3)



(static)



(lightning)

3. List seven forms of energy. (p. 4)

(kinetic)

(electricity)

(heat)

(light)

(mechanical)

(nuclear)

(chemical)



4. Name two ways we produce electricity. (p. 4)

(by burning fossil fuels)

(by breaking unstable atoms, which is what nuclear energy is)

5. What is energy measured in? (p. 4)

watts

grams

joules

degrees



Electricity, Magnetism, and Astronomy | 4-Day | Week 1 Activity Sheet

1



Science E: Week 1 Activity Sheet

6. What are two problems with using fossil fuels? (p. 5)

(they can cause pollution)

(the supplies are limited—once they are used up, they are gone)



7. List five alternative energy sources. (p. 5)

(wind)

(waves)

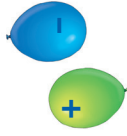
(water)

(solar)

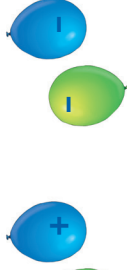
(geothermal)

8. Add (+) and (-) signs to the balloons below. Give one example of charges that attract and at least one example of charges that repel. (p. 6)

Attract



Repel



9. What causes static electricity? (p. 6) (extra electrical charges build up)

10. Does more static electricity build up in a dry or damp climate? Circle the correct answer. (p. 6)

dry

damp



Week 1 Activity Sheet | 4-Day | Electricity, Magnetism, and Astronomy

2

Science E: Week 1 Activity Sheet



11. Why are we generally unaware of electrical charges? (p. 7) _____
_____ *(most materials have an equal amount of positive and negative charges—they cancel each other out)*

12. A positive ion has more _____ *(protons)* than _____ *(electrons)*. (p. 7)



13. A negative ion has more _____ *(electrons)* than _____ *(protons)*. (p. 7)



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Electricity and Magnetism

1. What form of electricity do we use? (p. 3)

current electricity

static electricity

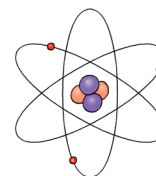


2. What type of electricity is found naturally? Give two examples. (p. 3)





3. List seven forms of energy. (p. 4)



4. Name two ways we produce electricity. (p. 4)

5. What is energy measured in? (p. 4)

watts

joules

grams

degrees

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Science E: Week 1 Activity Sheet

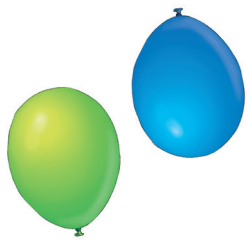
6. What are two problems with using fossil fuels? (p. 5)



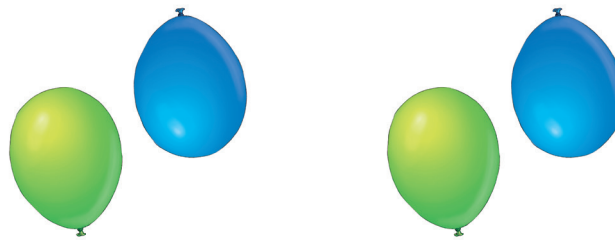
7. List five alternative energy sources. (p. 5)

8. Add (+) and (-) signs to the balloons below. Give one example of charges that attract and at least one example of charges that repel. (p. 6)

Attract



Repel



9. What causes static electricity? (p. 6) _____

10. Does more static electricity build up in a dry or damp climate? Circle the correct answer. (p. 6)

dry

damp

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11. Why are we generally unaware of electrical charges? (p. 7) _____

12. A positive ion has more _____ than _____. (p. 7)



13. A negative ion has more _____ than _____. (p. 7)



Science E

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
Electricity and Magnetism	pp. 8–9	pp. 10–11	pp. 12–13	
Activity Sheet Questions	#1-3	#4-7	#8–9	
Optional Experiments in Electricity and Magnetism	“Make your own conductor”	“Looking at magnetic fields” & “Testing magnetic power”	“Make your own compass”	
Discover & Do Level 4 DVD			Optional: Track #53	Track #36
TOPS #33: Magnetism				#2 “Name That Pole”
Do Together		Positively Magnetic	Hide and Seek	
Supplies for Optional Experiments in Electricity and Magnetism	We provide: ESK—aluminum foil, straight pin, iron filings, paper clips, washers, magnets. You provide: running tap water, plastic ruler, sweater, wooden spoon, coin, bar magnet, 2 thick pieces of paper (regular weight), bowl of water, cork.			
Shopping/Planning List for Optional Experiments	For next week: copper coins, paper towels, salty water, headphones.			
Supplies	We provide: ESK— magnets, masking tape, paper clips. You provide: scissors, thread, pencil.			
Shopping/Planning List	For next week: paper punch, pencil, sheet of paper, scissors, thread.			
Additional Subjects:				

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Electricity and Magnetism

Day 5	pp. 8–9
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Where does lightning strike most often? In the United States, the most lightning strikes occur in Florida. But Central Africa gets the most lightning in the world, specifically near the village of Kifuka, Democratic Republic of the Congo.

Day 7	pp. 12–13
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How might migratory animals such as birds sense the magnetic field of the earth? Scientists aren't really sure. As the book notes, scientists aren't even sure that migratory birds are sensing the magnetic field of the earth—it's just an educated guess. Even if we were to come up with a scientific explanation for bird migration, it's still amazing, suggesting evidence of design in our world, not chance. One explanation is that certain animals have magnetite

Parental Notes

inside them and this helps them act like a compass. This, however, still doesn't explain how such a seemingly complex system could come about without the influence of a designer. [p. 13]

Do Together

Day 6 Positively Magnetic

Magnets are fun. It's a fact of life. Unavoidably, undeniably fun. So why fight it? You know you want to grab some magnets and just play. Join your children and just have some fun with magnets today.

You probably have magnets on the refrigerator already. If you need an excuse, use this activity as reason to go to a craft store and buy a variety of different sizes and type of magnets. We're sure you'll eventually use them all anyway...there are a lot of writing assignments and crafts that'll need to be hung on the refrigerator before the year is over!

Let your children's interest in magnets guide your fun today. Encourage them to experiment with the magnets in whatever way they like. What do they attract? What do they repel? How many paper clips can they attract with a single magnet? Have fun and enjoy your time playing together—your children will never suspect you're subtly reinforcing what they learned from their reading!

Day 7 Hide and Seek

Reinforce what your children learned today about compasses by teaching them how to use one to navigate in the woods. First, get a compass. It doesn't have to be an expensive one. A simple, cheap one will do just fine.

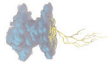
Show them how to navigate from one point to another using the directional arrow of the compass and the bearings marked on the compass.

For extra fun, bring along a surprise package of some kind of goodies. Hide it somewhere along your walk, and then give your children directions (for example, walk 50 yards northeast on a bearing of 45 degrees) to it. Can they find it? If they're successful, trade places and let them hide the package for you to find. Have fun in the woods together! ■

Science E: Week 2 Activity Sheet

Electricity and Magnetism

- Talk it out then write it down: Explain your answer verbally to Mom or Dad, then write it below.
 Could lightning be used as a power source? Why or why not? (p. 8)
(No, we don't know where it will strike and it creates too much power too quickly for us to be able to use it efficiently)
- Please find Cut-Out #1 in the appendix. Put the steps in order of what causes lightning below, but check your answer with Mom or Dad before gluing them down! Then, use this sheet to help you explain it to someone who doesn't know. (p. 8)



Static electricity builds as water droplets hit one another.


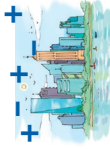
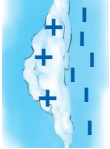
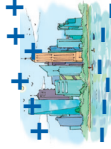
Negative charges build up in the bottom of the cloud.

Negative charges in the cloud repel negative charges in the buildings below.

Positive charges are left behind in the buildings.

When the charge gets large enough, it breaks through the insulation of the air.

The electrical charge at the base of the cloud discharges and lightning strikes.

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Electricity, Magnetism, and Astronomy | 4-Day | Week 2 Activity Sheet **5**



Science E: Week 2 Activity Sheet

3. Lightning conductors cause lightning... (Circle the correct letter) (p. 9)
- a. to strike in a safe spot so it becomes harmless to nearby structures
 - b. to be neutralized by sending out positive charges to join with the negative charges in the cloud**
 - c. to be neutralized by sending out negative charges to repel negative charges in the cloud
 - d. to be neutralized by getting rid of all the charges in the cloud

4. Where is a magnet's charge strongest? (p. 10) (at its poles)



5. How can you tell if something can be magnetized? (p. 11) (if it is magnetic—i.e., if it is attracted to a magnet, it can be magnetized)



6. List characteristics of a magnetic substance. (p. 10)
(any substance that will behave like a magnet—in that it will attract metals)
(a magnetic substance, when allowed to free-float, will always end up in a north-south position)

7. Talk it out, then write it down: Explain your answer verbally to Mom or Dad, then write it below. What do scientists believe causes magnetism? Be sure to include the terms "domain" and "force" in your explanation.



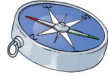
Draw a picture to help you explain. (p. 11)
(in a magnet, all of the tiny internal units, called domains, line up, causing a united magnetic force)

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Science E: Week 2 Activity Sheet

8. What was probably the earliest use of the magnet? Who used it? (p. 12)
(for a compass; the Chinese)



9. How does a compass work? (p. 13) (the compass needle aligns with the poles on a magnet, and since Earth has a magnetic pole, the needle aligns to the pole)



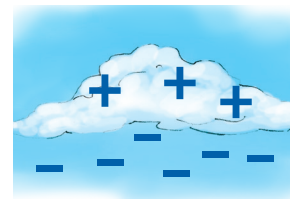
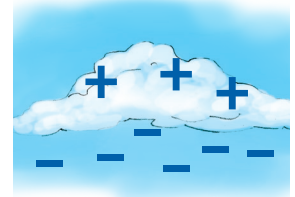
Electricity and Magnetism

- 1. Talk it out then write it down: Explain your answer verbally to Mom or Dad, then write it below.

Could lightning be used as a power source? Why or why not? (p. 8)



- 2. Please find Cut-Out #1 in the appendix. Put the steps in order of what causes lightning below, but check your answer with Mom or Dad before gluing them down! Then, use this sheet to help you explain it to someone who doesn't know. (p. 8)



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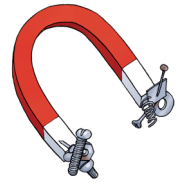


Science E: Week 2 Activity Sheet

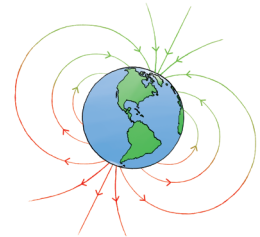
3. Lightning conductors cause lightning... (Circle the correct letter) (p. 9)
- a. to strike in a safe spot so it becomes harmless to nearby structures
 - b. to be neutralized by sending out positive charges to join with the negative charges in the cloud
 - c. to be neutralized by sending out negative charges to repel negative charges in the cloud
 - d. to be neutralized by getting rid of all the charges in the cloud

4. Where is a magnet's charge strongest? (p. 10) _____

5. How can you tell if something can be magnetized? (p. 11) _____



6. List characteristics of a magnetic substance. (p. 10)



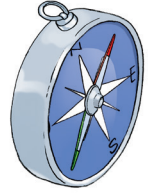
7. Talk it out, then write it down: Explain your answer verbally to Mom or Dad, then write it below.

What do scientists believe causes magnetism? Be sure to include the terms "domain" and "force" in your explanation.

Draw a picture to help you explain. (p. 11)



8. What was probably the earliest use of the magnet? Who used it? (p. 12) _____




9. How does a compass work? (p. 13) _____

Science E

Days 9–12: 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 9	Day 10	Day 11	Day 12
Electricity and Magnetism	pp. 14–15	pp. 16–17	pp. 18–19	
Activity Sheet Questions	#1–2	#3–6 	#7–16	
Optional Experiments in Electricity and Magnetism	“Make your own voltaic pile”			
Discover & Do Level 4 DVD	Optional: Track #34			Track #37
TOPS #33: Magnetism				#3 “Pin Magnets”
Do Together	Back to the Future		Safety First!	
Supplies for Optional Experiments in Electricity and Magnetism	We provide: ESK—aluminum foil, paper clips, insulated wire. You provide: copper coins, paper towels, salty water, headphones.			
Shopping/Planning List for Optional Experiments	For next week: 9-volt battery, blank cassette tape, tape recorder.			
Supplies	We provide: ESK—Styrofoam cups, straight pins, masking tape, magnets. You provide: paper punch, pencil, sheet of paper, scissors, thread.			
Shopping/Planning List	For next week: scissors, thread.			
Additional Subjects:				

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Electricity and Magnetism

Day
10

pp. 16–17

André-Marie Ampère lived from 1775 to 1836 and is remembered primarily for his works in mathematics and physics. He studied magnetism in relation to electrical current, known as electromagnetism. [p. 17]

Day
11

pp. 18–19

Georg Simon Ohm lived from 1789 to 1854. As a physicist in 1827 Ohm developed a mathematical formula known as Ohm's Law, having to do with force, electrical current, and circuit resistance, published in a pamphlet titled *The Galvanic Circuit Investigated Mathematically*.

Thomas Alva Edison (1847–1931) was an American inventor who filed 1,093 patents. His inventions were in various fields such as electrical lighting, the phonograph, the telegraph, the motion picture industry, and more. His research facility in Menlo Park, New Jersey, contributed to his nickname, "The Wizard of Menlo Park." [p. 18]

Activity Sheet Questions

Day
10

#3

Note: In the crossword exercise, this is the definition for a joule as your children will find it in their text, however it more accurately describes the definition of a kilocalorie. Unfortunately, a little online research will further confound the true definition of a joule. WolframAlpha states a joule is "a unit of electrical energy equal to the work done when a current of one ampere passes through a resistance of one ohm for one second." while Wikipedia more simply states, "The work required to move an electric charge of one coulomb through an electrical potential difference of one volt." Or "The work required to produce one watt of power for one second." (October, 2012). Regardless, we think each of these definitions digs much further into physics than you were probably planning to go this year, so please know that at this age, your children simply need to understand that a joule is a measurement of energy equal to a certain amount of work. They will learn more about joules and other units of measurement as they further their scientific study.

Do Together

Day
9

Back to the Future

Spend some time with your children today researching the types of alternative-energy vehicles available on the market today.

Use the Internet to search for information. There are many government websites that have plenty of information about alternative-fuel vehicles. Likewise, you may find interesting information on sites dedicated to vehicles, in general, such as www.edmunds.com.

What do your children think about these types of vehicles? What are their benefits? Their drawbacks? Would they like to drive one? Own one? Why or why not? What technologies interest them the most? What type of car do they think they'll drive when they're your age?

Day
11

Safety First!

As your children learned in the reading assignment today, faulty circuits can be dangerous in the home. Put that knowledge to use and let your children help you inspect all of the electrical cords in your home.

Before they check any particular cord, make sure the item is unplugged first. Show them how to check the cord from its base to its tip, looking for weak spots or areas with bare wire exposed.

If they find cords that need to be repaired, set them aside and turn the repair of these cords into a separate project. If you are uncomfortable making such repairs yourself, arrange to have the items repaired by a capable electrician. Otherwise, feel free to show your children how to properly repair and insulate damaged wires, so that the appliances they service may be used safely.

As you work on this project together, reinforce the lessons your children have been learning about electricity. Use the time to remind them to respect electricity in all its forms. It's never too early to teach safety in the home! ■

Science E: Week 3 Activity Sheet



Electricity and Magnetism

- How does a battery work? (Choose one.) (p. 14) (c)
 - the chemicals within the battery explode and produce electrical energy
 - the chemicals in the air around the battery react to produce energy
 - the chemicals within the battery react and produce electrical energy
 - batteries were once plugged into an outlet and they "stored up" electricity
- Review.** Draw a line from each term to the correct definition. (pp. 3–4, 10–11, 13–15)

geothermal electricity energy efficiency magnetic field flux lines residual or induced magnetism angle of declination photovoltaic cells voltaic pile	amount of energy used to do the task required compared to the amount of unwanted heat (p. 4) difference between magnetic north and geographic north (p. 13) electricity generated from heat of hot rocks inside the earth (p. 3) lines of force in a magnetic field; the field is strongest where these are closest together (p. 10) magnetic force of attraction and repulsion that surrounds a magnet (p. 10) normally non-magnetic metal that becomes magnetized after being in contact with a magnet (p. 11) they transfer light into electrical energy (p. 15) a first battery that combined copper, zinc, and soaked cardboard (pp. 14–15)
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Science E: Week 3 Activity Sheet

- Solve the puzzle. Feel free to use the glossary in the back of the book if you need help. (pp. 4, 17)

ampereage	power	wattage	joule
voltage	joule	wattage	ampereage

Across:

- electrical flow or current—volume per hour (p. 17)

Down:

- electrical pressure; potential energy (p. 17)
- the energy needed to raise the temperature of 1kg of water by 1° C (p. 4)
- electrical volume; the rate of doing work (p. 4)
- the rate at which a device transfers energy from one form to another and is measured in watts (p. 4)

1	V	O	L	T	A	M	P	E	R	A	G	E
2	J	O	U	L	T	T	W	A	A	T	O	W
3	W	A	T	T	O	P	O	W	E	R	E	R
4	G	E	G	E	R	E	R	E	R	E	R	E

- What do you complete when you turn on your computer or switch on a flashlight? (p. 16)
 a **connection** a **circuit** a **circle**

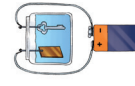
- Does electricity flow in a completed circuit like soda through a straw—where you can see it rising, or have to wait momentarily for it to reach the top? Explain. (p. 16)

(No—currents are invisible, we only know they are there because we can see the effect of them. Electricity in a completed circuit has a current instantaneously once the circuit is completed. It doesn't really "flow" through the wire.)

- Use the words or phrases in the box to complete the following. (p. 17)

electrolysis	ions	electrolytes	attraction
positive	attraction	ions	electrolysis

Certain liquids, known as electrolytes, contain ions that carry either a positive or negative charge. Electrolysis is a process that uses the attraction of the ions to positive and negative terminals to purify metals or to coat something in metal.



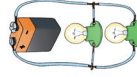
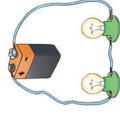
Science E: Week 3 Activity Sheet



Review: Fill in the blanks with the correct answer.

accumulators	amperes	circuit	conductors	electricity
electrolytes	ohms	insulators	ion	electromagnetism

7. Current is measured in _____ (*amperes*) _____ (p. 17)
8. _____ (*Electricity*) _____ is an energy form that is easily transferred to and from other forms such as heat and light. (p. 3)
9. _____ (*Electromagnetism*) _____ is electricity that creates magnetism. Many machines use this property. (p. 3)
10. An _____ (*ion*) _____ is an atom with an unbalanced or unequal number of protons and electrons. (p. 7)
11. _____ (*Electrolytes*) _____ are liquids that contain charged ions—they seem to help thermal reactions occur. (p. 14)
12. _____ (*Accumulators*) _____ are batteries that build up electrical energy. (p. 15)
13. A _____ (*circuit*) _____ is a path for electricity that starts and finishes at the source of power. (p. 16)
14. Materials that carry electricity are called _____ (*conductors*) _____ (p. 16)
15. Materials that have few "free" electrons and therefore do not carry electricity are called _____ (*insulators*) _____ (p. 17)
16. Resistance is measured in _____ (*ohms*) _____ (p. 18)



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Electricity and Magnetism

1. How does a battery work? (Choose one.) (p. 14) _____
 - a. the chemicals within the battery explode and produce electrical energy
 - b. the chemicals in the air around the battery react to produce energy
 - c. the chemicals within the battery react and produce electrical energy
 - d. batteries were once plugged into an outlet and they “stored up” electricity

2. **Review.** Draw a line from each term to the correct definition. (pp. 3–4, 10–11, 13–15)

- | | |
|---------------------------------|---|
| geothermal electricity • | • amount of energy used to do the task required compared to the amount of unwanted heat (p. 4) |
| energy efficiency • | • difference between magnetic north and geographic north (p. 13) |
| magnetic field • | • electricity generated from heat of hot rocks inside the earth (p. 3) |
| flux lines • | • lines of force in a magnetic field: the field is strongest where these are closest together (p. 10) |
| residual or induced magnetism • | • magnetic force of attraction and repulsion that surrounds a magnet (p. 10) |
| angle of declination • | • normally non-magnetic metal that becomes magnetized after being in contact with a magnet (p. 11) |
| photovoltaic cells • | • they transfer light into electrical energy (p. 15) |
| voltaic pile • | • a first battery that combined copper, zinc, and soaked cardboard (pp. 14–15) |

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Science E: Week 3 Activity Sheet

3. Solve the puzzle. Feel free to use the glossary in the back of the book if you need help. (pp. 4, 17)

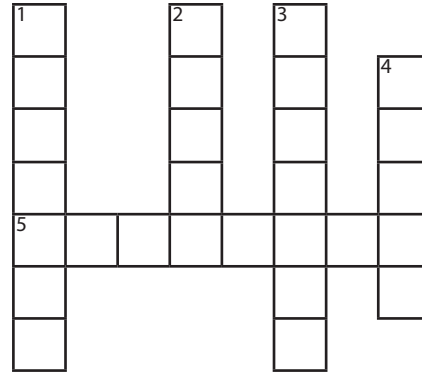
amperage	power	wattage	joule	voltage
----------	-------	---------	-------	---------

Across:

- 5) electrical flow or current—volume per hour (p. 17)

Down:

- 1) electrical pressure; potential energy (p. 17)
- 2) the energy needed to raise the temperature of 1 kg of water by 1° C (p. 4)
- 3) electrical volume; the rate of doing work (p. 4)
- 4) the rate at which a device transfers energy from one form to another and is measured in watts (p. 4)



4. What do you complete when you turn on your computer or switch on a flashlight? (p. 16)

a connection

a circuit

a circus

a circle

5. Does electricity flow in a completed circuit like soda through a straw—where you can see it rising, or have to wait momentarily for it to reach the top? Explain. (p. 16)

6. Use the words or phrases in the box to complete the following. (p. 17)

electrolysis	ions	electrolytes	attraction	positive
--------------	------	--------------	------------	----------

Certain liquids, known as _____, contain _____ that carry either a _____ or negative charge. _____ is a process that uses the _____ of the ions to positive and negative terminals to purify metals or to coat something in metal.





Review: Fill in the blanks with the correct answer.

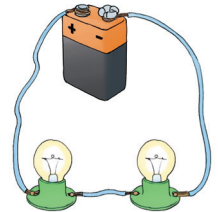
accumulators	amperes	circuit	conductors	electricity
electrolytes	ohms	insulators	ion	electromagnetism

7. Current is measured in _____ . (p. 17)

8. _____ is an energy form that is easily transferred to and from other forms such as heat and light. (p. 3)

9. _____ is electricity that creates magnetism. Many machines use this property. (p. 3)

10. An _____ is an atom with an unbalanced or unequal number of protons and electrons. (p. 7)



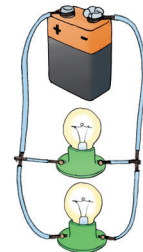
11. _____ are liquids that contain charged ions—they seem to help thermal reactions occur. (p. 14)

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15. Materials that have few “free” electrons and therefore do not carry electricity are called _____. (p. 17)



16. Resistance is measured in _____. (p. 18)

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Science E—Weekly Subject List

Week	Subject
1	electricity/magnetism/fossil fuels/nuclear energy/joules/alternate energy sources/ion/protons/electrons
2	thunder and lightning/magnetic compasses/magnetism/domain/force
3	cells and batteries/electric circuits/resistance: heat and light/magnetism/conductors/amperes/ohms
4	electromagnetism/electric motors/magnetism/currents
5	generating electricity/electricity at home/electricity in the future/magnetism/ alternating current/direct current/fuses
6	atoms/elements/electrons/protons/neutrons/periodic table/ energy particles/particle accelerators/magnetism
7	chemical discovery/designer molecules'/solids/liquids/gas/magnet models/ions
8	crystals/chemical compounds/energy particles/dark matter/magnetism
9	water/metals/plastics/magnetism/surface tension
10	carbon/silicon/biomimicry/magnetism
11	energy/nuclear power/alternative energy/physics/forces/magnetism/ energy: potential, chemical, kinetic/inertia/friction
12	gravity/black holes/Albert Einstein/time/pressure/magnetism
13	sound vibrations/ sound/heat energy/magnetism/ frequency/amplitude/ultrasound/infrasound/echolocation
14	low temperatures/electrical current/ electrical charges/static electricity/lightning/Tesla coil/magnetism
15	neurons/pacemakers/central nervous system/magnetism/electromagnetism/
16	electromagnetic spectrum/microwaves/X-rays/light/lasers/magnetism
17	color/optical illusions/computers/magnetism/perception/cones/UV light
18	Internet/World Wide Web/artificial intelligence/robotics/electricity
19	nanotechnology/genetics/DNA/cells/cloning/electricity
20	cybernetics/virtual reality/the universe/space/solar system/electricity/light year
21	sun/eclipses/Mercury/ solar wind/aurora borealis/electricity
22	Venus/Earth/Moon/electricity
23	Mars/Jupiter/Saturn/ Galileo/gas giants/electricity
24	Uranus/Neptune/ helium/methane gas/Pluto/electricity
25	asteroids/comets/meteors/exploring space/Sputnik/electricity
26	famous astronomers/satellites and galaxies/stars/Milky Way galaxy/nebulae/electricity
27	birth of stars/life of stars/variable stars/supernova/electricity
28	constellations/describing stars/maps of the stars/ home astronomy/star photographs/electricity
29	telescopes/astronomy facts/constellations/map of the moon/microscopes (optical/electron)/using a microscope /electricity
30	microscopes/using a microscope/viewing paper, print, fibers, and fabrics/archaeology/forensic science/electricity
31	microscopes/viewing hair, teeth, and tongue/cells/nucleus/DNA/genes/bacteria/ red cells/white cells/platelets/electricity
32	microscopes/viruses/medicine/vaccines/surgery/plant cells/plant food/plant reproduction/pollen/electricity
33	microscopes/water plants/fungi/food science/insects/microscopic life/electricity
34	microscopes/pests/insects/sand and rocks/microfossils/crystals/electricity
35	microscopes/metals/micromachines/nanotechnology/electricity
36	microscopes/early microscopes/germs/contemporary microscopes/atoms/electricity



Cut-Out #1



made up of two or more atoms	smallest naturally occurring form of an element	made up of protons, neutrons and electrons
small parts of elements	smallest "building blocks"	

Cut-Out #2



SPREAD OUT (MOVE AROUND QUICKLY)	VERY CLOSE TOGETHER	CLOSE TOGETHER (BUT CAN STILL MOVE)	SOME ARE HEAVY	SOME ARE HARDER THAN OTHERS
SOME ARE HARDER TO POUR THAN OTHERS	MOST ARE INVISIBLE	SOME ARE LIGHT		

Cut-Out #3



Static electricity builds as water droplets hit one another.
When the charge gets large enough, it breaks through the insulation of the air.
Negative charges build up in the bottom of the cloud.
The electrical charge at the base of the cloud discharges and lightning strikes.
Positive charges are left behind in the buildings.
Negative charges in the cloud repel negative charges in the buildings below.

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SONLIGHT

2020-2021 CATALOG



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ESTIMATED DAILY TIME:
Student: 1.5-2 hrs | Parents: 1-1.5 hrs

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Grades: Kindergarten-1 | Ages: 5-6

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